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OF BEARS AND WOMEN:
INVESTIGATING THE HYPOTHESIS THAT
MENSTRUATION ATTRACTS BEARS

By

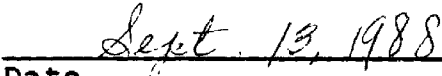
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B.A., University of California at Santa Cruz, 1981
Submitted in partial fulfillment of the requirements
for the degree of
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University of Montana
1988

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PREFACE

My personal experience with the hypothesis that menstruating women attract grizzly bears (Ursus arctos) has been instrumental in my choice of this investigation; it has also formed my biases. I worked seasonally for the U.S. Forest Service (USFS) for six years in grizzly/brown bear habitat. In the fall of 1983, my fourth season on the Shoshone National Forest in northwest Wyoming, I was working on a timber crew marking a timber sale in Situation 1 grizzly habitat. On our return to the ranger station we passed a hunter's camp that bears had ransacked. We investigated and found clear tracks of an adult grizzly and one cub. They had entered the wall tent, found groceries inside, and had torn up the contents of the tent. The camp had not been "grizzly proofed." Food had been left inside the tent improperly contained; the hunter had not taken any precautions to avoid contact with grizzlies.

We reported the incident to the District Ranger's Office; this resulted in an investigation by a USFS special agent assigned to the district to enforce grizzly bear regulations during the hunting season. A few days later, my crew (three women and one man) was informed that due to the recent bear trouble, women would no longer be allowed to work in the backcountry during their menstrual periods.

The women on the crew failed to make the connection between the incident involving food in a hunter's camp and

working during our menstrual periods. Combined, we had 19 seasons of experience in the backcountry, mostly in grizzly bear country, and none of us had ever seriously considered this hypothesis. We suspected that our backcountry jobs would be threatened by a policy that prevented us from working approximately five days of every month. We told the District Ranger of our concerns and were told that given this new policy, it would be unlikely that we would receive backcountry jobs the following year.

We wanted to protest this policy, but we needed to know more about the hypothesis that menstrual odors attract bears. We discovered, from hearing the opinions of various bear biologists, including John Craighead and Charles Jonkel, that there were opposing views to the hypothesis' validity and, at that point, it had not been published or put before peer review. Consequently, we filed a formal opposition to the policy with the Equal Employment Opportunity office in Denver and the policy was rescinded.

This introduction to the hypothesis that menstruating women attract grizzly bears sparked my interest in the topic. The more I investigated it, the more questions I discovered. Because my undergraduate degree is in cultural anthropology, I was aware of the prevalence of bear mythology and menstrual taboos in many cultures. This background led me to suspect a connection between how our culture looks at bears, women, and menstruation, and the hypothesis that menstruating women attract bears. Also, as a backcountry worker, I became aware of some people's

tendency to believe that "the woods" is no place for women and that mountains are a man's realm.

This background made me reluctant to accept the biological evidence that polar bears (U. maritimus) were attracted to menstrual odors (Cushing 1980). However, in writing a master's thesis, a bias such as that is unacceptable. I have done all I can to override this bias and to evaluate information from all aspects of the issue.

The hypothesis that menstruation attracts bears is "culturally weighted", full of potential misinterpretations because of cultural preconceptions about women, menstruation, and wilderness. On one side, the acceptance of this hypothesis has implications for women's recreational and employment opportunities. On the other hand, overlooking evidence that bears respond differently to women than to men would be inexcusable and potentially dangerous.

INTRODUCTION

The National Park Service (NPS) and the USFS have recommended in their visitor information handouts that women should stay out of grizzly bear country during their menstrual period (Grizzly, Grizzly, Grizzly 1982). More recent pamphlets leave the decision to the individual by saying, "Women may choose to stay out of bear country during their menstrual period" (IGBC 1985). Newspapers such as The Los Angeles Times (Oct. 4, 1984), have reported that the "folk wisdom" that says menstruating women attract bears is true and that it is pheromones (hormonal scents) and not blood that draws the bears.

This hypothesis, that menstruating women attract bears, especially grizzly bears, has had far reaching coverage, and has probably been accepted by the majority of people who have heard of it. The predominant underlying message is that women may be more attractive to grizzly bears and are therefore more likely to be attacked. In Canada, the information given to travelers in national parks states that the risk of bear attacks on women may increase during menstruation (Parks Canada 1985). The implied danger of employing women in grizzly country has been discussed by U.S. government agencies (see PREFACE and Responses to Cushing's Findings). The extension from attraction to attack is commonly made. Many women are thus scared and probably hesitant to travel, hike, or work in grizzly bear country, perhaps unnecessarily.

My goal in this paper is to examine the hypothesis that menstruating women attract grizzly bears, its genesis and acceptance, its scientific basis, its management and legal implications, and the cultural attitudes supporting it.

Glacier Attacks

The hypothesis first surfaced officially after two women were killed in separate incidents, on the same night, by grizzly bears in Glacier National Park, Montana, in 1967. The Park's report on the bear attacks (USDI 1967:13), noted that: "The Trout Lake girl was in her monthly menstrual period while the Granite Park victim evidently expected her period to begin at any time." The woman at Granite Park had two tampons in her backpack, leading to the Park's conclusion that her period was expected.

Trout Lake

In asking the question why Michele Koons was attacked at Trout Lake and her companions were not, the report concludes:

She was wearing the external type of sanitary pad. This type does not stop menstrual body odor to any degree. A later interview with the other girl in the party brought out that she, too, was in her menstrual period but was using the internal tampon-type device which supposedly leaves no odor because the menstrual fluid is not exposed to the air. The bear briefly investigated this girl before going on. A number of letters have been received at the Park reporting incidents of women in their monthly period being attacked by various wild animals. It would seem a plausible reason for the attack (USDI 1967:21-22).

The report did not find menstrual odors to be a primary

cause for the bear's approach but postulated that both menstrual odors and odors from cosmetics may have caused the bear to press its attack upon Michele Koons. The background of the attack reveals reasons other than menstruation for the bear's approach to the site.

The Trout Lake area had seen heavy human use and bears had been attracted to camping areas by discarded food containers, food scraps, and the remains of caught fish (USDI 1967). The bear at Trout Lake that eventually killed Michele Koons had been approaching and harassing people throughout the summer. The bear was an aggressive old female without young. Olsen (1969) details the bear's summer-long career of aggressive behavior. He cites local newspapers' accounts of the Trout Lake bear obtaining human food and driving campers away from the area (Olsen 1969). The bear had driven a father and son out of the area the day before the fatal attack (USDI 1967).

On the night of August 13, 1967, two young women, three young men, and one dog were camped together at Trout Lake. The bear approached the camp several times, first at 8:00 p.m. as it was getting dark and after the campers had cooked hot dogs and fish (USDI 1967). The bear frightened the campers so they abandoned their campsite and moved their sleeping bags down to the lake. The bear seemed most interested in their food, as had been the case with previous visitors to Trout Lake.

On the bear's final visit, when all the campers were asleep in their sleeping bags, it approached and examined

each in turn. Michele Koons was the last person the bear approached. The other four got out of their bags and were jumping and shouting, causing confusion and excitement as they rushed to climb trees. In this atmosphere of noise and excitement, the bear went directly to the one remaining person and almost immediately began tearing into her sleeping bag. Her struggles and screams probably further excited the bear. According to Paul Dunn, one of the campers, Michele couldn't get her zipper undone and could not get out of her bag. The bear pulled her several hundred feet away from the lake and ate her (USDI 1967).

Questions about the role of menstrual odors in this attack reveal the difficulty of isolating the possible influence of menstrual odors in bear encounters. If menstrual odors or menstrual pheromones had been an attractant would the bear have gone straight to Michele rather than approaching her last? If it were pheromones associated with menstruation and not menstrual blood that acted as an attractant, as has been proposed by Cushing (1980) and Jonkel (pers. commun.), the other woman present was also menstruating; why was she not singled out by the bear?

C. Jonkel (pers. commun.) points out that if odors associated with menstruation attract bears, they do not necessarily entice them to attack. The odors may bring a bear into the vicinity of humans; once there, an attack may occur, and who is attacked may not be related to the

reasons for the approach. Other factors (proximity, food odors, a sudden movement or noise, etc.) may trigger the actual attack. Determining what had attracted a bear into the vicinity of humans and then isolating the factors responsible for its subsequent behavior would be very difficult given the interaction of factors and the complexity of bear behavior.

The bear at Trout Lake had approached many people, with food as its apparent motive (USDI 1967 and Olsen 1969). If menstruation played a role in the approach or the attack, it is not an obvious one. Yet, this attack has been used as an example in developing the hypothesis that menstruating women attract grizzly bears. Emphasizing menstruation as a possible causal factor overshadows the importance of the bear's past history, the role of human food, and the atmosphere of noise and confusion in the attack.

Granite Park

The attack at Granite Park involved a young man and woman, Roy Ducat and Julie Helgeson, at a campground not far from Granite Park Chalet. Excess garbage from the Chalet had traditionally been dumped in a nearby gully. Grizzlies were accustomed to feeding in the garbage dump. Roy Ducat and Julie Helgeson were attacked by a female with two cubs, who had been regular feeders at the dump.

The victims were sleeping outside when the bears approached. The adult female bear attacked Roy first,

then went back and forth between him and Julie. When Julie started to scream the bear dragged her away; Roy "emphasized that he remained silent all the time during the attack" (USDI 1967:8). Roy was able to reach nearby campers and was taken to the Chalet where he was given immediate medical treatment and 75 minutes later was transported by helicopter to a Kalispell hospital. Julie was found and brought to the Chalet 3 hours and 15 minutes after the attack was reported. Her injuries were extensive and she died before she could be transported to a hospital.

The Park report concluded that due to the nature of the attack it was clear that Julie's sex, her physical condition and/or her use of some odor-emitting substance were not factors in the attack (USDI 1967:17). A link between menstruation or menstrual pheromones and this attack would be speculative and arbitrary. Herrero (1985) attributes both Glacier attacks to the bears' histories of feeding on garbage and human food.

That the first two grizzly bear-related fatalities in Glacier National Park occurred on the same night, and that the victims were both young women, was enormously shocking to the public and to the NPS. "The mystery triggered almost hysterical speculation as to the cause" (Watson 1967:74). It demanded an immediate explanation and menstruation, although not named as a primary cause, became a credible reason for the attacks.

That menstruating women attract the attention of

animals is a common belief in our culture. Glacier Park officials received letters from the public reporting incidents of women in their monthly period being attacked by various wild animals. These letters, and Michele Koon's menstrual status, led them to conclude that menstruation was a plausible reason for the Trout Lake attack (USDI 1967).

Another publicly supported rationale for the attacks was that drugs had caused the bears' aggressive behavior. Glacier Park also received letters speculating that the bears had been drugged with LSD or some other hallucinogen (Watson 1967). According to the Park, there was no evidence that the bears had any contact with drugs of any kind (USDI 1967).

The letters from the public reveal a desire to have a simple, understandable reason for the attacks. The reasons for the attacks were complex and had no simple answers; the main issue they both pointed to was the danger of bears becoming habituated to human food and garbage.

The idea that menstruation entices predators has a strong cultural base and perceived credibility. When a young woman was eaten by a shark off a Long Island beach, menstruation was suggested as the reason she was attacked (Delaney et al. 1976). Whether she was menstruating and whether it could have played a role in the attack are unknown. My sister, when working as a polo pony groom, was told to stay away from any stallions when she had her period because it would enrage them and she would be in

danger. Such casual observations and warnings have never been quantified or tested. It could be argued that this belief is culturally founded in our attitudes about women and menstruation and may have no basis in fact.

I wrote to 20 zoos that keep grizzly, black (U. Americanus), or polar bears, asking if any of the people who were in contact with the bears had ever noticed a difference in the bears' behavior in response to different types of people, i.e. women or menstruating women (see Appendix A). None of the nine respondents said they had noticed any difference. Three responses were from women zoo employees; they said they had not noticed any change in the bears' behavior when they were menstruating.

Marty Mendel, Zookeeper at Oglebay, West Virginia, replied:

I have noticed no change in behavior or particular interest in the bears at the time of my menstruation Although I have heard many stories of different animals reacting to women's menstrual periods, I personally have never seen any evidence of this, nor has any other woman keeper that I have talked to.

The few responses I received indicate that even though there is an awareness that menstruation supposedly affects animal behavior, these zoo personnel had no personal experience supporting that assumption.

This was a cursory survey of zoo keepers' impressions. A specific research project in this area could lead to conclusive results concerning zoo personnel, the patterns of behavior of different types of zoo animals, the responses of zoo animals to different types of people, or the

responses of different individual zoo animals to people.

Bear trainer Doug Seus (pers. commun.), however, believes that all women exude a hormone that a predator responds aggressively to, and that the predatory instinct of bears is accentuated by menstruating women. His experience training grizzlies, black bears and mountain lions (Felis concolor), leads him to believe that men with self-confidence (he includes himself here) have no problems with bears but women, no matter how confident, are at danger because of their pheromones.

Seus' opinions versus those of the zoo employees, illustrate the breadth of attitudes about bears' responses to different types of people. The divergence of the opinions shows how personal attitudes and philosophies color the casual interpretation of animal behavior.

The idea that menstruation influences the behavior of animals preceded the Glacier National Park attacks as evidenced by the letters the park received. This idea, along with Michele Koons' menstrual status, made the hypothesis that bears are attracted to menstrual odors plausible. This analysis of the genesis of the idea that menstruation attracts bears reveals that cultural attitudes may have predisposed its acceptance.

Scientific Study

Scientific investigation of the idea that menstrual odors attract bears was undertaken after the Glacier attacks brought it so dramatically to light.

Cushing (1980, 1983) studied the effects of human menstrual odors on the polar bear. He premised his study by noting that the possibility of human menstrual odors attracting bears had been debated for years, and that menstruation was suggested as the cause of the 1967 Glacier attacks. He also cited Craighead (1976), who argued that menstrual odors could in no way lead to conflicts. Cushing (1980) proposed to supply empirical evidence to determine if menstrual odors had any role in bear encounters. He added; "If these odors attract bears, then firm warnings and possibly restrictions must be issued to female campers and employees to make them aware of the potential danger" (Cushing 1980:3) (emphasis added).

Cushing (1980) tested the hypothesis that menstrual odors may attract bears using polar bears at Churchill, Manitoba. Because Cushing's study has been used so extensively to support the hypothesis that bears are attracted to menstrual odors, I report his findings in some detail here.

Cushing's Laboratory Test

Four bears were studied in the laboratory, two in 1978 and two in 1979. The bears were problem bears that would otherwise have been killed (Wood 1980). Bear number four, the last bear caught in 1979, was captured too late in the season to test with animal and food odors, and with human subjects (menstruating and nonmenstruating females). The bears were kept separately, and at different times in

cages inside a room equipped with an observation booth. Two fan boxes opened into the room. After a baseline observation period of five days, olfactory stimuli were placed randomly in one of the boxes and the fan was turned on for 20 minutes. Each stimulus was presented to the bears once, except used tampons were presented three times and five women were presented at two different times.

During a test period the bear's behavior was recorded for 10 seconds at the start of every minute. The observer /recorder was not blind to the stimuli presented nor to the objectives of the study (Cushing pers. commun.).

In the tests using women instead of scents the procedure was the same, except that the women entered the room and sat passively facing the cage for the 20 minute test (Cushing 1983).

In the tests, a maximal behavioral response was defined as "sniffs for most of the test, tracks scent to source, and shows from 5-10 minutes of increased activity." Increased activity included pacing the cage, groaning, chuffing, pawing, chewing on the bars, and sniffing. A moderate response was "sniffs several times, and shows increased activity for 2 minutes or less." Minimum + was defined as no movement, sniffs air 10-20 times. A minimum response was, no movement, sniffs air 3-7 times. If the bear slept through the test, the response was recorded as asleep (asl). Where no response is recorded the bear was not exposed to the stimulus (Cushing 1983: 272). Results of these tests are presented in Table 1.

Table 1 - Cushing's (1980, 1983) laboratory test results;

Test stimulus	Response			
	Bear 1	Bear 2	Bear 3	Bear 4
Baseline odors				
Control (fan only)	None	None	None	None
Sardine mash	----	None	----	----
Seal oil	Max	Max	Max	Max
Seal blubber	Max	Max	Max	----
Human blood	None	None	None	None
Unused tampon	None	None	None	None
Used tampon, non-menstrual	----	----	None	----
Menstrual odors				
Sanitary napkin	----	None	None	----
Used tampon 1	Max	Min+	----	----
Used tampon 2	----	----	Max	Max
Used tampon 3	asl	Max	----	----
Animal and food odors				
Castoreum	Mod	Min	None	----
Chicken	None	None	Max	----
Horse manure	None	Min	Max	----
Musk	Min	Min	None	----
Sardine mash	----	None	----	----
Seafood	None	None	Min+	----
Miscellaneous				
Decayed meat	Min	Min+	Max	----
Bear trail	Min	----	----	----
*Seal model	Mod	Mod	----	----
Seal model/oil	None	None	----	----
Tent fabric	----	None	None	----
Nonmenstruating human, subjects				
*1st female	Min	Mod	----	----
*2nd female	None	----	----	----
*3rd female	Min	----	----	----
*4th female	----	----	Min	----
*5th female	----	----	Min+	----
Menstruating human, subjects				
*1st female	Mod	Mod	----	----
*2nd female	Mod	Min	----	----
*3rd female	Mod	----	----	----
*4th female	----	----	Mod	----
*5th female	----	----	Mod	----

* Responses visually cued

Cushing concluded that, in the laboratory, menstrual odors were acting as an attractant to the polar bears. During the laboratory tests using women, "in all but one instance there was a behavioral response by the bears to the presence of a human female, whether they were menstruating or not" (Cushing 1983:271).

No response was greater than a medium [moderate] response and all responses were visually cued... This activity [in medium responses] consisted of groaning and chucking, and pawing and chewing at the bars, usually at the opposite end of the cage from the subject. (Cushing 1980:14) (emphasis added).

This is the only test of bears' responses to menstruating women. Whether menstruating women attract bears is not clearly shown by the laboratory results. The sample sizes are small (five menstruating women, three bears, and seven responses, versus five nonmenstruating women, three bears, and six responses). The differences between moderate, minimum +, and minimum are not great. That the responses were cued visually, not olfactorily, and that they included limited sniffing as well as activity at the opposite end of the cage from the women could indicate that it was not menstrual odors that were eliciting significant behavioral responses from the bears when exposed to human subjects. It would have been interesting to see how the bears responded to men.

Cushing's Field Tests

Cushing's field tests further test polar bears' responses to used tampons. The field tests were conducted from 14 October to 8 November, 1979. Observations were made from a tower near Gordon Point, 18 km east of Churchill. Forty-two stakes, 35.5 - 45.5 cm high, were placed from 50 m to more than 402 m away from the tower and were arranged such that no stakes were closer than 70.7 m to each other. Plain paper toweling was used to hold 5 ml, or less, of liquid material, except for used tampons; the amount of menstrual blood was not measured or controlled, and was not transferred to paper toweling (Cushing pers. commun.). One sample of each material was placed upon several stakes and replaced after 1 or 2 days, depending on the material, or after consumption (Cushing 1983). Beer, linseed oil, and snowmobile oil were field tested along with the other stimuli which had been previously tested in the laboratory. Cushing presents their results separately in 1980, but not at all in 1983. How many of the 42 stakes each of the 12 substances was placed on, how often, and how they were distributed is not described.

During the field season 45 bears made 150 approaches to the test stimuli (excluding beer, linseed oil and snowmobile oil, which together had a total of 14 approaches). Data were recorded as an "approach" anytime a bear passed within 30 m of a stimulus. The 164 approaches are presented in Table 2.

Table 2 - Cushing's (1980 and 1983) field results:

Responses by polar bears to test stimuli (row totals and responses to beer, linseed oil, and snowmobile oil are added).

Stimulus	Response						row total
	none, upwind	ignore	sniff	lick	chew	consume	
*Beer	-	1	-	-	-	2	3
*Linseed oil	-	-	2	1	-	7	10
*Snowmobile oil	-	1	-	-	-	-	1
Blood	3	7	1	1	-	3	15
Castoreum	-	3	3	-	1	-	7
Chicken	-	-	-	-	-	6	6
Horse manure	2	6	4	2	1	-	15
Musk	-	-	-	-	-	-	0
Seafood	4	-	-	1	-	8	13
Seal oil	2	-	-	-	-	24	26
Tampon	-	4	2	-	-	1	7
Used tampon	9	2	3	5	9	33	61
Column Totals	20	22	13	9	11	75	150

* Not included in the column totals or in Cushing's statistics because they were not laboratory tested.

Bears detected significantly more of the materials² olfactorally than visually ($X = 11.03$, d.f. = 1, $P < 0.0001$). Seafood scents were detected by scent 100% of the time; chicken scent, 80%; seal oil, 73.3%, used tampons, 65.4% (34 of 52); horse manure scent, 30.7%; castoreum, 28.6%; human blood, 16.7% (2 of 12); and unused tampons, 0.0%.... Seal samples were consumed every time they were detected, while used tampons were consumed or vigorously chewed 42 of 52 contacts, and the difference in consumption rate [between seal samples² and used tampons] is significant ($X = 5.32$, d.f. = 1, $P < 0.05$)...Also, the other food scents, chicken and seafood, were not consumed more often than the used tampons² ($X = 1.39$, d.f. = 1, $P > 0.1$ and $X = 0.34$, d.f. = 1, $P > 0.5$, respectively). These results support the contention that menstrual odors are an attractant to polar bears (Cushing 1983:272) (All² X results are before Yates correction).

Without knowing how many of each stimulus was presented it is difficult to interpret Cushing's results. Chicken was consumed each time it was presented (Table 2). The 100% consumption rate for chicken, 92% for seal oil, 70% for linseed oil, 66% for beer, and 62% for seafood, are higher than the 54% consumption rate for used tampons.² The X results comparing consumption rates of chicken, linseed oil, beer, and seafood with used tampons² ($X = 0.372$, d.f.= 1, $P > 0.5$, $X = 0.117$, d.f.= 1, $P > 0.7$, $X = 0.008$, d.f.= 1, $P > 0.9$, and $X = 0.013$, d.f.= 1, $P > 0.9$, respectively, after Yates correction) indicate that the consumption rate is independent of the stimuli offered.

Polar bears are attracted to chicken, seal oil, linseed oil, beer, seafood, and used tampons. Hunters of black and grizzly bears have been known to use used tampons and sanitary pads to bait bears. However, this still does not

answer the question of whether or not bears are attracted to menstruating women. A menstruating woman does not smell like a used tampon. Menstrual flow has an odor only if it has been exposed to the air for some time (Luria 1987). Cushing's (1980, 1983) results suggest need for proper care and disposal of used tampons when in bear country, but they do not clearly indicate that polar bears are attracted to menstruating women.

The following points of Cushing's (1980) conclusion pertain to points that will be brought up in the examination of cultural history and attitudes later in this paper. In wondering why polar bears would be attracted to human menstrual odors, Cushing (1980) arrived at two theories; one, that bears recognize and are investigating a sexual odor, and two, that bears are attracted by these odors because they represent potential prey.

Responses to Cushing's Findings

Cushing (1980:38) warns that making the jump from menstruation attracting bears to menstruation causing bear attacks is inappropriate given his findings:

Although menstrual odors attract polar bears, we must avoid drawing the simple conclusion that attacks upon menstruating women will occur. The odor test did not take into account the physical presence of human beings....the bears, in general, appeared to attempt to avoid or escape from the women. This was true in 11 of 12 trials....(emphasis added).

However, newspapers reported that Cushing's findings confirmed the assumption that women in their menstrual periods are more susceptible to bear attack (Great Falls

Tribune, Oct. 26, 1980 and Hungry Horse News, Oct. 30, 1980). The extrapolation that menstrual odors attract bears to menstrual odors trigger an attack is commonly made and accepted without a crucial interpretation that once close, a bear could attack someone as a result of the proximity.

Based on his results, Cushing (1980:43) determined that, "Agencies and companies should issue firm warnings and take positive steps to protect human females required to work in bear habitat or who utilize bear habitat for other reasons".

With Cushing's report and the press coverage, Glacier National Park officials found it timely to "address some potential problems we may now foresee in assigning women employees to backcountry locations" (Morey 1980:1). On September 17, 1980, a report summarizing Cushing's results and conclusions was distributed to the Superintendent, Rangers, Naturalists, Trail Crew Foremen, Biologists, and the Federal Women's Coordinator of Glacier National Park. The concern was that if Cushing's findings were correct, Glacier Park should follow his advice and do more to warn and protect women entering bear habitat during their menstrual period (Wood 1980).

It was questioned whether findings from polar bears were applicable to the behavior of grizzly and black bears (this question is also presented by Herrero 1985). But the Park officials decided that it was prudent to extend to grizzlies the warnings based on Cushing's study (Wood 1980).

The Glacier Park officials were concerned with the safety of their visitors and employees as well as with the liability implications of Cushing's findings. They were also mindful of the Equal Employment Opportunity (EEO) and Privacy Act implications of any policy requiring a woman to notify her supervisor if she was menstruating (Fellbaum 1980).

Female employees were asked their viewpoint on hiking and camping in Glacier's backcountry while menstruating. Women backcountry workers held a meeting on December 15, 1980. The nine women made the following points: 1) They questioned Cushing's methods when he made conclusions about odor stimuli from visually cued responses. 2) They found that Cushing's results were too inconclusive to base policy decisions on. 3) They stressed that emphasis be placed on educating women as to the proper care of used tampons in the field, and that individuals be allowed to decide for themselves whether to take the risk of traveling in grizzly country. 4) They objected to the idea, suggested by Cushing (1980) in his conclusion, that women need to be protected in the backcountry, and that more must be done to warn them (Blacker et al. 1980).

An EEO Subcommittee was formed and determined that National Park employees working in grizzly country should be advised of the recent research findings and it should be left up to the female employees to request a tour of duty that would preclude bear country assignments during the menstrual cycle. "To arbitrarily prohibit female

employees from specific duty assignments would be discriminatory" (Childers et al. 1981:2). The Subcommittee recommended that information regarding the effects of menstrual odors on bears be widely disseminated among employees and visitors throughout the Park. They suggested keeping work schedule assignments flexible to accommodate the requests of women to assignments not in the backcountry. The EEO Subcommittee came to the conclusion that because there was "'sound biological opinion' that menstrual odors attract bears, the Service must recognize that at certain times, some female employees and persons working with them in bear country may carry an increased risk of bear attack" (Childers et al. 1981:2). Again, the extension from attract to attack was taken as a logical step.

The Director of the NPS responded to this report, and the recommendations of officials at the Office of Personnel Management, however, by saying that because there was not a clearly demonstrated correlation between menstrual odor and bear attraction, a policy should not be established to control assignment of female employees in backcountry areas. In view of the lack of conclusive research, he determined that the NPS would be subject to complaints of differential treatment and invasion of privacy, and that the logistics of sending employees in and out of the backcountry would create managerial and morale problems. Nonetheless, he decided that, because there might be a possibility of increased risk for female

employees, information regarding the potential danger should be distributed (Hutchinson 1981).

After these considerations, warnings that women should stay out of bear country during their menstrual period were again printed and distributed by the NPS and USFS throughout grizzly bear country. (Warnings were first printed after the 1967 Glacier attacks, but were removed when questions of their legitimacy were raised). Employees in Glacier National Park are given orientations about the topic and their attendance is documented and filed (A. Wood pers. commun.). However, given my own experience with the USFS in 1983 (see preface), it does not appear that the NPS and the USFS exchanged the memoranda regarding the EEO concerns, since the policy of excluding women from backcountry work when they menstruate was considered at the Forest Supervisor level.

Pheromonal Research

Cushing (1980:38) found that it was an odor peculiar to menstrual blood that attracted polar bears. Media reports of his findings (Los Angeles Times Oct. 4, 1984) have defined this peculiar aspect as female pheromones associated with menstruation. Pheromones are compounds produced by certain animals which have the effect of inducing one or more specific responses within members of the same or closely related species (Comfort 1971). All mammalian pheromones so far recorded are olfactory (Bruce 1970). Pheromones would be more difficult to contain than a used

tampon and would imply that throughout menstruation, no matter how hygienic and conscientious about the care of used tampons, a woman would be more at risk of attracting bears.

Human pheromones have long been suspected and searched for, yet pheromonal research in the last ten years has not established that human pheromones exist (Luria et al. 1987, Monmaney and Katz 1987).

The initial focus of pheromone research was on vaginal odors and sexual allurements (i.e. Michael 1971), but test results were ambiguous and contradictory and further research ended in this area (Hopson 1979).

Doty et al. (1975), in a study of the intensity of human vaginal odors, found considerable variation in odor patterns present across cycles from the same donor, as well as across cycles from different donors. Differences between individual menstrual cycles are pronounced (Ford and Beach 1951 and Frieze et al. 1978) making it difficult to generalize or to come to conclusions concerning "normal" menstrual cycles.

With the lack of encouraging results from vaginal odors the emphasis of pheromone research shifted from the vagina to the armpit, a more likely source of scent signals in a vertical social organism (Hopson 1979).

The apocrine glands, found in the armpit, genito-anal region, and around the nipples, produce sweat that is different from the sweat produced by the rest of the body. Apocrine sweat is oily and is the source of human body

odor; both the yellowish color and odor have been attributed to bacteria. The apocrine glands become functional at puberty, and are not equally developed among different races. Mongolids, especially Koreans, have weakly developed apocrine glands. Europids and Negrids have well developed apocrine glands. The Europid odor is particularly strong in the Nordic subrace and other subraces of northern and central Europe (Baker 1974).

Armpit sweat was found to regulate and synchronize women's menstrual cycles (Russel et al. 1980, Cutler et al. 1986, and Preti et al. 1986).

Pheromones are thought to be intraspecific; their adaptive value lies in communicating to the opposite sex of the same or at least closely related species (Comfort 1971). However, Madison (1978) found that the behavioral characteristics of lactating meadow voles (Microtus pennsylvanicus), as well as possibly their chemical signals, made them more susceptible to predation by snakes (Coluber constrictor and Elaphe obsoleta). Cushing (1985) demonstrated that the reproductive odors of estrous mice (Peromyscus maniculatus bairdi) are used by weasels (Mustela nivalis) to increase their predatory success rate.

It is thus far unknown whether bears have, and respond to, pheromones. It would seem pertinent to determine whether bears are attracted to bear pheromones before postulating that bears may be attracted to human pheromones.

Bears have acutely sensitive senses of smell;

undoubtedly they can detect and distinguish human odors. Whether a bear tries to avoid contact with humans, or is attracted by the presence of humans, depends on the situation, the bear's social status, history and past experiences with human food, and its individual personality. It appears that human pheromones are relatively undeveloped compared to those of other primates.

If bears do respond to human pheromones, they do not respond in the same manner as weasels to mice. Weasels are predators and mice are their main prey. Bears are opportunistic omnivores, humans are not their prey. It appears that bears can quickly learn to associate humans with food, however, and become bold in their searching for and acquisition of it (Hunt 1984).

The vagina is a less likely source of pheromones than the apocrine sweat glands. Variability in the production of odors between races and individuals and within an individual over time is the rule, making it difficult to generalize about the production of human odors and the possibility of a predictable response from bears.

Behavioral effects of the Menstrual Cycle

Changes in women's behavior due to the menstrual cycle could effect how they respond to bears and the outcome of the encounter. This possible change in behavior could contribute to the idea that menstruation attracts bears.

Women's behaviors and attitudes are thought to change

throughout the menstrual cycle, although, as with odor patterns, variability is the rule. According to Bardwick (1971), feelings of self-confidence and well-being are highest around ovulation, while those of aggression and low self esteem are highest at menstruation.

Paige (1973) and Weideger (1975) have argued that the changes in feelings can be attributed to socialization because of the low social value placed on menstruation, and that women who do not devalue or feel guilty about menstruation do not experience such attitude changes. Supporting their position, Frieze et al. (1978:197) reported that:

In some research, significant changes in symptoms across the cycle are not found. In one group of twenty-nine college women, no significant differences were found on six measures of mood, assessed menstrually, at mid-cycle, and premenstrually. Also, the average mood rating were very similar to those obtained from a group of male classmates.

Sommer (1983:84) concludes, "It is clear, given the body of research done thus far, that menstrual cycle effects (on behavior) are probably small, perhaps even ephemeral".

Men, too, have hormonal and mood cycles that range from four to six weeks. They can be charted and a Japanese private transportation system adjusted schedules and routes to coincide with the best time of the month for each worker - subsequently dropping their accident rate by one-third (Delaney et al. 1976). However, Fausto-Sterling (1985:147), in a critique of studies linking hormones to moods, emotions, and behavior, concludes: "The evidence that male hormones control aggression in humans and other

primates ranges from weak to nonexistent".

Despite the source, a change in behavior may have an effect on an animal's reaction to people. Hunt (1984) found that in a laboratory setting changes in people's movements (stomping) and position (crouching) elicited different responses (aggressive or non-aggressive) from bears. There was a substantial behavioral variety in individual bears, and between bears, in their responses to humans and to repellents tested. S. Sammarco (pers. commun.), a Zoo Keeper at Lincoln Park Zoo, reported that the bears in her care responded to changes in her "style", as well as to the more aggressive behavior of her male partner.

The behavior of humans, and of bears, is extremely unpredictable and varied; normal, predictable behavior is even more difficult to quantify than a normal predictable menstrual cycle. It cannot be said that due to the menstrual cycle, women have predictable behavioral changes that would influence the circumstances of a bear encounter. "The outcome of a given confrontation is the result of bringing the variable behavior of a given bear into interaction with the much more variable behavior of a given person" (Herrero 1985:202).

The background of the hypothesis that menstrual odors attract bears has been presented at great length to examine its origin, casual opinions, its scientific basis, the agency reactions, its dissemination, and the liability implications. My position concerning the hypothesis

is that by examining the bear/human encounter records it can be seen if there is any basis in actual field occurrences on which the hypothesis can be supported or not. This approach is easier and may provide clearer results than further experimental testing with bears and humans.

Designing a study of grizzly bear attraction to menstruating women in the field would be problematic. Grizzly bears are behaviorally variable, dangerous, elusive, and rare. A field experiment to test the hypothesis on grizzlies would be beset with hazards, small sample sizes, and many uncontrollable variables. Field experiments may not even be called for if available information on field encounters show no significant pattern. The data on actual encounters of women with grizzlies and black bears, compared to man/bear encounters, should be a strong indication of any patterns concerning bears' attraction to women. As of yet, bear attacks on women have not been examined fully to see if menstruation is playing a significant role in attracting bears to women, or if there are any indications that bears are behaving in any different manner when the incident involves a woman.

METHODS

I have chosen two approaches in addressing the question of whether menstruating women attract bears. My first question is whether the frequency and descriptions of bear/women encounters in the field will reveal if bears behave differently around women than men. My second point of view is that our cultural beliefs about women, menstruation, and wilderness, influences the belief that menstrual odors attract bears.

To address the first question, bear/human encounters are tested statistically to see if bears respond/react differently to females than males. The hypothesis that menstruation attracts bears is not tested directly; the statistical tests instead reveal uniformity or differences in bear behavior in regards to the gender of the person encountered. Certain bear/human incidents are discussed in detail to illustrate factors examined in the statistical analyses.

My second approach cannot be tested statistically. Our cultural attitudes towards women and menstruation are presented descriptively in order to put the belief that menstrual odors attract bears in a more complete context.

Herrero's Sample

Herrero (1985) has investigated why bears attack humans and how attacks can be avoided. He gathered information on bear attacks and encounters from all North American national parks and from all non-national-park agencies

that have jurisdiction over grizzly bears.

Herrero gave me access to the incident records he collected; my statistical analyses are done with this information. I use Herrero's classifications and interpretations of bears' motivations for encounters in my statistical analyses.

Statistical Methods

The sex of the people encountering bears was tabled with the following variables; the distance from the bear(s), the most aggressive bear's status and age class, the bear's species, the age of the person, the extent of the person's injury, the type of encounter, the bear's known history of conditioning to garbage and human food - and contact with humans, the location of the encounter relative to development, the activity of the bear prior to the encounter, the inferred motive of the bear, and the action which seemed to trigger aggression.

The encounters are measured two ways, by individual and by event. The first method treats each person encountering bears as a separate individual. In the 411 incidents recorded by Herrero, 713 people are represented; 491 are males, 139 are females, and for 83 the gender was unknown. The unknown gender cases are not included in any of the tests. Treating each individual encountered as a separate case has the advantage of increasing the sample size, but is problematic in that it does not recognize that 54% of the incidents involved more than one person who would thus

be encountering the bear(s) under the same circumstances.

The second method treats each encounter as a separate case. Of the 411 incidents, 239 involved all males - either as all male parties or a sole male, 75 involved parties of mixed males and females, 33 involved all females - either as all female parties or a sole female, and 64 encounters involved people of unknown gender. None of the unknown gender cases are included in the tests. The second method may be a better indicator of how bears may respond differently to males or females because it can separate situations in which the presence of a female might have had an influence that affected her male companions. All female, all male, and mixed male and female parties are presented in the tables. In addition, chi-squared tests combining all female and mixed parties are performed to separate the circumstances of all male parties encountering bears from incidents including females.

Cross-tabulations simultaneously classify the frequency of certain traits with respect to their levels of occurrence. A chi-squared (χ^2) test of cross-tabulated data indicates whether the traits are significantly independent of, or contingent with, each other. Chi-squared tests the estimated expected frequency under the model of independence. I have chosen 0.1 as the level of significance for the χ^2 tests because of the variable nature of the data.

Before computing the χ^2 statistic, each table was

examined to see if the expected cell frequencies were too small (less than five). Because the validity of the goodness-of-fit test precludes this situation, adjacent cells were combined until the expected frequency was at least five (Bhattacharyya and Johnson 1977). For some cases expected frequencies of less than five were left in the table when they did not have a large effect on the outcome of the χ^2 test. Effect on the χ^2 result is measured by the standardized residual $(sresid)(O-E/\sqrt{E})$: The larger the $sresid$, the larger the effect on the χ^2 .

To have eliminated all cells with expected frequencies of less than five would have eliminated some important categories. None of the tables displaying individuals as separate cases have more than 20 percent of cells with expected frequencies of less than five, and none of the expected values are less than one. Some tables displaying encounters as separate cases do have more than 20 percent of cells with expected frequencies of less than five and have expected values of less than one. They are included for comparison but are not used in hypothesis testing.

By cross-tabulating the sex of people encountering bears with other factors and testing with χ^2 it can be inferred whether the circumstances in an encounter are independent of the sex of the persons encountered. The results tell if the pattern of bear encounters vary according to the sex of the people encountered: if the patterns are what would be expected given the numbers of

men and women encountered (independent), or if there are significant differences in the ways bears relate to males or females (not independent).

The null hypothesis in each test performed is that sex and the situations behind bear encounters are independent (there is no difference in the way bears respond to people based on the person's sex). If the null hypothesis is not rejected, it would appear that bears do not respond significantly differently to human females than human males. All of the following data, classifications, and variable names are from Herrero (personal files). The only changes to his information I have made are to combine some similar categories.

The predictability of the other (dependent) variables, given gender, was assessed with the Lambda statistic. Lambda measures the proportional reduction in error using one item (gender) to predict the other. Lambda has a range from 0 to 1. A value of 0 means the independent variable is of no help in predicting the dependent variable.

All fatalities and cases of known menstruation up to 1984 are presented in depth in the discussion of the statistical results. Fatalities and cases of known menstruation are of special interest and concern because they may greatly influence the belief that women are more likely to be attacked than men. Looking at these cases in terms of whether menstrual odors possibly played a role in the encounter has not been done before. In doing this analysis support for the hypothesis that menstrual odors

attract bears may be revealed or discounted by the information from the actual occurrences.

STATISTICAL ANALYSES

Results and Discussion

For each table the factors cross-tabulated with the numbers of females and males encountering bears are underlined and followed by a description of the different categories for each factor. The first cross-tabulation treats all individuals as a separate case, the second treats each encounter as a separate case. The number of occurrences and the column percentage is presented in each cell of the cross-tabulations.

The cross-tabulations are followed by the results of the X^2 tests and the lambda measurements of association.

Discussion of the relevance of each test to the hypothesis that bears are attracted to menstrual odors, or more generally, that bears respond in any way differently to female humans, follows each table. Appropriate examples from documented bear encounters are also presented to illustrate points made by the statistical results and to demonstrate the interactions of factors involved in bear encounters.

Table 3 - Sex by distance from bear(s). When the person first became aware of bear(s): Less than 50 m (<50 m); between 50 and 100 m (50-100 m); between 100 and 200 m, combined with, more than 200 m (>100 m).

INDIVIDUALS

DISTANCE	FEMALES	MALES	ROW TOTAL
<50 m	63 78%	191 80%	254 80%
50-100 m	10 12%	23 10%	33 10%
>100 m	8 10%	25 10%	33 10%
COLUMN TOTAL	89 25%	234 75%	320

2

$X^2 = 0.489$, d.f. = 2, significance = 0.783. Do not reject the null hypothesis. Lambda with distance dependent = 0.016.

ENCOUNTERS

DISTANCE	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
<50m	12 92%	94 80%	40 82%	146 82%
50-100m	1 8%	12 10%	5 10%	18 10%
>100m	1 8%	12 10%	5 10%	18 10%
COLUMN TOTAL	13 7%	117 65%	49 27%	179

2

$X^2 = 1.521$, d.f. = 4, significance = 0.823, minimum expected frequency (e.f.) = 1.089, cells with e.f. < 5 = 44%. Lambda with distance dependent = 0.

2

With all females and mixed combined; $X^2 = 0.496$, d.f. = 2, significance = 0.780. Do not reject the null hypothesis.

The sex of the person encountered appears to be independent in regards to the distance from the bear(s) when first encountered. This test does not have any clear implications for the hypothesis that menstruation attracts bears.

Table 4 - Sex by the status of the bear most active in the encounter: Single bear; mother with cub(s); other.

INDIVIDUALS			
BEAR'S STATUS	FEMALES	MALES	ROW TOTAL
single bear	75 59%	248 57%	323 57%
mo. w/ cub(s)	44 34%	160 37%	204 36%
other	9 7%	28 6%	37 7%
COLUMN TOTAL	128 23%	436 77%	564

²
 $X^2 = 0.254$, d.f. = 2, significance = 0.881. Do not reject the null hypothesis. Lambda: with bear's status dependent=0.

ENCOUNTERS				
BEAR'S STATUS	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
single bear	18 58%	124 54%	38 54%	180 55%
mo. w/ cub(s)	12 39%	85 37%	28 40%	125 38%
other	1 3%	19 8%	4 6%	24 7%
COLUMN TOTAL	31 9%	228 69%	70 21%	329

²
 $X^2 = 1.459$, d.f. = 4, significance = 0.834, minimum e.f. = 2.260, cells with e.f. <5 = 11%. Do not reject the null hypothesis. Lambda with bear's status dependent = 0.

²
 With all females and mixed combined; $X^2 = 1.212$, d.f. = 2, significance = 0.546. Do not reject the null hypothesis.

Encounters involving female bears with cubs most likely revolve around protection of young, and would not be expected to differ according to the gender of the people encountered. From the X² results, the status of the bear encountered does not appear to be dependent on the person's gender. Any pattern from this table could not be tied directly to menstrual odors.

An example of a sudden encounter with a female bear with cubs is presented here to illustrate that for cases of this type it is unreasonable to expect differential responses by the bear(s) to the gender of the people encountered.

Barbara Chapman, July 27, 1976, Glacier/Revelstoke National Park, Canada (Herrero 1985:17-19).

A tragic sudden encounter occurred on the morning of July 27, 1976. Barbara Chapman, age twenty-four, was hiking in Glacier National Park, Canada, with a friend, Andrew Stepniewski, age twenty-six...

They were about one-and-a-half miles up the trail with Andrew hiking in front. There was restricted visibility along several portions of the trail. They had just rounded a bend in the trail when they saw a grizzly bear, which was "huffing and puffing," charging toward them from less than fifty feet away. Andrew had only a second or two to notice that it was a grizzly, but not a big one, when the bear grabbed hold of him. He screamed, yelled, and resisted for a few seconds, and then realizing that resistance was futile, he relaxed and put his hands behind his head.

He thought that the attack on him lasted for only fifteen or twenty seconds and then the bear attacked Barbara. This attack lasted only a "few seconds." Andrew remembers Barbara kicking at the bear and briefly trying to resist, and then the attack was over.

Barbara Chapman was dead. Andrew Stepniewski was critically injured with head, facial, neck, and body wounds....

(This encounter) involved a female with cubs, encountered at close range...I believe that the suddenness of the encounter triggered a defensive attack by the mother bear.

Whether Barbara was menstruating or not is unknown. There is no indication that menstruation or the fact that Barbara was female had anything to do with this encounter. The bear was not approaching Barbara and Andrew out of any attraction to their odors. It was a sudden encounter at close range with a mother and her three cubs. The mother bear was defending her cubs. Andrew was in the lead and was attacked first; Barbara may have died because she actively resisted the attack.

Table 5 - Sex by age class of bear most active in the encounter: Adult; sub-adult - includes cubs to 3 year olds.

INDIVIDUALS

BEAR'S AGE	FEMALE	MALE	ROW TOTAL
adult	74 73%	266 79%	340 78%
sub-adult	27 27%	69 21%	96 22%
COLUMN TOTAL	101 23%	335 77%	436

2

$X = 1.363$, d.f. = 1, significance = 0.243 (after Yates correction). Do not reject the null hypothesis. Lambda with bear's age class dependent = 0.

ENCOUNTERS

BEAR'S AGE	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
adult	19 83%	143 83%	44 73%	206 81%
sub-adult	4 17%	30 17%	16 27%	50 19%
COLUMN TOTAL	23 9%	173 68%	60 23%	256

2

$X = 2.539$, d.f. = 2, significance = 0.281, minimum e.f. = 4.492, cells with e.f. < 5 = 17%. Do not reject the null hypothesis. Lambda with bear's age dependent = 0.

2

With all females and mixed combined; $X = 1.227$, d.f. = 1, significance = 0.268 (after Yates correction). Do not reject the null hypothesis.

The sex of the person encountered appears to be independent in regards to the age class of the bear most active in the encounter. This test does not have any clear implications for the hypothesis that menstruation attracts bears.

Table 6 - Sex by bear's species: Black; grizzly;
grizzly - probably (?).

INDIVIDUALS			
BEAR SPECIES	FEMALES	MALES	ROW TOTAL
black	32 23%	76 15%	108 17.5%
grizzly	102 73%	384 80.5%	486 80%
grizzly?	5 4%	17 3.5%	22 3.5%
COLUMN TOTAL	139 22.5%	477 77.5%	616 100%

2
 $X = 3.777$, d.f. = 2, significance = 0.151. Do not reject the null hypothesis. Lambda with bear's species dependent = 0.

ENCOUNTERS				
BEAR SPECIES	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
black	10 29%	35 14%	15 20%	60 16%
grizzly	23 66%	215 83%	58 77%	296 80%
grizzly?	2 6%	9 4%	2 3%	13 4%
COLUMN TOTAL	35 10%	259 70%	75 20%	369

2
 $X = 6.992$, d.f. = 4, significance = 0.136, minimum e.f. = 1.233, cells with e.f. < 5 = 22%. Do not reject the null hypothesis. Lambda with bear's species dependent = 0.

2
 With all females and mixed combined; $X = 4.883$, d.f. = 2, significance = 0.087, minimum e.f. = 3.875, cells with e.f. 5 = 17%. Reject the null hypothesis.

A significant pattern emerged in these tests. The largest effects on the X^2 results came from the high number of females encountering black bears. For the individual females the $sresid = 1.5$, for the all female parties the $sresid = 1.7$, and for the all female parties combined with parties of males and females the $sresid = 1.7$.

The encounters of females with black bears had notable effects on other categories of classifications such as the age of the person encountered and the number of predatory attacks on females. For this reason further discussion of black bear encounters is presented.

Black bears are not thought of as being as dangerous as grizzlies, yet they were responsible for seven of the fourteen fatalities involving women or girls. At least 23 people were killed by American black bears from 1900 to 1980 (Herrero 1985).

According to Herrero (1985), 90 percent of the major injuries inflicted by black bears resemble predation patterns. Ten people killed by black bears were under eighteen years of age; five were less than ten years old, four of these were girls. Seemingly, young people are more subject to fatal attacks by black bears yet, nine victims were adult men (Herrero 1985). A few examples are presented to further illustrate the circumstances of black bear attacks.

Olga Gregorchuk, August 30, 1929, Manitoba, (Herrero personal files).

A large (420 pound) black bear chased Olga and her brother into their family's farm house where it knocked the door in, attacked, dragged out, and ate Olga. The bear may have been hungry as the attack followed a period of severe brush fires. Olga was less than ten years old.

Carol Ann Pomranky, July 7, 1948, Michigan, (Herrero 1985:106-108).

Carol Ann was playing outside the cabin when Mrs. Pomranky and her visitor, Mrs. Summers heard her scream. A very thin black bear had approached her growling and gnashing its teeth. It then attacked her, dragged her into the brush, and ate her. The three year old girl was eaten as if prey. There was food and garbage within 100 m but there were no garbage dumps around the house and the Pomrankys did not put food out for animals.

Rarely, given their high populations and extensive ranges, do black bears attack adult humans. Cynthia Dusel-Bacon was one of those rare events, and because of her comments specific to menstruation, her case is presented here.

Cynthia Dusel-Bacon, August 13, 1977, Alaska (Herrero 1985 and Kaniut 1983).

Cynthia Dusel-Bacon was severely mauled by a black bear in Alaska while working for the U.S. Geological Survey. The summer of 1977 was her third summer mapping in the Yukon-Tanana Upland of Alaska. She had encountered black

bears and had seen grizzlies every year. She traveled alone, on foot, unarmed. She was aware of the potential dangers from bears, especially grizzlies since they were generally considered more unpredictable and dangerous (Kaniut 1983). She carried a walkie-talkie radio to keep in contact with the other mappers and to contact the helicopter for pick ups. "I always attempted to make noise as I walked so that I would alert any bears within hearing and give them time to run away from me. For two summers this system worked perfectly" (Kaniut 1983:114). As she was chipping off and examining rock samples:

A sudden loud crash in the undergrowth below startled me and I looked around just in time to see a black bear rise up out of the brush about 10 feet away. Nevertheless, I decided to get the upper hand immediately

I shouted at it, face-to-face, in my most commanding tone of voice: 'Shoo! Get out of here, bear! Go on! Get away!' The bear remained motionless and glared back. I clapped my hands and yelled even louder. Even this had no effect on the bear (Kanuit 1983:116).

The bear did not leave despite her continued attempts to scare it away. It attacked and pinned her from behind. The bear chewed on Cynthia's right arm as she attempted to get to her radio to call out for help. It also bit her head, tearing at her scalp and penetrating her skull. The bear dragged her about 20 feet stopping to lick at the blood coming out of the large wound on her right arm. When the bear rested, almost half an hour into the attack, Cynthia did get to her radio and called out to the helicopter pilot. The radio call spurred the bear to attack again this time at her good left arm. However, the radio

call was effective, and the helicopter came with the pilot and two geologists. The bear left and Cynthia was taken to an army hospital. She lost both arms. Her comments regarding why she thinks the bear attacked her are especially relevant to the hypothesis that menstrual odors attract bears.

I do not even consider a fourth possibility, [for why the bear attacked] one that has often been suggested as a reason for discriminating against women in similiar situations - namely, the possibility that wild animals, particularly bears, are often attracted by the scent of menstrual blood of women at the times of their periods. For three summers I worked out in the bush, I was never approached by any wild animals, and my periods came and went regularly. On the day of the attack I was not menstruating (Kaniut 1983).

Herrero (1985) described this attack as seemingly attempted predation.

Table 7 - Sex by age of person: Less than 10 years old (<10); 10 to 19 years old (10-19); 20 to 29 years old (20-29); 30 to 39 years old (30-39); I combined the numbers of people encountered in the age classes 40-49, 50-59, 60-69, and 70+ (>39).

AGE	INDIVIDUALS		ROW TOTAL
	FEMALES	MALES	
<10	11 13%	10 5%	21 7%
10-19	15 18%	37 17%	52 18%
20-29	45 54%	101 48%	146 50%
30-39	5 6%	31 15%	36 12%
>39	7 9%	33 15%	36 12%
COLUMN TOT.	83 28%	212 72%	295

2

$X^2 = 12.489$, d.f. = 4, significance = 0.014. Reject the null hypothesis. Lambda with age dependent = 0.

AGE	ENCOUNTERS			ROW TOTAL
	ALL FEMALES	ALL MALES	MIXED	
<10	5 22%	3 3%	9 20%	17 9%
10-19	2 9%	21 17%	11 24%	34 18%
20-29	13 57%	60 50%	22 48%	95 50%
30-39	0 0%	15 12%	0 0%	15 8%
>39	3 13%	22 18%	4 9%	29 15%
COLUMN TOTAL	23 12%	121 64%	46 24%	190

2

$X^2 = 28.545$, d.f. = 8, significance = 0.0004, minimum e.f. = 1.816 cells with e.f. < 5 = 40% Lambda with age dependent = 0.

2

With all females and mixed combined; $X^2 = 26.058$, d.f. = 4, significance = 0.000. Reject the null hypothesis.

The high numbers of girls under ten were instrumental in raising the X^2 results and rejecting the null hypothesis. The girls in the under 10 years age class would be pre-adolescent and their high numbers could not support the hypothesis that menstrual odors attract bears. The cases of Olga Gregorchuk and Carol Ann Pomranky presented in the discussion of the species of bear relative to the gender of people encountered, could just as well be presented here in the discussion of the age of the person. Two more examples are offered to emphasize the the high numbers of individual girls and parties of girls attacked by black bears and the subsequent large effect on the high number of females involved in encounters of predation.

Suzanne Duckitt, August 9, 1967, British Columbia, (Herrero personal files).

Suzanne and another little girl were eating outside when a black bear attacked and killed Suzanne. Both girls were premenstrual.

Victoria Lee Valdez, May 16, 1974, Washington, (Herrero personal files).

Victoria, who was under ten years old, was playing at the edge of a pasture, perhaps near some livestock when a black bear came out of the nearby woods, attacked, dragged her away and ate her. Victoria's father shot and killed the bear, it was a male subadult in excellent condition. The bear was acting as a predator.

The lower numbers of women in the 30-39 and >39 categories also had large impact on the X^2 results. The results

may point to different human use patterns by different age groups of males and females - it appears that fewer women over 30 travel in bear country than men of that age class.

Table 8 - Sex by extent of injury: Death; more than 24 hours hospitalization (>24); less than 24 hours hospitalization, or no hospitalization (<24); none.

INDIVIDUALS

INJURY EXTENT	FEMALES	MALES	ROW TOTAL
Death	13 9%	38 8%	51 8%
>24	14 10%	69 15%	83 13%
<24	19 14%	78 16%	97 16%
none	91 66%	294 61%	385 63%
COLUMN TOTAL	137 22%	479 78%	616

2

$X = 2.525$, d.f. = 3, significance = 0.471. Do not reject the null hypothesis. Lambda with extent of injury dependent=0.

ENCOUNTERS

INJURY EXTENT	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
death	5 14%	33 12%	6 8%	44 12%
>24	5 14%	52 19%	18 24%	75 20%
<24	10 29%	60 22%	11 15%	81 21%
none	15 43%	124 46%	39 53%	178 47%
COLUMN TOTAL	35 9%	269 71%	74 20%	378

2

$X = 5.526$, d.f. = 6, significance = 0.478, minimum e.f. = 4.074, cells with e.f. <5 = 8%. Do not reject the null hypothesis. Lambda with injury extent dependent = 0.

2

With all females and mixed combined; $X = 0.968$, d.f. = 3, significance = 0.809. Do not reject the null hypothesis.

The idea that women are more likely to be injured or killed by bears is not supported by the extent of injury test - the most significant differences on the χ^2 results were: the low number of individual females receiving injuries requiring more than 24 hours of hospitalization and the low number of mixed parties fatally attacked. All female parties had a significantly low incidence of injuries requiring more than 24 hours hospitalization. There were small differences in injury extent between all female parties combined with parties of mixed gender and all male parties.

Table 9 - Sex by encounter type: Aggressive but no injury (aggressive); Not aggressive - bear is seemingly aware of person but continues its previous activity, or the bear leaves encounter site quickly or slowly, or the bear approaches and perhaps explores person or nearby belongings; Injury.

INDIVIDUALS

ENCOUNTER	FEMALES	MALES	ROW TOTAL
aggressive	45 33%	186 39%	231 37%
not aggressive	17 12%	35 7%	52 8%
injury	75 55%	263 54%	338 54%
COLUMN TOTAL	137 22%	484 78%	621

2

$X = 4.316$, d.f. = 2, significance = 0.116. Do not reject the null hypothesis. Lambda with encounter type dependent = 0.

ENCOUNTERS

ENCOUNTER	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
aggressive	12 34%	102 38%	25 34%	139 37%
not aggressive	3 9%	15 6%	11 15%	29 8%
injury	19 57%	149 56%	38 51%	207 55%
COLUMN TOTAL	35 9%	266 71%	74 20%	375

2

$X = 7.067$, d.f. = 4, significance = 0.132, minimum e.f. = 2.707, cells with e.f. < 5 = 11%. Do not reject the null hypothesis. Lambda with encounter type dependent = 0.

2

With all females and mixed combined; $X = 5.704$, d.f. = 2, significance = 0.058. Reject the null hypothesis.

The most marked differences between expected and actual occurrences for this test were all in the "not aggressive" category. In this category there were: high numbers of individual females, high numbers of mixed parties, and high numbers of all female parties combined with parties of mixed gender - high enough in this case to cause the rejection of the null hypothesis.

Almost exactly the same number of individual males and females were injured as expected. From these results it is clear that once an encounter occurs, females are not more likely to be attacked and injured by bears than are males. This does not support the idea that menstrual odors may cause a bear to press its attack on a woman.

Table 10 - Sex by the bear's history of conditioning to garbage and human food : No known history of contact and cases in which the history of the bear was unknown, are combined.

INDIVIDUALS			
GARBAGE	FEMALES	MALES	ROW TOTAL
unknown	122 88%	451 92%	573 91%
yes	17 12%	37 8%	54 9%
COLUMN TOT.	139 22%	488 78%	627

$\chi^2 = 2.409$, d.f. = 1, significance = 0.121 (after Yates correction). Do not reject the null hypothesis. Lambda with garbage history dependent = 0.

ENCOUNTERS				
GARBAGE	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
unknown	32 91%	254 94%	68 91%	354 93%
yes	3 9%	15 6%	7 9%	25 7%
COLUMN TOTAL	35 9%	269 71%	75 20%	379

$\chi^2 = 1.588$, d.f. = 2, significance = 0.452, minimum e.f. = 2.309, cells with e.f. < 5 = 33%. Lambda with garbage history dependent = 0.

With all females and mixed combined; $\chi^2 = 1.048$, d.f. = 1, significance = 0.306 (after Yates correction). Do not reject the null hypothesis.

Table 11 - Sex by bear's known history. Does the bear have a known history of contact with humans? No known history of contact and cases in which the history of the bear was unknown, are combined.

INDIVIDUALS

HISTORY	FEMALES	MALES	ROW TOTAL
unknown	110 79%	422 87%	532 85%
yes	29 21%	65 13%	94 15%
COLUMN TOTAL	139 22%	487 78%	626

2

$X = 4.216$, d.f. = 1, significance = 0.040 (after Yates correction). Reject the null hypothesis. Lambda with known history dependent = 0,

ENCOUNTERS

HISTORY	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
unknown	29 83%	238 89%	62 83%	329 87%
yes	6 17%	30 11%	13 17%	49 13%
COLUMN TOTAL	35 9%	268 71%	75 20%	378

2

$X = 2.555$, d.f. = 2, significance = 0.279, minimum e.f. = 4.537, cells with e.f. < 5 = 17 %. Do not reject the null hypothesis. Lambda with known history dependent = 0.

2

With all females and mixed combined; $X = 2.044$, d.f. = 1, significance = 0.153 (after Yates correction). Do not reject the null hypothesis.

Notable in these tests are the high numbers of individual females, all female parties, mixed parties, and all female parties combined with mixed parties encountering bears with known histories of conditioning to human food and contact with people. The higher number of females encountering bears with known histories may be a result of the higher percentage of females using frontcountry locations, close to 50 percent (McNaught 1985), where bears with known histories would be more likely to be encountered, than using backcountry locations, 20% to 30% (Lucas 1980, 1985)(see Ratios).

Herrero (1985) emphasizes the dangerous consequences of bears conditioned to associating humans with sources of food. Many of the fatalities involving females involved bears habituated to eating human food and garbage (see Fatalities). The example of Mary Pat Mahoney illustrates how quickly the danger of bears associating humans to sources of food can escalate.

Mary Pat Mahoney, September 23, 1976, Glacier National Park (Herrero, 1985:62-63)

On September 23, 1976, Mary Pat Mahoney, a woman in her early twenties, and four female companions of about the same age were camped in two two-person tents at the Many Glacier Campground on the eastern side of Glacier Park...All of the women were experienced campers and hikers... They had a clean camp, no food was in their tents, they had no deodorants, perfumes, or odorous materials on them, and none of them was menstruating ...The board of inquiry that investigated the case concluded that they had "followed or exceeded the precautions one would take in avoiding conflict with bears."

Despite their precautions, at around seven on the morning of September 23, Mary Pat Mahoney was dragged from her tent, killed and partly devoured by a grizzly bear. One-and-a-half hours later two young grizzly

bear siblings both male, were killed. One of them had human blood between its front claws. Strong circumstantial evidence, including the similarity of the distance between puncture marks on Mahoney's body and the distance between both bears' canine teeth suggested that one of these bears killed her (Herrero 1985:62-63) (emphasis added)

The bears had a brief, nine day, history of feeding on human food or garbage. They first found food carelessly left at an illegal backcountry camp. They next encountered hikers who fled, leaving their packs which the bears scavanged for food. The bears then started visiting the Many Glacier campground and feeding from garbage cans. They began approaching people, pursuing two fishermen into a lake. Finally, the day before the attack on Mary Pat Mahoney, they tore up a backcountry camp. This prior experience, according to Herrero (1985), taught the bears that approaching people could lead to a meal.

The other women with Mary Pat Mahoney were not injured although the bear did have contact with some of them. All of them were awake and alarmed throughout the attack. Two got to the car and honked the horn, while one (in the same tent as Mary Pat Mahoney) lay passive in her sleeping bag. They were talking and screaming to each other. Mary Pat Mahoney was screaming as the bear attacked, bit, and dragged her away.

None of the women were menstruating. Their camping was impeccable. Mary Pat Mahoney was the victim of an apparently unprovoked attack by a habituated bear that had rapidly learned to associate people with food. Nothing about this attack implicates menstrual odors as an

attractant for the bear.

The danger of human food and contact habituated bears is, of course, not exclusive for females as the example of Roger May illustrates.

Roger May, June 24, 1983, Gallatin National Forest, Montana (Herrero 1985:70-71).

The attack on Roger May in the Gallatin National Forest outside of Yellowstone is relevant to this discussion as it has similarities to the attacks on Mary Pat Mahoney, Brigitta Fredenhagen (see "sex by motive"), Jane Ammerman (see "sex by location"), and Julie Hegelson (see Introduction - Granite Park attack). In all these cases the victims were attacked at night while sleeping and treated as prey. The bears involved were habituated to people to varying degrees and/or to eating garbage and associating humans with food.

June 24, 1983, Roger May and Ted Moore camped in a tent at Rainbow Point Campground in Gallatin National Forest adjacent to the west side of Yellowstone National Park. They went to bed about 11 p.m.. Earlier they had cooked a dinner of steak and yams. They took all the recommended precautions for camping in bear country except that the clothes they had cooked in were in the tent; they were not especially dirty (Herrero 1985).

At 2:30 a.m. a bear collapsed their tent and dragged Roger out a hole torn in the roof. Moore got out of the tent and saw a large bear standing over Roger, then dragging him away. Moore chased the bear off with a tent pole

but when he left Roger to get back to the tent for a flashlight, the bear returned and dragged May away. Roger May's body was found at 3:30 a.m. by a search party, approximately 70 pounds of him had been eaten or lost as fluid (Herrero 1985).

The bear was a large adult male well known to Yellowstone bear biologists as bear no. 15. It had been thoroughly habituated to people through twelve years of being studied, including nine years of intermittent radio-tracking, and one year of close-quarters intensive tracking involving constant disturbance (Jonkel pers. commun.). The bear had fled in previous contacts with people and was not known to be aggressive. "What caused bear 15 to attack and kill Roger May is speculative....A likely contributing circumstance was the bear's habituation to people and its history of garbage feeding" (Herrero 1985:71).

Table 12 - Sex by food and garbage factors: Was food or garbage within 100 m of the encounter site?

INDIVIDUALS

FOOD	FEMALES	MALES	ROW TOTAL
no	3 7%	10 7%	13 7%
yes	43 93%	130 93%	173 93%
COLUMN TOTAL	46 25%	140 75%	186

2

$X^2 = 0.000$, d.f. = 1, significance = 1.000, minimum e.f. = 3.215, cells with e.f. < 5 = 25%. Do not reject the null hypothesis. Lambda with food and garbage dependent = 0.

ENCOUNTERS

FOOD	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
no	0 0%	5 8%	2 7%	7 7%
yes	6 100%	57 92%	28 93%	85 93%
COLUMN TOTAL	6 6%	62 63%	30 31%	98

2

$X^2 = 0.551$, d.f. = 2, significance = 0.759, minimum e.f. = 0.429, cells with e.f. < 5 = 50%. Lambda with food and garbage factors dependent = 0.

2

With all females and mixed combined; $X^2 = 0.003$, d.f. = 1, significance = 0.954 (after Yates correction), minimum e.f. = 2.571, cells with e.f. < 5 = 50%.

The small sample sizes and low expected frequencies in these tests compromise any conclusions based on them. Nonetheless, it is notable that 93% of the encounters were within 100 m of food and garbage. It appears that the presence of food and garbage is independent of the gender of the people encountered.

Table 13 a - Sex by location of encounter in relation to development: In auto access campground or within 2 km of auto access campground (access); backcountry campsite - either designated, self-chosen, or of an unknown type (backcountry camp); off trail by more than 100m and more than 2 km from travelled road (off trail); at or within 2 km of a garbage disposal travelled road - but not within 2 km of auto access campground (road); on or within 100 m of trail more than 2 km from travelled road (on trail).

INDIVIDUALS			
LOCATION	FEMALES	MALES	ROW TOTAL
access	18 21%	53 20%	71 20%
backcountry camp	10 11%	25 9%	35 10%
off trail	12 14%	53 20%	65 19%
dump	2 2%	10 4%	12 3%
other	10 11%	18 7%	28 22%
road	17 19%	61 23%	78 22%
on trail	19 22%	44 17%	63 18%
COLUMN TOTAL	88 25%	264 75%	352

2

$X = 5.209$, d.f. = 6, significance = 0.518, minimum e.f. = 3, cells with e.f. < 5 = 7%. Do not reject the null hypothesis. Lambda with location dependent = 0.

Table 13 b - Sex by location of encounter in relation to development: In auto access campground or within 2 km of auto access campground (access); backcountry campsite - either designated, self-chosen, or of an unknown type (backcountry camp); off trail by more than 100m and more than 2 km from travelled road (off trail); at or within 2 km of a garbage disposal area or storage area (dump); other; on or within 2 km of travelled road - but not within 2 km of auto access campground (road); on or within 100 m of trail more than 2 km from travelled road (on trail).

ENCOUNTERS

LOCATION	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
access	9 43%	35 25%	4 8%	48 23%
backcountry camp	2 9%	13 9%	6 13%	21 10%
off trail	1 5%	27 19%	8 17%	36 17%
dump	0 0%	4 3%	2 4%	6 3%
other	4 19%	8 6%	5 10%	17 8%
road	3 14%	32 23%	9 19%	44 21%
on trail	2 10%	21 15%	14 29%	37 18%
COLUMN TOTAL	21 10%	140 67%	48 23%	209

2

$X^2 = 21.969$, d.f. = 12, significance = 0.0379, minimum e.f.=0.603, cells with e.f. < 5 = 52%. Lambda with location dependent = 0.062.

2

With all females and mixed combined; $X^2 = 7.513$, d.f.= 6, significance = 0.276, minimum e.f.=1.981, cells with e.f. < 5 = 14%. Do not reject the null hypothesis.

The patterns in these tests reveal that females are more highly represented in the frontcountry and on roads and trails where habituated bears would be more common (Nadeau 1987). These findings relate to the tests of the known history of the bear(s). There are low numbers of individual females encountering bears off trail, and high numbers encountering them on trails and on roads. All female parties have low representation in off trail encounters with bears. Mixed parties are high in the on trail encounters. All female parties combined with mixed parties were also highly represented in the on trail encounters with bears. In addition, the low incidence of mixed parties (sresid = -2.1) and high incidence of all female parties (sresid = 1.9) encountering bears in or near auto access campgrounds, as well as the high occurrence of mixed parties encountering bears on trails (sresid = 1.9), were responsible for the rejection of the null hypothesis for the test measuring encounters.

The large difference in significance between the tests measuring individuals and encounters shows the value of measuring encounters as separate events to reveal patterns not apparent when individuals are measured as separate events.

The location of the encounter can be a significant factor in the nature of an encounter, as is illustrated by the following example.

Jane Ammerman and Kim Eberlee (male), July 24, 1980,
Glacier National Park (Herrero)

Jane (Ammerman) and Kim (Eberlee) worked at the Lake McDonald Lodge in Glacier National Park. In late July they decided to go hiking and camping. They ended up at the small resort area at St. Mary... The teenagers made an illegal camp between the campground and the development at St. Mary...

They camped alongside a stream that cuts through a very bushy area...a natural travel route for a bear moving through the bush...

About half a mile from their camp was a small garbage dump...When our investigating team visited the dump we saw a horse carcass beginning to decay. Items such as this can attract bears from several miles away. Whether attracted by the dead horse or other garbage, the grizzly bear was probably heading to or from the dump in the early hours of July 24. Near his route of travel were the two teenagers, apparently sleeping on top of their tent because the night was warm and muggy. The bear had learned to accept the smell of humans from foraging at the dump.

One of the bodies was found by fishermen around noon of July 24. An investigating team of park rangers found the other body nearby. Both had been partly consumed (Herrero 1985:64-65).

Jane Ammerman was not menstruating at the time of the attack. Her last period had begun July 1, the attack occurred July 24. Although odors from sexual intercourse were suspected as an attractant, no sperm was found in the vaginal smear done as part of the autopsy. The final report also noted that in neither victim had the genital area been eaten or touched by the bear (Glacier Bear sighting record #801073).

Unknowingly, these two made major mistakes regarding camping in grizzly country. They camped on a bear trail that led to a garbage dump which had a rotting horse in it; they also slept out in the open. Herrero (1985:149) has found "that people sleeping without tents were more likely to be injured, even killed than were people who slept in tents".

Table 14 a - Sex by the bear's activity prior to the encounter: Feeding on vegetation or digging; feeding on garbage; at a dead animal or hunting; other; resting or quiet while in brush or treed area - bear not visible to person; travelling on road or trail (via); travelling cross-country (xc).

INDIVIDUALS			
BEAR'S ACTIVITY	FEMALES	MALES	ROW TOTAL
feeding on vegetation/dig	12 25%	31 19%	43 21%
feeding on garbage	5 10%	14 9%	19 9%
at a dead animal/ hunting	4 9%	19 12%	23 11%
other	6 13%	35 22%	41 20%
quiet/rest	10 21%	25 16%	35 17%
via	6 13%	8 5%	14 7%
xc	4 9%	28 18%	32 16%
COLUMN TOTAL	47 23%	160 77%	207

2

$X^2 = 8.521$, d.f. = 6, significance = 0.202, minimum e.f. = 3.179, cells with e.f. < 5 = 14%. Do not reject the null hypothesis. Lambda with bear's activity dependent = 0.

Table 14 b - Sex by the bear's activity prior to the encounter: Feeding on vegetation or digging; feeding on garbage; feeding on unknown food; at a dead animal or hunting; other; resting or quiet while in brush or treed area - bear not visible to person; travelling on road or trail (via); travelling cross-country (xc).

ENCOUNTERS

BEAR'S ACTIVITY	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
feeding on vegetation/dig	1 13%	15 17%	11 33%	27 21%
feeding on garbage	1 13%	5 6%	3 9%	9 7%
at a dead animal/ hunting	2 25%	13 15%	1 3%	16 13%
other	2 25%	21 24%	4 12%	27 21%
quiet/rest	1 12%	13 13%	7 21%	21 16%
via	1 12%	3 4%	3 9%	7 6%
xc	0 0%	16 19%	4 12%	20 16%
COLUMN TOTAL	8 6%	86 68%	33 26%	127

$\chi^2 = 14.131$, d.f. = 12, significance = 0.292, minimum e.f. = 0.441, cells with e.f. < 5 = 52%. Lambda with bear's activity dependent = 0.

With all females and mixed combined; $\chi^2 = 8.709$, d.f. = 6, significance = 0.191, minimum e.f. = 2.260, cells with e.f. < 5 = 21%. Do not reject the null hypothesis.

There seem to be slight differences in what a bear is doing before encountering people of either sex. The largest influence on the X^2 came from the high number of individual females encountering bears travelling on a road or a trail and low number of women encountering bears travelling cross-country.

The largest effects on the X^2 result in the second test were from the high numbers of mixed parties encountering bears while the bears were feeding on vegetation or digging, and the low numbers of mixed parties encountering bears at a dead animal or while they were hunting. No all female parties encountered bears while the bears were travelling cross-country. The results from the second test are compromised by the small sample size of all women parties and the high percent of cells with e.f. <5.

Similiar patterns are reveal when all female parties were combined with mixed parties; the largest effects on the X^2 came from the high number of parties with females encountering bears while the bears were travelling on a road, and while feeding on vegetation or digging. There were low incidences of parties with females encountering bears while the bears travelled cross-country or while at a dead animal.

Like the age of the person, bear's history, and person's location results, these may tell more about human use patterns than about bear behavior or the role of menstrual odors in influencing bears' actions.

Table 15 a - Sex by inferred motivation of bear: Protection of young (young); searching for human foods or garbage (search); startled and attacking a strange object (startle); possible predation (pred??); curiosity; response to harassment (harass); defending a food source (defend food).

INDIVIDUALS			
MOTIVE	FEMALES	MALES	ROW TOTAL
young	33 31%	126 31%	159 31%
search	28 26%	97 24%	49 24%
startle	6 6%	43 11%	49 10%
pred???	22 20%	51 13%	73 14%
curious	9 8%	29 7%	38 8%
harass	7 6%	42 10%	49 10%
defend food	3 3%	14 4%	17 3%
COLUMN TOTAL	108 21%	402 79%	510

2

$X = 7.646$, d.f. = 6, significance = 0.265, minimum e.f. = 3.6, cells with e.f. < 5 = 7%. Do not reject the null hypothesis. Lambda with motive dependent = 0.002.

Table 15 b - Sex by inferred motivation of bear: Protection of young (young); searching for human foods or garbage (search); startled and attacking a strange object (startle); possible predation (pred??); curiosity; response to harassment (harass); defending a food source (defend food).

ENCOUNTERS				
MOTIVE	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
young	9 35%	66 31%	20 32%	95 32%
search	9 35%	51 24%	15 24%	75 25%
startle	2 8%	27 13%	3 5%	32 11%
pred???	3 11%	24 11%	12 19%	39 13%
curious	2 8%	13 6%	5 8%	20 7%
harass	1 4%	22 10%	5 8%	28 9%
defend food	0 0%	9 4%	3 5%	12 4%
COLUMN TOTAL	26 9%	212 70%	63 21%	301

2

$X^2 = 9.257$, d.f. = 12, significance = 0.681, minimum e.f. = 1.037, cells with e.f. < 5 = 33%. Lambda with motive dependent = 0.

2

With all females and mixed combined; $X^2 = 6.018$, d.f. = 6, significance = 0.421, minimum e.f. = 3.548, cells with e.f. < 5 = 7%. Do not reject null hypothesis.

The inferred motivation of the bear seems to be independent of the gender of the person encountered. Some patterns were, however, revealed. All tests revealed a low incidence of females harassing bears and startling bears. For the test combining all female parties with mixed parties, the low number of parties with females startling bears had the largest effect on the X^2 .

The high numbers of individual females involved in possible predation encounters had the largest effect on that test's results and could imply that bears are more likely to attack females. This was not the case for the encounters test which had a lower percentage of all female parties involved in possible predation and a high number of mixed parties in this category. As has been noted in the discussion of the bear's species and the age of the person, the high incidence of predatory attacks by black bears on young girls can not support the idea that menstrual odors attract bears. Again, examples of possible predation are presented to illustrate the prevalence of predation on young, pre-menstrual females.

Allison Muser, July 1, 1977, Waterton Lakes National Park Alberta (Herrero personal files).

Allison and Phillipa Muser, both under ten years old, were playing in a picnic area while their father, Paul Muser, fished nearby. A female adult grizzly in seemingly good health approached the girls within fifty meters, reared up to look then charged and attacked, dragging Allison away. Upon seeing the bear, Allison screamed,

while Phillipa stood very still and quiet. Paul Muser came running after the bear who by then had dropped Allison. The girls had been touching fish and had eaten sausages for dinner. There is a possibility that another bear was present at the time of the attack.

This attack resembles one of predation, perhaps because of the food odors and the girls' small size (Jonkel pers. commun.). The girls involved were pre-menstrual, so there is no possibility of menstrual odors playing a role. If any odors were involved in the motives of the bear they may have been the food odors from the fish and the girl's dinner.

The one all female encounter that involved harassing a bear involved Marianna Young.

Marianna Young, June 13, 1978, Yellowstone National Park (Yellowstone National Park files incident #39).

About a mile in from the Heart Lake trailhead Marianna Young saw and was attempting to photograph a mother grizzly with three cubs. The mother bear charged, attacked, pulled her from a tree she had tried to climb, dragged her a distance and ate five to ten pounds of tissue.

The Park report and Herrero conclude that Marianna was harassing the bears by being too close, intent on photographing them. The mother bear responded protectively by attacking.

Marianna was between 20 and 29 years of age and her menstrual status was unknown. However, her sex, age, and menstrual status are probably irrelevant, given the provo-

cation she precipitated.

The complexity and difficulty of inferring a bear's possible motivation and determining the contributing factors to the occurrence and outcome of an attack are illustrated by the following example.

Brigitta Fredenhagen, July 30, 1984, Yellowstone National Park (from Yellowstone National Park files incident #842914 and Herrero 1985:72-73)

Brigitta Fredenhagen was an experienced camper from Basel, Switzerland. She was visiting Yellowstone National Park with her brother and sister-in-law. On July 30, 1984, she was hiking and camping alone in the Yellowstone Backcountry. She had been informed of the dangers of grizzly bears and the precautions she should take by literature handed out at the entry gate and in person by the rangers issuing her backcountry permit. She had even been told by a ranger (Youngblood) that "A lot of women in this area do not hike during their period".

When she didn't return as scheduled, her brother and sister-in-law reported her missing. When the rangers found her camp it was clear that she had been meticulous in following all grizzly bear precautions. However, judging from the tracks and other indications left by the bear, late in the evening of July 30, or early in the morning of the 31st, a grizzly climbed a tree to get her food cache. The bear got and ate her food and then dragged her, still in her sleeping bag, out of her tent. Brigitta died of massive trauma and was partially consumed by the bear. According to the coroner's report, "There

was no evidence of menstruation, the victim appeared to be in the secretory phase of her menstrual cycle" (Lee K. Hermann, M.D. P.C., Cody WY).

The reasons for this attack are unclear. The bear appeared to be searching for food since it went first to her food cache. Beyond that, it may have been in search of more food when it approached the tent. Brigitta was in a designated campsite and its design and placement in relation to the trail and known bear habitat may have contributed to bear traffic in the area (Yellowstone Park report #842914). Several habituated and people-conditioned bears were known to frequent that area (Jonkel pers. commun.).

That Brigitta had kept a remarkably clean camp, had followed all bear precautions makes the attack appear to be random and unprovoked. Herrero (1985:73) concludes his assessment of this attack; "the most obvious contributing circumstance was once again the prior conditions that allowed a grizzly bear to become used to people, and have little enough avoidance of them that it would enter camp".

Table 16 a - Sex by action which seemed to trigger aggression: Person unintentionally approaches too close to bear (close); food odors; moving away from bear (moving); moving away from bear quickly (moving quickly); moving intentionally towards bear (towards); other; standing ground (standing);

INDIVIDUALS			
TRIGGER	FEMALES	MALES	ROW TOTAL
close	39 47%	159 49%	188 49%
food odors	12 14%	29 10%	41 11%
moving	4 5%	23 7%	27 7%
moving quickly	11 13%	14 5%	25 6%
towards	4 5%	11 4%	15 4%
other	8 10%	56 18%	64 17%
standing	5 6%	23 7%	28 7%
COLUMN TOTAL	83 21%	306 79%	389

²
 $X = 13.360$, d.f. = 6, significance = 0.038, minimum e.f. = 3.201, cells with e.f. < 5 = 7%. Reject the null hypothesis. Lambda with trigger dependent = 0.

Table 16 b - Sex by action which seemed to trigger aggression: Person unintentionally approaches too close to bear (close); food odors; moving away from bear (moving); moving away from bear quickly (moving quickly); moving intentionally towards bear (towards); other; standing ground (standing);

ENCOUNTERS				
TRIGGER	ALL FEMALES	ALL MALES	MIXED	ROW TOTAL
close	9 53%	83 53%	26 51%	118 52%
food odors	1 6%	10 6%	8 16%	19 8%
moving	0 0%	9 6%	4 8%	13 6%
moving quickly	2 12%	4 3%	5 10%	11 5%
towards	1 6%	5 3%	2 4%	11 4%
other	2 12%	33 21%	5 10%	40 18%
standing	2 12%	13 8%	1 2%	16 7%
COLUMN TOTAL	17 8%	157 70%	51 23%	225

²
 $X = 17.569$, d.f. = 12, significance = 0.129, minimum e.f. = 0.604, cells with e.f. < 5 = 52%. Lambda with trigger dependent = 0.

²
 With all females and mixed combined; $X = 12.762$, d.f. = 6, significance = 0.047, minimum e.f. = 2.418, cells with e.f. < 5 = 29%.

2

The largest effect on the X results comes from the high number of individual females, mixed parties, all female parties, and all female parties combined with mixed parties (sresid = 2) moving away from bears quickly.

An example of this response and its consequences is offered by the following incident.

Barbara Coates, August 12, 1958, Sunwapta Bungalows, Jasper National Park, Alberta, (Herrero 1985:109).

An adult black bear with a known history of frequent contact with people, contact that had been considered harmless and good natured, killed seven-year-old Barbara as she was playing with her sister. As the girls were playing the bear approached, followed them as they retreated, then attacked Barbara and dragged her away. The bear didn't fight or act aggressively when the two girls hit him. Barbara had picked up a tablecloth with cookies in it when she saw the bear.

Barbara Coates was under ten years old and premenstrual. Herrero (1985) classifies the attack as a search for food and act of predation. When the girl ran, a predatory response may have been triggered in this bear.

The high numbers of females and parties with females moving away from bears quickly were instrumental in rejecting the null hypothesis in these tests. Yet, nothing from these result shows a possible role of menstrual odors as a trigger for bear's aggression.

Cases Involving Known Menstruation

For only three of the incidents involving women is it known that they were menstruating. One of these cases was Michele Koons described in the introduction. Descriptions of the other incidents involving known menstruation shed little light on the possible role of menstrual odors in attracting bears.

Mary Keogh, July 18, 1971, La Sal Mnts. Utah (Herrero).

In the north end of the La Sal Mountains, about 40 miles from Moab, Mary Keogh was camped with three other people. Mary was between ten and nineteen years of age and was menstruating at the time of the encounter. She was sleeping out in the open when a two year old male black bear bit her. The bear was in poor condition with no fat. The weather had been dry so that the abundance and quality of bear forage was poor. Mary was sleeping between a stream and some garbage cans and it is thought that the garbage in the area lured the bear in. Mary's injuries were not serious. As with Olga Gregorchuk, this incident supports Herrero's (1985) speculation that the failure of natural food sources may bring bears into closer proximity with people and cause some black bears to attack.

Also relevant to this attack was Mary Keogh's location near garbage cans and possibly between the bear and the garbage.

Cindy Walker, July 10, 1977, Polychrome Glacier, Mount McKinley National Park (Herrero).

July 10, 1977, Cindy Walker and Curtis Sklar, both in their twenties were camped at a backcountry site near the Polychrome Glacier when a grizzly bear that had been feeding on vegetation approached their camp. Curtis Sklar shouted and both people retreated. The bear followed one of them although it is not specified who, and then left. Herrero classifies the bear's behavior as neutral and curious, it showed no interest in obtaining food or in threatening the people.

Of the 137 females included in the recorded bear incidents it is known that 16 women were not menstruating at the time of the encounter. There are three cases when it is known the women encountered were menstruating. This gives an estimate of 16% menstruating women encountering bears. This corresponds with a rough estimate of an 18% possibility that a woman is menstruating based on five days of menstruation in a 28 day cycle. Estimates like these are risky given the variability of menstrual cycles. Also, even though the 16% estimate comes from the sample, applying this percentage to the remaining 118 females may be complicated by the following factors: 1) Assuming that women are aware of, and believe, the hypothesis that menstrual odors attract bears, many may choose not to be in bear country while they menstruate. This self-selection would decrease the number of menstruating women that encounter bears. However, vacations - hiking and camping

trips in bear country, are rarely flexible as to a women's menstrual cycle. 2) Even given prior planning to avoid a trip during a menstrual period, periods are especially unpredictable when traveling and with physical activity. Women who work for, and take courses from, the National Outdoor Leadership School (NOLS) have found remarkable changes in their cycles; some are shortened others are lengthened. 3) Many women work in the public lands containing bears and they work throughout their menstrual cycles. Women that live in bear country are also exposed to bears throughout their cycles.

The proportion of the 118 females for whom there is no menstrual status information that were menstruating is unknowable given the variability of menstrual cycles and because of the self-selection due to the hypothesis that menstruation attracts bears.

Fatalities

Bear attacks resulting in the deaths of women and girls are of special concern because of the prevalent belief that women are more likely to be attacked due to the attraction of menstrual odors. Also, more information is available for victims of fatal bear attacks, giving a more complete picture of what could have lead to the encounter. From 1929 to 1984, eight women and six girls were killed by bears. Six of the women and one girl were killed by grizzlies; two women and five girls were killed by black bears. Of the eight women, one (Michele Koons) was known

to be menstruating, four were definitely not menstruating (Julie Hegelson, Mary Pat Mahoney, Jane Ammerman and Brigitta Fredenhagen), while the menstrual status of Barbara Chapman, Janice Laybowrine and Carol Marshall, is unknown. With the pre-menstrual girls and the women who were known not to be menstruating, the total of positively non-menstruating victims of fatal bear attacks is 10 out of 14.

The background of of these fatalities point to root causes other than menstrual odors or pheromones for the attacks. Considering first the victims whose menstrual status is unknown; Barbara Chapman encountered a female grizzly with cubs at close range (less than 50 feet). This sudden close encounter spurred the mother's instinct to defend her cubs.

Of Janice Laybowrine, September 2, 1976, Alberta, Hines Creek area (Herrero personal files), very little is known. She was the victim of a sudden attack by a black bear. This incident is unique among the fatalities of women or girls by black bears in that it was a mother with cubs. One circumstance that may have contributed to this attack was the poor berry crop that year, bringing bears to the vicinity of people where food is abundant (e.g. camps, crops, garbage). Whether menstrual odors could have had any bearing on this attack is unknown.

Carol Marshall, August 14, 1980, Alberta (Herrero 1985:116-117), was also the victim of a sudden attack by a black bear. The bear that killed her had previously

killed a co-worker of hers and was aggressively pursuing Carol and another co-worker, Martin Ellis. Carol was killed when she fell out of the tree she was trying to climb and the bear broke her neck. Her menstrual status at the time of the attack is unknown but there is nothing to indicate that the bear was pursuing her because of any associated odors. The bear was aggressively attacking people and seemed indiscriminate in its selection. The entire case is extremely unusual.

Michele Koons, Julie Hegelson, Mary Pat Mahoney, Jane Ammerman, and Brigitta Fredenhagen were all killed by grizzlies that attacked while the women were sleeping. If menstrual odors were acting as attractants to bears it would be reasonable to find them playing a role in these situations. Michele Koons was menstruating at the time of the attack on her, none of the other women were. Most significantly, Michele Koons, Julie Hegelson, Mary Pat Mahoney and Jane Ammerman were all victims of bears that were habituated to people and to eating human food and garbage.

The bears that killed Koons and Mahoney had known histories of aggressive behavior, chasing and harrassing people and getting food as a result. The bears that attacked Julie Hegelson, Roy Ducat, Kim Eberlee, and Jane Ammerman were on their way to or returning from garbage dumps. "Habituation combined with food conditioning has been associated with a large number of injuries" (Herrero

1985:51); these fit that pattern.

Brigitta Fredenhagen was also the victim of an unprovoked attack at night. She too had camped impeccably and was not menstruating. It appears that the bear was interested in her food as it secured her food cache and ate it before attacking her. Brigitta was camped in a designated campsite and its design and placement in relation to the trail and known bear habitat may have contributed to bear traffic in the area (Yellowstone Park Report #842913).

All the rest of the fatalities were young girls. They were all prepubescent so no pheromonal or menstrual odors could have played a role in their attacks.

In analysing the above cases, it is difficult to single out any condition that seems specific to women. The cases represented have counterparts with men as the victims. Bear encounters are complex, and much depends on the "personalities" of the bears and of the people involved. For these accounts, Jope's (1982:47) conclusion that "most injuries have been attributable to some extent to improper behavior by people, though not always the victim", holds true.

It would be irresponsible to say the motives for any of the encounters were completely understood and explained. Nonetheless, there is nothing significant in these incidents to point to menstrual or female pheromonal odors as motivating bears to approach women.

Ratios

It is difficult to confidently compare the ratio of males and females encountering bears to the ratio of males and females using bear country because of the paucity of information about the break down of human use of bear country by gender. In the studies done so far, Lucas (1980, 1985) determined that visitor use in nine wilderness areas (eight in Montana/Idaho, seven containing grizzly bears) is approximately 20-30% female. In the Bob Marshall Wilderness Complex in northern Montana, Lucas (1985) found that the proportion of female visitors grew from 20% in 1970 to 30% in 1982.

Krumpe (1979:74) found that 80% of the responses from party leaders in Yellowstone National Park's backcountry were males. Krumpe (1979) felt this percentage might be biased toward men because men may be more likely to be hiking party leaders and/or take on the role of signing the trail register.

McNaught (1985) found that males and females were almost equally represented in Yellowstone National Park frontcountry campgrounds - 54% males and 46% females.

The incident reports gathered by Herrero represent both frontcountry and backcountry incidents. They begin in the early 1900s, 9% occurred before 1959, 19% from 1960 to 1969, and 72% from 1970 to 1981.

The percentage of females in the sample is 22% females. This corresponds with the approximated percentages for backcountry use presented by Lucas (1980, 1985).

Summary of Results

TABLE 17

FACTOR	INDIVIDUALS	ENCOUNTERS	ALL FEMALE WITH MIXED
<u>Distance from Bears</u>			
2			
X	0.489	1.521	0.496
d.f.	2	4	2
significance	0.783	0.823	0.780
Lambda	0.016	0	0
minimum e.f.	----	1.089	----
% cells with e.f. <5	----	44%	----
<u>Bear's status</u>			
2			
X	0.254	1.459	1.212
d.f.	2	4	2
significance	0.881	0.834	0.546
Lambda	0	0	0
minimum e.f.	----	2.260	----
% cells with e.f. <5	----	11%	----
<u>Bear's age class</u>			
2			
X	1.363	2.539	1.227
d.f.	1	2	1
significance	0.243	0.281	0.268
Lambda	0	0	0
minimum e.f.	----	4.492	----
% cells with e.f. <5	----	17%	----
<u>Bear's species</u>			
2			
X	3.777	6.992	4.883
d.f.	2	4	2
significance	0.151	0.136	0.087
Lambda	0	0	0
minimum e.f.	----	1.233	3.875
% cells with e.f. <5	----	22%	17%
<u>Age of person</u>			
2			
X	12.449	28.544	26.058
d.f.	4	8	4
significance	0.014	0.0004	0.000
Lambda	0	0	0
minimum e.f.	----	1.816	----
% cells with e.f. <5	----	40%	----

Extent of injury

2			
X	2.525	5.526	0.968
d.f.	3	6	3
significance	0.471	0.478	0.809
Lambda	0	0	0
minimum e.f.	----	4.074	----
% cells with e.f. <5	----	8%	----

Encounter type

2			
X	4.316	7.067	5.704
d.f.	2	4	2
significance	0.116	0.132	0.058
Lambda	0	0	0
minimum e.f.	----	2.707	----
% cells with e.f. <5	----	11%	----

Bear's history of conditioning to human food and garbage

2			
X	2.409	1.588	1.048
d.f.	1	2	1
significance	0.121	0.452	0.306
Lambda	0	0	0
minimum e.f.	----	2.309	----
% cells with e.f. <5	----	33%	----

Bear's known History

2			
X	4.216	2.555	2.044
d.f.	1	2	1
significance	0.040	0.279	0.153
Lambda	0	0	0
minimum e.f.	----	4.537	----
% cells with e.f. <5	----	17%	----

Food and garbage within 100m

2			
X	0.000	0.551	0.003
d.f.	1	2	1
significance	1.000	0.759	0.954
Lambda	0	0	0
minimum e.f.	3.215	0.429	2.571
% cells with e.f. <5	25%	50%	50%

Location of encounter in relation to development

2			
X	5.209	21.969	7.513
d.f.	6	12	6
significance	0.518	0.038	0.276
Lambda	0	0.062	0.019
minimum e.f.	3.000	0.603	1.981
% cells with e.f. <5	7%	52%	14%

Bear's activity prior to encounter

2			
X	8.521	14.131	8.709
d.f.	6	12	6
significance	0.202	0.292	0.191
Lambda	0	0.070	0.060
minimum e.f.	3.179	0.441	2.260
% cells with e.f. <5	14%	52%	21%

Inferred motivation of bear

2			
X	7.646	9.257	6.018
d.f.	6	12	6
significance	0.265	0.681	0.421
Lambda	0	0	0
minimum e.f.	3.600	1.037	3.548
% cells with e.f. <5	7%	33%	7%

Action which seemed to trigger aggression

2			
X	13.360	17.569	12.762
d.f.	6	12	6
significance	0.038	0.129	0.047
Lambda	0	0	0
minimum e.f.	3.201	0.604	2.418
% cells with e.f. <5	7%	52%	29%

The null hypothesis that sex is independent of the circumstances leading to a bear encounter, was not rejected for the following tests: the distance from the bear(s), the most aggressive bear's status, the most aggressive bear's age class, the bear's species (the test measuring encounters as separate cases and combining all female and mixed parties rejected the null hypothesis for the species of bear), the extent of injury, the type of encounter (the test measuring encounters as separate cases and combining all female and mixed parties rejected the null hypothesis for the type of encounter), the bear's known history of conditioning to human food and garbage and contact with humans (the test measuring individuals as separate cases did not reject the null hypothesis for the bear's known history of contact with people), food and garbage factors, the location of person prior to the encounter, the bear's activity prior to the encounter, and the inferred motive of the bear.

The null hypothesis was rejected for the following tests: age classification of person encountered, the bear's species and the encounter type when measuring encounters as separate cases with all female and mixed parties combined, bear's known history of contact with people when measured by individual, and the action which seemed to trigger aggression.

The Lambda results were all zero, or very close to it, implying that knowing the gender of a person is of no help in predicting the circumstances of an encounter.

There is little indication from the tests or case studies that bears respond in any significantly different way to females or female odors. For the most part, the statistical results do not support rejecting the null hypothesis that bears do not respond to people specific to their gender. It appears that females are not injured more often than males and that bears are not more aggressive around females. Females may encounter more bears with known histories of habituation to human food and garbage, and known contact with humans - this may be due to the greater use of frontcountry locations by females. There is no significant difference apparent in bears activities before an encounter with a female or a male human. The inferred motive of the bear for the encounter is not significantly different for males or females. And none of the possible triggers of the encounter point to menstrual odors playing a role.

Encounters involving menstruating women do not provide strong evidence that menstrual odors attract bears. Analyses of fatalities do not implicate menstrual odors in any way. And, comparing the ratios of women in bear country to women encountering bears reveals that females do not encounter bears more often than would be expected.

The hypothesis that bears are attracted to odors specific to women, although not directly tested, is not supported by these results.

Johe (1982) came to similar, although more limited conclusions concerning differences in bears' responses to

males and females in her analysis of interactions between grizzly bears and hikers in Glacier National Park. She summarized the incidents involving hiker injury from 1939 to 1981, by saying:

Twenty-three hikers have been injured and 10 campers have been injured (4) or killed (6) by grizzly bears in Glacier National Park (Appendix 3). Ten of the victims were women (26% of hikers, 40% of campers; no difference, $z=0.77$, $P>0.1$). Only 1 woman was menstruating when injured (Koons), giving no support to the common belief that menstrual odors invite attack by grizzly bears (Jope 1982:43).

Jope (1982) expressed the common extension of the hypothesis that menstrual odors attract bears to the idea that menstrual odors invite attack by grizzly bears. The jump from attraction to women, to attack of women, seems to be the commonly held belief concerning the hypothesized relationship between menstruation and bears. Regardless of Cushing's (1980:38) assertion that "we must avoid drawing the simple conclusion that attacks upon menstruating women will occur", I believe that most people do draw that conclusion, and that the idea that women are more likely to be attacked has greatly affected women's attitudes towards traveling in grizzly country. That women are more concerned about their safety while in grizzly habitat is supported by Trahan's (1987:18) findings that in Yellowstone, "women were more likely to be concerned about the presence of grizzly bears in the backcountry than men and this did seem to impact their hiking decisions".

CULTURAL ATTITUDES

Evidence that menstrual odors attract bears is inconclusive. Cushing's (1980, 1983) methods and results are questionable. Cushing's (1980, 1983) conclusion that his results support the contention that menstrual odors are an attractant to polar bears, is overstated (see Scientific Study). The genesis of the attack in the Michele Koons incident (see Trout Lake Attack) does not clearly implicate menstruation as an attractant in that encounter. Research into the existence of human pheromones (see pheromonal research) is also inconclusive, rendering the question of whether female pheromones attract bears untenable.

Results of the statistical analyses reveal that, in general, and given that there was an encounter, bears do not appear to react significantly differently to males or females. Although these analyses do not specifically address the role of menstruation in bear encounters, they do point to a conclusion that bears react to humans based on the situation, not on the person's gender. The biological evidence, thus far, does little to shed light on the hypothesis one way or the other.

Another approach to examining the hypothesis is to look for its origins and support in Western cultural attitudes about menstruation. Feminist historians and commentators have explored the importance of menstruation in Western society, while anthropologists have studied it cross-culturally. I present a summary of these different

inquiries here to examine the attitudes that may have predisposed the genesis and acceptance of the hypothesis that menstruation attracts bears.

Throughout human history menstruation has been a powerful cultural symbol. No human culture is free from menstrual taboos, in varying degrees, they are one of the few cross-cultural universals (Nunley 1981). A society's beliefs and taboos surrounding menstruation can indicate the broader images of women's role and status in that society (Young and Bacdayan 1965).

Contemporary Western culture's approach to menstruation is to keep it hidden, to deny its existence to the public world (Delaney et al. 1976). Nonetheless, menstruation is a topic deep in meaning and symbolism. Paradoxes, overlaps and contradictions are rife among attitudes about menstruation, and rarely do the images and beliefs it evokes reflect the reality of women's experiences.

Inherent in the hypothesis that menstruation attracts bears are the following themes that have their sources in long standing, deeply embedded, Western cultural attitudes about menstruation: (1) That menstruation is a source of dangerous power from which men must protect themselves, (2) It links women closer to the animal, carnal, world, but paradoxically, (3) leaves women more vulnerable, more likely to be prey in need of protection. (4) That menstruating women should be excluded from male domains.

The most apparent paradox in Western views is that menstruation ties women closer to nature while at the same

time it makes them more vulnerable and in need of protection from nature. A similiar paradox is the view of menstruation as a source of power and danger, yet also as a debilitation, the source of women's weakness.

Each of these themes will be presented, as well as an historical perspective of how attitudes about menstruation have limited women's opportunities in American society .

Women and Nature

Underlying ideas about menstruation is the notion that women have a deep connection with nature. In Western society the terms "Mother Nature" and "Mother Earth" make clear the connection between women and nature. Women's ties to regeneration through menstruation, pregnancy, and childbirth are the rationales for women's alleged close connection with nature.

Anthropology, psychology, history, and literature tell us that Western Civilization regards women as more natural than cultural. Men, in the Judeo-Christian tradition, are closer to God, to the spiritual, and to culture; they are thus higher on a hierarchical scale. Nineteenth-century scientists used evolutionary theory to buttress a priori beliefs that women were less evolved and essentially belonged to a separate sphere, socially and biologically,

than men. One school of thought used brain capacity measurements to establish women as more closely related to gorillas than to men (Le Bon in Gould 1981).

Ortner (1974) argued that, cross-culturally, the secondary role of women is a result of a universal view of nature as below culture. Women's involvement with menstruation, child-bearing, and child-rearing makes them seem closer to nature and thus they are "pulled down" in status. "It all begins, of course, with the body and natural procreative functions specific to women alone, which...seem to place her closer to nature...and place her in social roles..at a lower order of the cultural process than man's" (Ortner 1974:73). Ortner, however, backs up her thesis with examples from Western culture, specifically the writings of Simone de Beauvoir (1952), and provides little cross-cultural evidence that nature is universally placed lower than culture. It can be argued that her premise is valid for Western society, but is not pan-human.

Campbell (1959:54) explains the connection of women and nature this way; "The fear of women and the mystery of her motherhood have been for the male no less impressive imprinting forces than the fears and mysteries of the world of nature itself". Conceptions about the nature of woman have paralleled conceptions about the nature of nature; topics as broad as these are necessarily complex and convoluted.

Women's association with nature is at the root of the other themes presented in this section as applicable to the idea that menstruation attracts bears.

Danger and Power

Cross-culturally menstruation is seen as a source of great danger and power. One of the themes apparent in the idea that menstrual odors attract bears is that menstruating women are a source of danger. The EEO Subcommittee examining the implications of Cushing's (1980) results for the work assignments of Glacier National Park's back-country employees, stressed that the NPS "must recognize that at certain times, some female employees and persons working with them in bear country may carry an increased risk of bear attack" (Childers et al. 1980:3).

Menstruation is tied to women's powers of regeneration, it is completely foreign to the male experience, and "The belief that menstrual blood is dangerous and always to be avoided by men is almost universal" (Hays 1964:23). Other cultures' taboos that prevent menstruating women from preparing food for men, or handling their possessions stem from the notion that women are "intrinsically dangerous" to men (Hays 1964:40). Horney (1967:99) agrees, "the taboos of primitive people bear eloquent testimony to man's deep fear of women, which centers precisely around menstruation". Neumann (1955) and Thompson (1981) present the idea that menstruation has been devalued by Western society, precisely because it is an expression of the

power and mysteries of the feminine.

Anthropologists have examined the pervasiveness of menstrual taboos and have found that the diversity of practices and beliefs surrounding menstruation are unified by the acceptance of menstruation as a source of dangerous power. Anthropological hypotheses attempting to explain the source of menstrual taboos run the gamut from; "The extensiveness of menstrual taboos observed in a primitive society is determined (to a significant extent) by the average intensity of castration anxiety felt by the men in that society" (Stephens 1961:385), to "It might be, then, that childbearing and menstruation were at one time viewed as so elevating women that men sought revenge by imposing unpleasant taboos on the menstruating woman" (Bettelheim 1955:180). Driver (1961), in outlining the substratum of beliefs and practices concerning menstruation throughout North America, describes the menstruant primarily in a state of close contact with the supernatural. She must behave properly and avoid contact with hunters, fishermen, gamblers, shamans, and priests who are also in a state of spiritual flux. It is her power which can harm theirs. Schlegel (1972), also hypothesizes that practices concerning menstruation are a subclass of practices concerning a state of spiritual danger. There are, she asserts, "striking parallels, especially in American Indian practices, between restrictions placed upon menstruating women and men in a state of spiritual tension or danger, such as before warfare or the hunt, after homicide, or during

ceremonial periods" (Schlegel 1972:90). Schlegel believes the feelings of inferiority and uncleanness that are characteristic of Western societies' notions of menstruation are not universal.

One short-lived hypothesis concerning the source of menstrual taboos is of particular interest to the hypothesis that menstrual odors attract bears. De Rios (1976:261) hypothesized that;

Odors produced by adult females may have operated in early hunting societies to alert animal species to the presence of hunting groups. The odors may have triggered either flight or fight responses in animals being hunted ...

March (1980) then tested de Rios' hypothesis by presenting white-tailed deer (Odocoileus virginianus) with pellets treated with menstrual blood or human urine. The deer avoided the pellets treated with menstrual blood and ate the pellets treated with urine. However, Nunley (1981:634) found that white-tailed deer avoided pellets treated with male human venous blood; "thus suggesting that it is human blood per se, and not female menstrual odor which is aversive to deer."

In presenting the idea that it is women's odors that have resulted in menstrual taboos, March (1980) and Kitahara (1982) accept without question the notion that bears respond aggressively to menstrual odors: "Bears exhibit aggressive curiosity and a tendency to attack" (March 1980:125), and "in response to human menstrual odors, omnivores and carnivores tend to become aggressive"

(Kitahara 1982:901). Kitahara does not give a reference for his statement. March cites; Cole 1971, 1973; Herrero 1970; Martinka, 1971, 1972, n.d.; and Watson 1967, none of whom make a direct connection between bear's tendency to attack and menstrual odors. Both March (1980) and Kitahara (1982) supported the hypothesis that the influence of menstrual odors on animals explained the formation of menstrual taboos and the sexual division of labor, on the idea that bears attack menstruating women. This reveals how readily, and without question, the idea that bears are attracted to menstrual odors has been accepted.

Horney (1967) traces the traits of male psychology as it pertains to attitudes about women and finds that men "harbor deep within themselves a secret distrust of them (women)". In Judeo-Christian traditions;

woman's capacity to give birth is partly denied and partly devalued: Eve was made of Adam's rib and a curse was put on her to bear children in sorrow... woman appears as the sexual temptress (the apple), who plunges man into misery...Man's fear of woman is deeply rooted in sex...Women lure him to his doom... Even greater is the fear of menstruation (Horney 1967: 112-113).

Hays (1964) also describes how the fear of menstruation has lingered in our culture, and finds that it indicates deep-seated male anxiety concerning the procreative functions of women. Like Horney, Hays connects man's fear of women's danger with the fear of women's sexuality.

Sexuality

Cushing (1980:39) proposes that bears may recognize and investigate a sexually attractive odor in menstrual odors. "This implies that certain mammalian species' sexual odors are similar enough that another species would investigate them"

This same link is made from a very different source, a "B" grade horror movie, "Grizzly". The movie and subsequent novelization (Collins 1976) reveal how popular culture has made obvious ties between menstruation enticing attack by bears, and bears being attracted sexually to menstruation. The movie was apparently inspired by the 1967 attacks in Glacier National Park just as the extremely popular movie "Jaws" was based on a shark attack on a young woman in Long Island (Delaney et al. 1976). The descriptions of the bear attack scenes could be descriptions of rape scenes; "all that came out of her contorted lips were little bleating sounds which, in another context, might sound like cries of passion" (Collins 1976:31). It sounded like "a phony rape scene" (Collins 1976:36). Not surprisingly, the bear is attracted to its first and second victims by the smell of menstrual blood. The first four victims are women; "he likes to kill women" (Collins 1976:95) expressing the belief that women are more likely to be attacked than men. The victims are all young, attractive, and anticipating or fantasizing about a visit from a lover before the bear attacks.

Griffin (1981) purports that woman's association with

bestiality and carnality is associated with woman's connection to nature and to the body rather than the soul. This link is apparent in pornography which is "filled with associations between women and animals" (Griffin 1981:24).

The idea that women are closer to nature and are therefore lacking in spiritual dimensions is not new to pornography. This idea so pervades the imagery and language of civilization that the concept takes on an air of reality....

As common as the image of the woman as beast is the image of the woman in coitus with an animal, as if, when a woman is pictured as the lover of a beast, her bestial nature is confirmed (Griffin 1981:25).

In her assessment of woman's status in Western society, de Beauvoir (1952:239) concludes that because of women's physiological structure, development, and functions, "her animality is more manifest".

The separation of the body from the intellect and soul, and the corresponding devaluation of the body can be traced to Greek and Christian traditions (Ruether 1976). In these traditions, women were associated with the body and carnality and their reproductive processes, including menstruation, were belittled and became shameful (Christ 1982). Symbolically, women became the expression of demonic sexuality (Ruether 1976).

In 1486, Christian ideology toward women was condensed by two priests, Heinrich Kramer and Joseph Spranger, into the guidebook of witch persecution, the Malleus Malificarum. It became the leading text of the Inquisition, and according to Hays (1964) exemplifies man's fear

of woman and her reproductive process. According to the Malleus, "All withcraft stems from carnal lust, which in women is insatiable" (Kramer and Spranger 1971[1486]:47).

Most of the crimes attributed to witches were powers that had traditionally been attributed to menstruation.

Women who were accused of being witches on the same evidence that men since the dawn of human life had been using to taboo and isolate menstruating woman. Pliny's list of the disastrous effects of menstruating women on men, cows, gardens, bees, milk, wine could be a catalog of the evil effects of witchcraft as it was understood by church and state in Europe (Delaney et. al. 1976:7-8).

The Malleus was an expression of the dread of women's sexual insatiability. Its influence did not end after the fifteenth-century witchhunts. The Malleus was an extreme expression of the Biblical condemnation of Eve for succumbing to the temptation of the Devil in the Garden of Eden. The underlying principles, that woman is more carnal and is sexually unsatiable, are integral in Judeo-Christian belief.

The most damning euphemism attached to menstruation reflects the belief that the monthly flow of blood is the curse god laid upon woman for her sin in Eden. This is not an example of the misconceptions of the ancient past, but continues to carry the weight of belief (Weideger 1975:84).

The perils of woman's sexuality are also expressed in the chivalric myths. The message in The Tales of Arthur and Chanson de Roland is that women's lust lures a knight to his death or at least prevents him from accomplishing his mission. The major women in these tales are despicable threats to men's virtues. Only men who avoid women and remain chaste virgins attain the goal of viewing the

Holy Grail. The only good women in the myths are completely subservient, submissive and pious. The chivalric image of true womanhood became the predominant ideal throughout Victorian America (Van der Wetering 1988).

It may seem far fetched to imply that the hypothesis that menstrual odors attract bears has connections to the association of women with dangerous sexuality. However, Cushing's (1980) theory that bears are attracted to menstrual odors because they are attracted to a sexual odor, and the subtheme of the admittedly low-grade movie and book "Grizzly" (Collins 1976) do make that connection.

The association of woman with dangerous sexuality is not one modern Western society consciously acknowledges and supports - it is distasteful to today's social conscience. The Victorians went to the opposite extreme of denying women's sexuality (Welter 1966). Both extremes are unreasonable, but the influence of long held beliefs within the Judeo-Christian ideology of women on today's attitudes, cannot be denied. In analyzing male/female differences, according to Fausto-Sterling (1985:9), "scientists peer through the prism of everyday culture...More often than not their hidden agendas, non-conscious and thus unarticulated, bear strong resemblances to broader social agendas".

Vulnerability

The belief that menstrual odors will attract bears implies that women are more likely than men to be attacked

by bears. Numerous examples of the extension from attraction to attack have been presented throughout this paper. Thus women feel more vulnerable - that they, more so than men, are seen as prey to a powerful predator, the bear. Cushing (1980:39-40) suggests that "bears were and are attracted by these [menstrual] odors because they represented a potential prey".

In Western culture, menstruation is accompanied by beliefs that it is debilitating, that it makes women vulnerable. Traditionally, when girls begin to menstruate they are filled with negative attitudes towards menstruation (Horney 1967, Delaney et al. 1976, Friday 1977, Washbourn 1979, Christ 1982, Golub 1983, Fausto-Sterling 1985). They are taught that their activities will be restricted, that they have become more vulnerable to physical discomfort, that hard physical work is not an option for them. The onset of menstruation is fraught with feelings of fear, disgust, and resentment at newly emplaced restrictions (Horney 1967).

As she enters sexual maturity, the girl learns that she "is the prey of the species" (de Beauvoir 1952:60); that "she is a potential victim" (Fausto-Sterling 1985:205). Emerson, in an ironic address to the first Congress on women's rights in 1855, described the ideal woman as "more vulnerable, more infirm, more mortal than man" (Emerson 1895:343).

An extension of these attitudes is that women must be

protected by men. One commentator wrote in 1854 that a true woman feels herself weak and timid and feels that she needs a protector (Welter 1966). This attitude was still apparent in 1973. Goldberg (1973:233) asserts that "In every society a basic male motivation is the feeling that the women and children must be protected". Responding to Cushing's (1980) suggestion that more be done to warn and protect women in bear country, Glacier National Park female backcountry employees objected to "the responsibility men feel toward the protection of women, as they would helpless children...Women expect equal, not selective protection in dealing with the risk of working in grizzly country" (Blacker et al. 1980:3).

Merchant (1980) sees woman's cultural connection to nature at the root of woman's status as prey. Historically, the devaluation of woman corresponded to a devaluation of nature resulting in both being viewed as prey (Merchant 1980). "Nature is the Universal prey, to manipulate as humans see fit" (Winner 1977:21). "Man is the hunter, woman is his game" (Tennyson, *The Princess*), and "the female is the prey of the species" (de Beauvoir 1955:59). Envisioning women as vulnerable prey in need of protection is implied by the hypothesis that menstruation attracts bears.

The supposed vulnerability and weakness of women has been the main argument restricting women's activities and opportunities in Western societies in recent history.

Exclusion

Menstruation has been used to bar women from higher education, professional careers, sports and, perhaps, from grizzly bear country. The term "menstrual politics" has been coined by some feminists to explain how menstruation has been used to limit women's opportunities in the last century of American history.

Practitioners of menstrual politics have one basic tenet in common: They are convinced that women are naturally and irrevocably limited by the menstrual functions... Menstrual politics has dominated social and economic relations between the sexes since the beginning of time... She [woman] has been taught that menstruation is disabling, and so she has been disabled (Delaney et al. 1976:50).

Perhaps because it is so uniquely feminine, menstruation has a long history as a rationale for women's inability to enter traditional male realms. The arguments are either; that menstruation makes women unfit for these activities, or the activities will harm women's abilities to menstruate and reproduce. Wilderness is one of the last of the male realms for women to enter, the use of menstruation as a partial limit to women's entrance here has well established precedences in the barriers placed before women's entrance to higher education, professions, politics, and sports.

During the late nineteenth and early twentieth century menstruation was used to extremely limit women's activities. At that time, an epidemic of "female complaints" centered on women's reproductive processes, specifically menstruation. Doctors then saw menstruation as inherently

pathological (Ehrenreich 1978). The extent to which the reproductive organs held sway over woman's body had no parallel in the male (Smith-Rosenberg 1974).

The cure commonly prescribed for the invalidism stemming from women's reproductive functions was rest, passivity and acceptance of a domestic and subordinate role (Smith-Rosenberg 1974). The most extreme "cure" in the late nineteenth century was that of Dr. Mitchell, a well-respected physician, who popularized the prescription of a "rest-cure"; complete bed rest and overfeeding for up to a year (Wood 1973).

The general acceptance that women's debilitation was a result of menstruation and women's reproductive processes allowed factors that may have been truly to blame to be overlooked. One such factor was the effects of Victorian women's fashions. Tight-laced corsets exerted, on the average, 2 pounds of pressure on the internal organs (up to 88 pounds was recorded). A well-dressed woman wore an average of 37 pounds of street clothing in the winter, 19 pounds of which was suspended from her waist. The short term results of these fashions were; shortness of breath, constipation, weakness and violent indigestion. Long term results were much more serious; bent or fractured ribs, displacement of the liver, and uterine prolapse. In some cases, the uterus would be gradually forced, by the pressure of the corset, out through the vagina (Ehrenreich 1979). Socially accepted images of sexual identity often act as blinders to the influences of factors outside of

the prescribed views; rarely do the images reflect actual experience (Van der Wetering 1988).

The bodily weakness attributed to the menstrual function became a favored argument for restricting the participation of women in higher education and national affairs (Delaney et. al. 1976). Dr. Edward F. Clarke of Harvard University, in his book Sex in Education (1873), described the debilitating effects of higher education on young women's reproductive functions and thus on the future of the human race. He was convinced that females had only a limited amount of energy and that the majority of it was required for the upkeep of menstruation.

Because of the limitations menstruation placed on women's activities, the life-style most frequently advocated for the young woman in the early twentieth century consisted of a routine of different tasks, such as bed-making, cooking, cleaning and child-tending (Smith-Rosenburg 1974). Such medical and biological arguments helped to rationalize women's traditional role (Smith-Rosenburg 1974). The message to women was that menstruation was dangerous, debilitating and, as described by one physician, a "humiliating badge of their inferiority to the stronger sex" (Smith-Rosenburg 1974:123).

Attitudes have, of course, changed since the turn of the century, and we must be wary of painting a caricature of that era to coincide with present-day theories (Morantz 1980). Yet as recently as 1970, Edgar Berman, a physician and Democratic party functionary, announced that he would

not like to see a woman in charge of this country at a time of national crisis because her "raging hormonal imbalances" would threaten the life and safety of all (Delaney et. al. 1976:81). "Raging hormones" were also used as ammunition in a Latin American diplomat's verbal attack on British Prime Minister Thatcher concerning her response to the Argentine invasion of the Falkland Islands in 1982 (Sommer 1983:53). Women's "lack of emotional stability" has also been used as a rationale to exclude women from climbing expeditions (Blum 1980:1).

Weideger (1976), argues that the menstrual taboo, the belief that menstruating women are a source of danger, is still active in our society. She presents the religious beliefs still prevalent in Jewish and Catholic traditions that associate menstruation with evil and see it as God's curse laid upon woman for her sin in Eden.

Paige (1973) contends that menstrual taboos are a method of controlling women, and that even though our own superstitions are unspoken, the implicit belief lingers that the menstruating woman is unclean.

Friday (1977) argues that American women see menstruation as a mark of inferiority, the cause of uncontrollable emotions, and irrationality, and that this common vision and experience of women leads to feelings of self-denial and low self-esteem.

Weideger (1976:103) agrees that the belief that menstruation is dirty is deeply embedded in our society, and that the menstrual taboo "has been one of the most suc-

cessful methods devised to undermine the self-acceptance and confidence of women".

Past research into the biological differences between men and women have appointed the male physiology to be normal and consequently, women are by nature abnormal and inherently diseased (Fausto-Sterling 1985). Woman's difference from man make her a second-class being: "She is, indeed, prevented from real accomplishment by the deplorable, bloody tragedies of menstruation and child-birth" (Horney 1967:114).

Our entire culture bears the masculine imprint... there has remained an obvious residue of general resentment against women. This resentment expresses itself, also in our times, in men's distrustful defensive maneuvers against the threat of women's invasion of their domains... This attitude does not express itself in scientific theories alone (Horney 1967:115).

Menstruation has long been used to restrict women's physical activities. The story of women in sports is one of the best example of these limitations. In 1934, a female 'Voice of Experience' gave the following advice to young readers: Girls should not exercise, play tennis, or wear high-heeled shoes during their periods. Athletic dancing, lifting of heavy weights, doing arduous household duties, swimming and horseback riding were also discouraged (Delaney et. al 1976).

A seminar was held in 1984 sponsored by the U.S. Olympic Committee to explore the effects of the menstrual cycle on physical activity. It was agreed that the view of the perfect female no longer has to be passive and

sedentary but can be athletic as well as feminine (Baker 1986). Nonetheless, the belief that menstruation is debilitating lingers and many athletes believe that menstruation negatively affects their performance (Brooks-Gunn et al. 1986). Yet, Brooks-Gunn et al. (1986) have found that the limited evidence to date suggests that not all athletes exhibit performance changes linked to cycle phases. For some women, in certain sports, performance may be enhanced during menstruation.

Menstruation continues to be an effective barrier to women's activities. It is as if its mention is enough to close an argument - nobody wants to pursue a tack containing menstruation because it is an embarrassing, private subject. Bringing menstruation into a debate ends the commentary, and its authority to determine women's limits seems final. This may be why the hypothesis that menstrual odors attracts bears was accepted so readily with scant supporting evidence; it seemed right that bears should be attracted to blood. No one pursued the tabooed subject with further research.

Research that is done on the effects of menstruation seems plagued with methodological problems (Sommer 1985). Fausto-Sterling (1985:8) has found that the "most widespread methodological problem is pinning the results of a study on gender when differences could be explained by other variables". Louck's (1986) conclusion about the problems in methods in studying the effects of the menstrual cycle speaks well to the tenacity of our menstrual

taboo, the pitfalls of menstrual research, and to the hazards of jumping to conclusions too quickly on the basis of insufficient evidence.

Finally, the political context in which this research is conducted cannot be ignored. Women have struggled for decades for access to athletic facilities, and this struggle is not yet complete. In addition, only recently has the inclusion of physical activity in the concept of femininity become widespread among women. Some proponents of women's athletics fear that publicity about possible harmful effects of athletic training upon the female reproductive system may hinder this struggle or discourage this social change... Investigators must resist such overreaction by refusing to allow their tentative and inadequately substantiated hypotheses to be prematurely put forth as facts for the determination of public policy. Matters of medical treatment, public policy, and personal lifestyle should be based on knowledge, not on ideology - whether archaic ideology or new ideology - nor on incomplete research. Nevertheless, anxiety about the unwarranted application of experimental results cannot be allowed to obstruct the study of women's physiology: Investigators must never fail to perform an experiment out of fear of what they might discover (Louck 1986:146).

Louck's (1986) statement speaks well to Cushing's conclusions and the response of the government agencies. The NPS showed good judgement by not taking his results too far and excluding women from backcountry work. However, concern for safety and liability did lead to the warnings printed in visitor information. The influence of these brochures may keep many women out of grizzly country thus limiting their recreational opportunities. This is perhaps unwarranted given the questionability of Cushing's study. However, Louck's other warning that anxiety about unwarranted application of experimental results should not obstruct continued research, also speaks well to this

issue - limiting women's recreational freedom is not a reason to ignore evidence that bears are attracted to menstrual odors.

Certainly menstruation is not consciously used to limit women's options. The hypothesis that menstruation attracts bears has the safety of women and their companions in mind. However, Clarke (1873) also had women's safety and the security of the human race in mind when he warned that allowing women into universities would irrevocably damage their reproductive systems. We do not know if bears are attracted to menstrual odors, we do know that the purported danger and debilitation of menstruation has long kept women from entering male domains.

I would argue that wilderness has been as difficult a realm for women to enter as sports, and that menstruation has been used here as well as a barrier to women's access.

Masculine culture in America characteristically sees wilderness as a place for defining virility, for playing out aggressive, adventure-seeking, sometimes violent impulses. Survival in a hostile natural environment is an ego-gratifying achievement and feeds the achievement oriented male psyche, enabling men to return to civilization and improve their culture (Norwood 1984:35).

The barriers to women's access to wilderness are typified by the barriers to women's participation in mountaineering. Mountaineering was an all male bastion long closed to women. Arlene Blum, an outstanding mountaineer, was informed by a Canadian climbing guide that "there are no good women climbers. Women climbers either aren't good climbers, or they aren't real women" (Blum 1980:1).

Attitudes about women's perceived inabilities and alleged natural inclination to want to "stay at home caring for small children and in general keeping the home fires burning" (Hillary 1979, in Blum 1980:2), deny women access to male realms and ignore the experiences of women who prove these attitudes wrong. In 1975 seven Chinese women climbed above 8,000 meters on Mount Everest, and one of them, Phanthog, a Tibetan, reached the summit (Blum 1980).

The hypothesis that menstrual odors attract bears has implications and associations far beyond bear country. In this section connections between the hypothesis and cultural attitudes about women and menstruation have been pursued. The hypothesis parallels beliefs that: menstruation is a dangerous power, that there is a link between women and animality, and that women are vulnerable - in need of protection. It also aligns with the historical beliefs about menstruation and how they have limited women's activities. None of these parallels answers or refutes the question of whether bears are attracted to menstrual odors, but they do reveal the hypothesis' support from Western cultural attitudes. These attitudes, in general, are prejudicial against women and act as barriers to women's options and self-esteem. There is little biological support for the hypothesis, while there is support for it, and its underlying implications, in Western cultural attitudes.

CONCLUSION

The question whether menstruating women attract bears has not been answered. Previous studies (Cushing 1980) do not offer strong evidence in support of the hypothesis. Statistical analyses of bear/human encounters seem to indicate that bears do not respond significantly differently to men or women, but do not address the question of menstruation specifically. Case by case analyses do not reveal menstruation playing a role in human female's encounters with bears, but there is much missing and unknowable information. Given the nature of the question, it cannot be said with confidence that bears are, or are not attracted to menstrual odors.

It would be extremely difficult to determine the affect of the odors bears distinguish on their subsequent behavior. Bear/human encounters are complex. It's doubtful whether any predictable responses by bears to menstrual odors will ever be determined with surety.

There is support for the hypothesis that menstrual odors attract bears in Western culture's attitudes about women and menstruation. These attitudes may have predisposed the genesis and acceptance of the hypothesis. That the hypothesis may be founded in cultural attitudes does not mean that it is wrong. However, its source in prejudicial attitudes about women should be recognized and all efforts should be made to eliminate limitations on women's options due to prejudicial attitudes.

The formation of the hypothesis and its support reveal connections between cultural history and scientific narrative as described by Thompson (1981:46-47).

Changes in our perception of natural history do not occur in a vacuum; natural history is related to human history, and through techniques of the field known as "the sociology of knowledge," we can begin to see relationships between the way a scientist perceives natural history and composes his narratives about natural processes, and the historical environment of ideas in which he or she lives.

The hypothesis also points to the need to probe our attitudes about gender differences in order to understand the roots of discriminatory attitudes and practices. As Ortner (1972:87) has said;

Efforts directed solely at changing the social institutions - through setting quotas on hiring, for example, or through passing equal-pay-for-equal-work laws - cannot have far reaching effects if cultural language and imagery continue to purvey a relatively devalued view of women.

But what about women in bear country? Are they in danger when they menstruate? One serious bear attack on a known menstruating woman (Michele Koons) has been recorded and menstruation did not appear to play a major role. It is probably unjustified that women are subjected to more fear because of the belief that they are more likely to be attacked by bears than men. It appears that relatively, women do not encounter bears more often than men, nor are they injured more often once an encounter occurs. Bear attacks are extremely rare but are nonetheless, a real danger. Each individual must make the personal choice to place themselves in that risk.

Management Recommendations

The hypothesis that menstruating women attract grizzly bears is given credence by NPS and USFS brochures warning women that they should stay out of bear country while menstruating (i.e. Bear Us In Mind, IGBC 1986). Underlying the credence that federal agencies and Cushing's study give the hypothesis, are questions concerning its implications for women's recreational, employment, and self-image limitations. Following the advice of the government brochures, many women probably do not hike in bear country while they are menstruating.

The government is justifiably concerned about protecting itself from liability for bear attacks. As of 1985, seven parties had attempted to sue the government for negligence in incidents of bear attacks. Only the first one, Claypool v. United States (98F.Supp. 702) in 1947, was successful in finding the government liable for not adequately warning the public of the dangers of camping in Yellowstone National Park. Nonetheless, the alteration in the National Park brochures provided at the entrance gates might suggest that the specter of litigation has affected park management policies (Hunter 1985). It is understandable that every attempt is made to warn the public of any possible dangers they may encounter and how to avoid them. It is unfortunate that a possible consequence of the warnings may be restricting women's enjoyment of traveling in grizzly bear country.

I would recommend that instead of warning women not to

travel in bear country, the informational brochures and other educational tools emphasize the proper care of used tampons, and the need for general hygiene. The information could emphasize the need to keep used tampons in air tight containers and, when in camp, stored in the same manner as food and garbage.

Whatever their action, the government agencies in charge of public lands are in a difficult position. They must do all they can to protect the safety of the public, they must rely on the best information available, and they must make every effort to be non-discriminatory. Leaving out the warning, even though such action may be warranted, could leave them open to liability suits in the event of an attack on a menstruating woman; leaving the warning in may, unintentionally, limit women's recreational opportunities in grizzly bear country.

Further Study

In a survey of Yellowstone National Park visitors, Trahan (1987:18) found that a significant number of women were "more likely to be concerned about the presence of grizzly bears in the backcountry than men and this did seem to impact their hiking decisions." Trahan's study is the only indication so far of public perceptions of the dangers of traveling in grizzly country and how those perceptions may differ between men and women. I have presented the academic investigations and theoretical aspect of cultural attitudes about menstruation. I have not pursued public perceptions of the hypothesis that

menstruation attracts bears, who believes the hypothesis, why, and how firmly and if it has practical significance in people's decisions to travel in bear country.

Kellert (1978, 1980, 1981, 1982, and 1983) has pioneered studies of public attitudes towards wildlife and wildlife related issues, and how the public's attitudes are, or are not supported by their behaviors. An exploration of this type, via a survey, could yield helpful information concerning the hypothesis that menstrual odors attract bears. Areas of interest may be: 1) people's beliefs about bears and their danger, 2) ideas about women in wilderness, 3) acceptance or rejection of the idea that menstrual odors attract bears and how it influences people's traveling decisions, and 4) prior ideas about menstrual odors' effects on animal behavior and how the hypothesis shapes or confirms these ideas.

Visitors to national parks and forests containing grizzly bears as well as a random sample of the general public could be surveyed. Breakdowns of responses by sex, age, educational background, geographic location, and income could provide further information about the acceptance of the hypothesis. A survey could test my position that the hypothesis that menstrual odors attract bears is buttressed by longstanding attitudes about menstruation and that acceptance of the hypothesis influences people's hiking decisions.

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Appendix 1 - Letter to Zoo Personnel

I am a graduate student in the Environmental Studies Dept. at the University of Montana. My thesis project is an investigation of the hypothesis that menstruating women attract grizzly bears. One aspect I'm hoping you can help me with is observations of zoo bears' reactions to different people. I would like to know if anyone working with the bears (grizzly/ brown, black, or polar) has noticed if the bears respond differently to women than to men. Do they seem more curious about women, are they more likely to approach a women or be more aggressive? In general do they seem more attracted to women than men? Do they exhibit any unusual behavior or behavioral patterns specific to women? Any observations or insights you may have concerning this topic would be of great help. Please specify which species of bear you are referring to in any reply. Also, if you know of any reference in the literature about this topic, or know of someone I should contact, I would appreciate that information as well. Thank you for your cooperation.

Appendix 2 - Cross-Cultural Beliefs

There are many connections between women and bears throughout Northern Native American traditions (Rockwell, pers commun. 1987). It seemed pertinent to examine Native beliefs to see if any links between menstruation and bears could be found. What I found was a wealth of information that primarily expresses how very differently Native Americans view their relationships with animals and the natural world than does Western culture. It became clear that anything beyond the briefest mention of cross-cultural beliefs regarding women and bears was beyond the scope and focus of this paper.

"The Native cultures of North America recognize a bewilderingly large range of people, only some of whom are human" (Miller 1982:274). In boreal cultures, myths and traditions linking bears and women are common. The bear-mother myth, in which a bear steals a woman for his wife and their children become the first "people" or true humans, is pan-boreal. It is considered one of the oldest and most widely distributed creation myths (Shepard and Sanders 1985). Bear ceremonialism throughout the northern hemisphere shares many common features including restrictions concerning women's contact with bears and bear hunts (Hallowell 1926).

The perceived connection between women and bears in native cultures is, of course, very different than our own. Native American's views of animals imply relationships and connections far exceeding those of Western

culture: "The interaction here is very intense, and the two orders of being coexist far more closely than in our own tradition" (Nelson 1983:20). For the Native Americans "there is no division between the animal and human spheres; each takes the other's clothing, shifting appearances at will...In an effort to merge the human and animal realms, marriages between the two are the natural result" (Erdoes and Ortiz 1984:389). Stories of bears marrying humans are common. Versions of the bear-mother myth in which a bear, sometimes in the guise of a human, takes a human wife are especially prevalent in the Northwest. In a modern version the association of women and bears persists and includes a reference to the role of menstruation in the association of women and bears:

SONG OF BEAR

There was a young woman who obeyed
 all the laws of cleanliness, and
 never went to the hills durin' her period, and
 did all the things we're supposed to do,
 but got loved by a bear anyway...
 (Cameron 1981:115)

"Traditional beliefs about bears who serve as guardian animals, women who can magically transform themselves into bears, and bears who understand literal human speech" are shared by Northern Athapaskan people (Mishler 1984:65). Tales of men marrying bears and women that become bears and have a human husband are also common. Northern Athapaskan men speak of bears in riddles and metaphors, never speaking its name when they are planning a bear hunt to avoid bad luck in the hunt. The secret must be kept

from any woman because she "might shamanistically dream to the bear and have the power to transform herself into a bear while doing so" (Mishler 1984:64). There is a great danger that a woman might warn the bear and the bear then attack the hunters. Hunting bears is a high expression of manhood and women are excluded from many parts of the process.

Like most Native American women, the Ojibwa women do the berry-picking, the gathering of wild plant foods and the fishing (Landes 1937), all of which closely connect them to the subsistence patterns of bears. For the Ojibwa, the bear is quasi-human (Landes 1968); Ojibwa women fear bears in the same capacity that they fear men. But, bears are also seen as helpers, rescuers, and protectors of women from malicious men (Landes 1938). For the Kutchin in northeastern Alaska and northwest Canada, bears are more likely to be guardian animals for women than men, and such men would not be able to participate in a bear hunt (Mishler 1984).

Many native cultures attribute bears with human qualities. The idea that a bear would marry a woman is an expression of kinship and helps "define a unique symbolic ecology" (Mishler 1984:66). In Native American courtship and love ritual stories;

As in tales with other themes, the usual divisions in the natural world are blurred. Human lovers become mountains, stars, and trees. A maiden marries a merman, while a man weds the moon. Alliance's between animals and humans are common in many tribes' myths (Erdoes and Ortiz 1984:273).

Stories of women marrying bears should not be viewed in the same light as our culture's hypothesis that bear's are attracted to women's pheromones.

Many Native American cultures have taboos against women coming in contact with bears (Hallowell 1926). It is however, with a very different connotation than our idea that women are more vulnerable to attack by bears. When Tagish women meet a grizzly they "will address it directly as 'brother' in hopes that it will be reminded of the incest taboo and run away embarrassed" (Mishler 1984:63). Anthropologist Richard Nelson expressed the relationship between Koyukon women and bears as similiar to two magnets in opposition. Both magnets have great power but when they are close they push against each other and cause a disruption of the normal order of things (pers commun. 1987). He tells of a Koyukon woman who was visibly shaken and morose when the boat they were in drifted close to a grizzly on shore. "Everything about her expressed the danger of a woman coming so close to a creature of such spiritual power. I do not believe I ever saw her more serious than during those minutes" (1983:187). Both the power of the bear and the power of women are recognized but are ritually separated.

The symbolism associated with bears is extremely complex and cannot be given justice in this brief coverage, but as a general statement, the theme of menstruating women associated with bears in lore and ceremonies is apparent throughout North America. David

Rockwell, in his study of Native American bear mythology, has found many connections between bears and menstruation (pers. commun. 1986). The Ojibway, Chippewa and Cree directly associate menstruating women with bears. For them a menstruating woman is called a bear, menarche is described as a girl becoming a bear, and the menstrual isolation is associated with a bear's hibernation. Menstruating women, like bears, are potentially dangerous and powerful. In tales of women becoming bears many of the attributes attached to menstruating women are expressed in their identity as bears; they are hysterical, aggressive, devouring and unloyal to men (Rockwell pers. commun. 1986). Links between bears, women and menstruation have been made by many cultures. Ours, however, is unique in seeing women as more vulnerable to attack by bears and in seeing menstruation as a catalyst of attack.