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Survey to Assess Parasite and Fly Control Methods Utilized by Washington Beef Cattle Producers

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Cover Photo: Rangeland beef cattle near Prosser, Washington, Benton County.

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Introduction

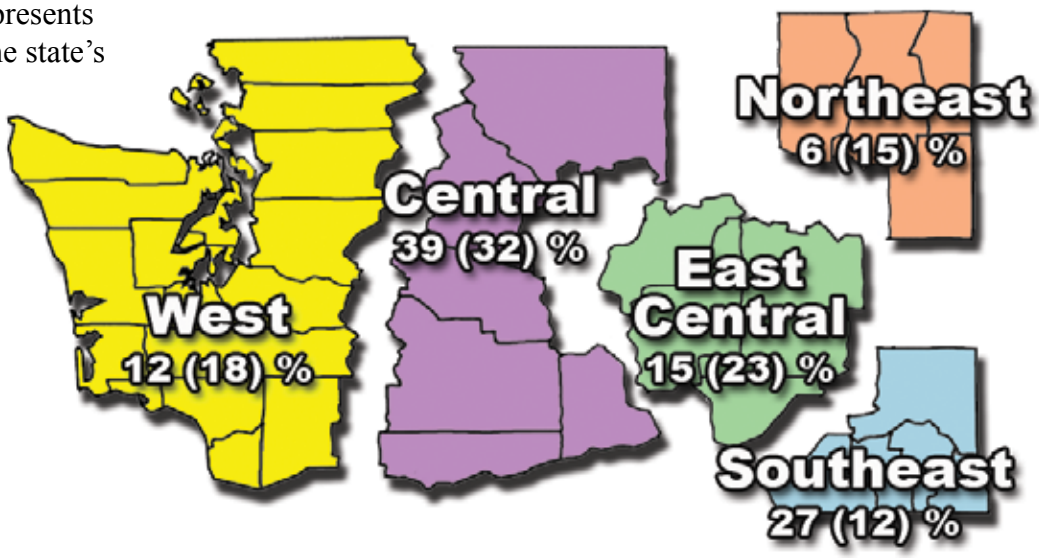
Beef cattle producers in Washington State have become increasingly aware of the risks of inefficient and unsustainable management of internal and external cattle pests. These producers have sought university assistance in managing these risks to improve their production.

To assess cattle pest prevalence and pest control product use and effectiveness, our team prepared a four-page questionnaire and distributed it to a large sample of the state's beef cattle producers in the fall and winter of 2005/2006. Results from this survey were used to help guide our research team in designing experiments and demonstrations in the course of carrying out a project funded by the U.S. Department of Agriculture (USDA) Federal Crop Insurance Corporation (FCIC) Risk Management Agency (RMA). This project, a three-year partnership between Washington State University (WSU) and the RMA, began in the fall of 2005 and is targeted for completion in the fall of 2008. Its objective is the development and implementation of reduced-risk pest management strategies in rangeland beef cattle. By conducting this survey prior to commencing experimentation, we helped assure that our project would address the needs of our target audience.

This document presents a brief overview of the state's beef cattle industry, describes the major internal and external parasites/pests, and reports on the results of our survey.

The Beef Cattle Industry in Washington

Beef cattle rank as the #4 agricultural commodity in Washington State. The industry has grown by 16% since 2002. The value of cattle/calf production in Washington in 2005 was over $600 million. A January 2006 inventory estimated that 9,200 ranchers were keeping approximately 796,000 beef cattle (293,000 cows, 150,000 steers, 353,000 calves; figure does not include bulls). These operations are distributed throughout the state with 18% of the cattle in the Western District, 32% in the Central District, 23% in the East Central District, 15% in the Northeast District, and 12% in the Southeast District.



Percentage of survey respondents by USDA National Agricultural Statistics Service region. Number in parentheses is percentage of the state's beef cattle produced in that region.

Survey Content and Participation

Our survey asked producers questions regarding the location and scope of their operations, irrigation practices, internal and external parasite/pest control practices, costs of treatment, effectiveness of products used, information sources, and pest/pest control product information needed. While the National Agricultural Statistics Service (NASS) gathered data on pesticide use in cattle and cattle facilities in 1999, those data were not summarized by state, nor did they include information on pest prevalence or treatment frequency. Our survey addressed those information gaps.

A total of 87 surveys were returned; of those, 84 were deemed suitable to be included in the data analysis. The majority of the respondents had cattle operations in the Central (39%) and the Southeast (27%) districts of Washington State (see map, page 1). Thus, while these regions were oversampled, the West, East Central, and Northeast districts were undersampled. Most respondents (79%) reported that they maintained cow-calf operations; a minority of producers reported having cows and stockers, stockers only, or replacement heifers. Approximately 35% of the respondents had fewer than fifty head of cattle, 33% had 50 to 200 head, and 30% had more than 200 head.

Irrigation Practices

The survey limited itself to pasture/rangeland beef producers. Thirty-eight percent reported that some of their land was irrigated (pasture graziers), while 80% reported that some or all of their rangeland was not irrigated. These results are a reflection of the geographic location of most of the respondents: the semi-arid regions of central and southeastern Washington.

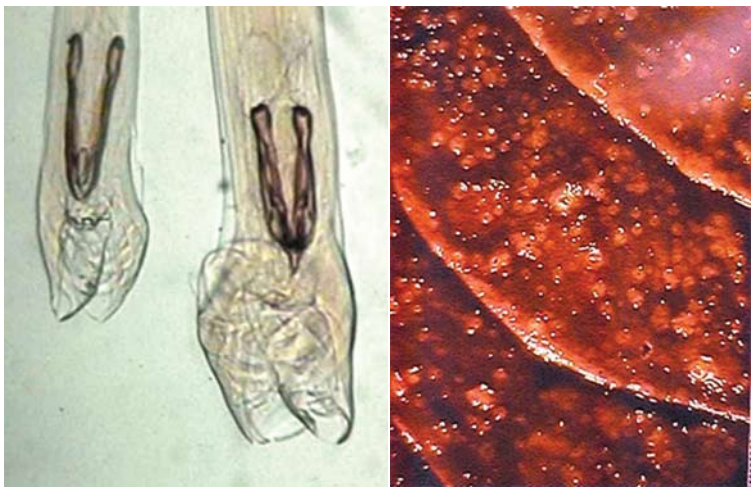
Above: Western Washington pasture, Snohomish County.
Below: Eastern Washington range, Benton County.

Descriptions of Parasites and Pests

Internal Parasites

Internal parasites, including stomach worms (gastrointestinal nematodes) and liver flukes, are major limiting factors in cattle production.

Stomach worms are a particular problem when pastures are wet, as may occur in western Washington from spring and fall rains, or from improper management of irrigation in pastures in eastern Washington. In addition to high ambient moisture (rainfall or irrigation), parasite infection is favored by mild winter temperatures and/or close grazing of pastures. Symptoms of gastrointestinal parasitism include poor growth, anemia, bottle jaw, diarrhea, weight loss, weakness, rough hair coat, dehydration, poor appetite, and unthriftiness. Stomach worms increase producer risks by contributing to reduced weight gain, delayed reproduction, immune system impairment and consequent increased susceptibility to diseases, and economic losses.



Above left: Brown stomach worm,* Ostertagia ostertagi*.
Above right: Lesions caused by the parasite. J.C. Fox, Oklahoma State University, Center for Veterinary Science

Liver flukes damage the bovine liver through their burrowing activity. Small numbers of flukes can be present without causing significant damage, but sizeable infestation of liver flukes is the main reason that cow livers get condemned at the processing plant. Symptoms of fluke infection include weakness, diarrhea, anemia, and unthriftiness. In addition, red water disease (also known as bacillary hemoglobinuria), a devastating and typically fatal cattle disease characterized by the presence of red blood cells present in the urine, is sometimes an aftermath of fluke infection.

Liver flukes are common in the Northwest and, like stomach worms, are favored by wet areas including marshy areas, riparian zones, and low-lying pastureland susceptible to flooding from heavy irrigation or rainfall. Wet conditions are necessary for the presence of the snails that are required for the fluke to complete its life cycle. Flukes hatch from eggs, then infect fresh water snail hosts for initial development stages, after which they form a protective cyst and attach to blades of grass. The cattle eat the grass, then the encysted flukes emerge in the bovines' stomachs as juveniles, making their way to the liver. Eventually, they lay eggs within the cattle hosts, which are shed with the animals' manure to begin the cycle on the ground again.

Far left:* Fasciola hepatica *egg. Roger Klingenberg.
Near left:* F. hepatica *adult. Raffaele Roncalli.
Above: Gross lesions on bovine liver from liver flukes. Dietrich Barth. All courtesy of Merck & Co., Inc.

External Parasites and Pests

External pests/parasites addressed in the survey included horn flies, face flies, cattle lice, cattle grubs, mange mites, and ticks. Infestation by these pests impacts calf and cow weight gain through direct and indirect means.

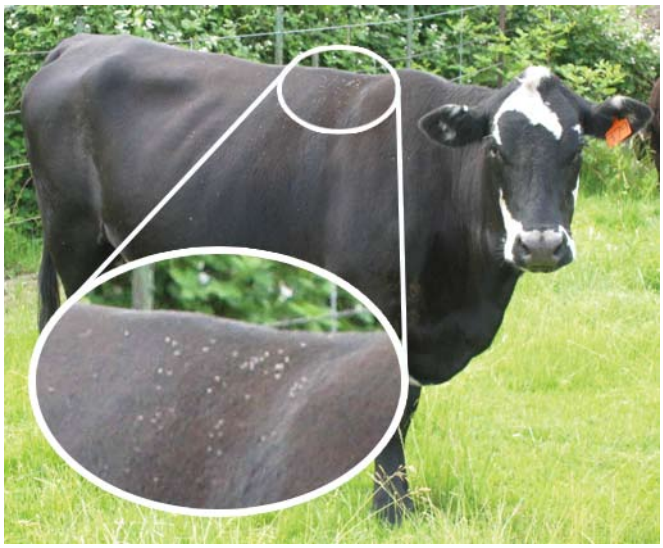
***Horn flies,* Haematobia irritans.**
J.F. Butler, University of Florida

Horn flies are biting, bloodsucking pests that spend their entire adult stage on the back of a cow. Their feeding causes weight loss or lack of weight gain by causing blood loss. They also cause annoyance, discomfort, and refusal to graze.

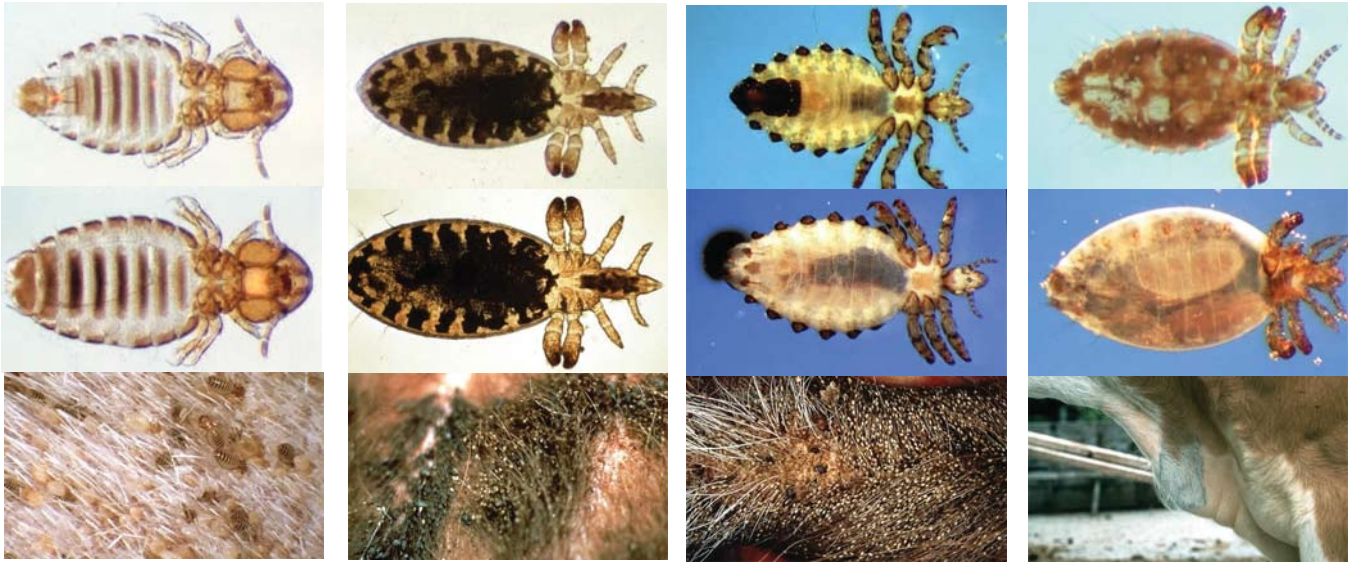
Face flies on cow. Clemson University, USDA Cooperative Extension Slide Series, http://www.insectimages.org

Face flies feed on mucous secretions of the eyes and muzzle and are extremely annoying to cattle. Cattle will try to avoid these flies by crowding in shady areas and refusing to feed, which obviously impacts growth and health. In addition, face flies can transmit the bacterial organism that causes pinkeye directly to cattle through their feeding on eye secretions, thus resulting in further significant reduction in weight gains.

***Face fly,* Musca autumnalis.**
Female on left, male on right.
Dietrich Barth, Merck & Co. Inc.



Horn flies on cow.



First column (from left): Cattle biting louse, **Damalinia (Bovicola) bovis.** ***Top: Male. Middle: Female. Bottom: On skin.***
Second column: Long-nosed cattle louse, **Linognathus vituli.** ***Top: Male. Middle: Female. Bottom: On skin.***
Third column: Short-nosed cattle louse, **Haematopinus eurysternus.** ***Top: Male. Middle: Female. Bottom: On skin.***
Fourth column: Little blue cattle louse, **Solenopotes capillatus.** ***Top: Male. Middle: Female. Bottom: On dewlap.***
All photos by Dietrich Barth and courtesy of Merck & Co., Inc.

Cattle lice infestations are most common in winter when long hair provides an excellent environment for the pest. Infested cattle produce less milk, wean lighter calves, and require more feed per pound of weight gain because of the blood loss to the pest. Cattle with lice may rub against structures to relieve discomfort, which can result in economic losses as both the animal's hide and the structure it rubs against can be damaged. Lice species most likely to impact Washington cattle include the cattle biting louse, the long-nosed cattle louse, the short-nosed cattle louse, and the little blue cattle louse.

Cattle grubs are fly maggots that migrate under the skin of the cattle from the legs to the back, causing reduced weight gain and detrimental impacts to the quality of the hide. The latter occurs when the maggots emerge on the backs of the cattle. The non-feeding adults are called heel or bomb flies; egg-laying adults may cause the animal to flee in panic or "gad" which detracts from feeding.

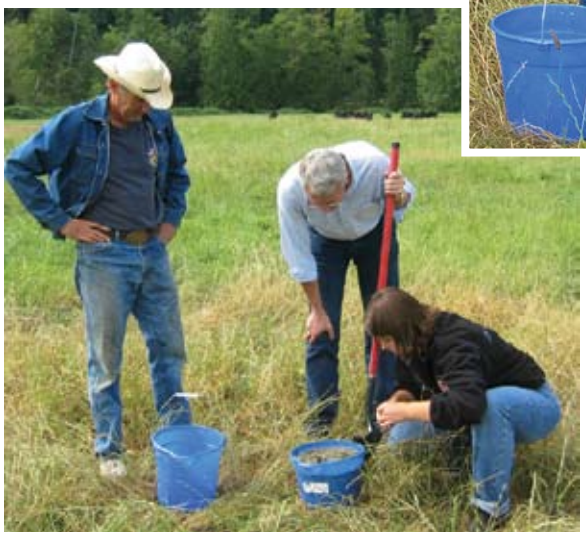
Above, top: Cattle grub, **Hypoderma bovis.** ***J.F. Butler, University of Florida. Above: Cattle grubs in action. Deitrich Barth, Merck & Co., Inc. At left: 3rd stage larva,*** **Hypoderma** ***sp. Raffaele Roncalli, Merck & Co., Inc.***

Mange mites cause scabies in cattle, a skin condition characterized by dermatitis and oozing, scabby areas. Mites are active on cattle all year, but the scabies they cause is most severe in the winter. Other symptoms observed with a mite infestation are general unthriftiness, scarred hides, rubbing or scratching against fencing or other objects, constant tail switching, and licking areas of the body.

Spinose ear tick,* Otobius megnini. *Mat Pound, USDA Agricultural Research Service, www.insectimages.org

Ticks are blood-sucking ectoparasites that cause skin lesions, damage to the hide and/or udder, and general irritation, resulting in production losses. Ticks pose an even greater threat as they may carry and transmit diseases such as babesiosis (cattle fever) and anaplasmosis. Several species of ticks parasitize cattle, including the spinose ear tick and the cattle fever tick.

The not-always-glamorous lives and work of university researchers, undergraduate and graduate student technicians, and producer-cooperators.



Treatment Practices for Parasites and Pests

Producers were asked to give information on treatment practices for specific parasites and pests on their cattle such as the age of animal treated, treatment frequency, reasons for initiating treatment, and product formulations commonly used. In most cases, the percentage of total respondents is given in the summary tables. In some tables, the percentage of nonresponders is given with the assumption that some or perhaps all of the nonresponders were indicating that they never had a particular pest problem and therefore never treated for that parasite or pest. For some of the questions, "other" was a choice and the producer was asked to specify the "other" item. Write-in responses were many and varied but only the percentage of all producers choosing "Other" is given in the tables for the sake of simplicity and completion. Significant write-in responses are given in the text where appropriate.

Table 1
Treatment Practices for Cattle Parasites and Pests, Statewide Overview

Pest	% respondents citing practice			
	Regularly treat	As needed	Seldom treat	Never treat/no response
Internal parasites*	75	17	5	3
Liver flukes alone	24	n.d.**	n.d.	76
Horn flies	50	n.d.	n.d.	50
Face flies	55	n.d.	n.d.	45
Cattle grubs	70	n.d.	n.d.	30
Cattle lice	79	n.d.	n.d.	21
Mange mites	33	n.d.	n.d.	67
Ticks	33	n.d.	n.d.	67
Other external pest (not specified)	10	n.d.	n.d.	90

*Includes liver flukes. †n.d.--No data. This response was not among the choices.

The age of cattle treated was similar for internal parasites and external pests/parasites. The majority of the respondents treated mature cows for both internal (79%) and external (83%) pests/parasites. Yearlings were treated by 60% of the respondents for internal parasites and by 58% of the respondents for external pests. Fifty-eight percent of the respondents treated calves for internal parasites compared with 51% for external pests.

Statewide Frequency of Treatment

Producers were asked both general and specific questions about frequency of treatment of internal and external pests and parasites. Frequency of treatment responses were sorted and tabulated in three ways: (1) by relative frequency statewide, (2) by number of times per year and time of year statewide, and (3) by relative frequency separated by region of the state. Table 1 shows an overview of statewide frequency of treatment of cattle pests based on the survey responses.

Internal parasites as a group ranked as the number one problem for beef cattle producers, followed by cattle lice in second place and cattle grubs in third place, followed by face flies and horn flies. While 97% of the respondents reported controlling internal parasites on a regular or occasional basis, 67% reported that they did not regularly treat for liver flukes specifically (9% did not answer the question. Seventy-nine percent of the producer respondents reported regularly treating for cattle lice and 70% for cattle grubs. Often treatment for these two pests is accomplished with the same product at the same time. About half of the respondents reported regularly treating for flies, 50% for horn flies and 55% for face flies. Again, treatment for these two species of flies usually means applying ear tags or using some other form of fly control product labeled for both. Mange mites and ticks are minor external parasites and for each, 33% of the respondents reported regularly treating their cattle for them.

Cattle in a feeding line in spring.

The respondents provided more specific information on how many times per year and at what time of year the producer treated his/her animals. The percentages may not match up with the response percentages in Table 1 as they were responding to different questions. It cannot be assumed or concluded from these data that certain pest problems are more severe at certain times of the year. Rather, the time of treatment is more a factor of convenience and practicality. Cattle, particularly those on pasture or range, are handled infrequently. Routine handling times such as branding, spring turnout, or preparation for shipment are therefore utilized as opportunities for pest control treatment.

Tables 2 through 4 summarize the most common times of year when cattle are treated for parasites and pests. Internal parasites were shown to be of greater concern to beef producers than external pests/parasites, based on the large percentage of respondents regularly treating for them (63% once a year and 26% twice a year). No respondents reported treating for internal parasites more than twice a year. However, more producers reported that they treated more frequently for horn flies and face flies (21/23% once a year, 12/12% twice a year, and 17/20% three or more times per year, Tables 2-4, respectively). From the responding producers treating once per year, cattle were treated most frequently in the fall for internal parasites, cattle grubs, cattle lice, and mange mites (63-76%), and in the spring for flies and ticks (50-67%) (Table 2). An overwhelming majority of the producers who treated cattle for internal parasites twice per year (91%) did so in the spring and fall (Table 3). Likewise, 50-68%

Table 2
Time of Year for Treatment of Cattle Parasites/Pests for Respondents Treating Once per Year

Pest	% respondents citing time of year				Number of responses (% of all respondents)
	Spring	Summer	Fall	Other*	
Internal parasites	21	2	75	2	53 (63)
Horn flies	50	33	11	6	18 (21)
Face flies	58	26	11	5	19 (23)
Cattle grubs	22	0	76	2	41 (49)
Cattle lice	17	0	73	10	41 (49)
Mange mites	25	0	63	12	16 (19)
Ticks	67	0	20	13	15 (18)
Other external pest (not specified)	50	0	50	0	2 (2)

*Other times cited were: as needed, on arrival, year-round, one month of age, and winter (cattle lice).

of those producers who reported treating twice per year to control flies, cattle grubs, cattle lice, mange mites, and ticks, did so in the spring and fall (Table 3). Responses from those producers treating their cattle three or more times a year for flies indicated that the most frequent treatment times were spring/summer (23-36%), spring/summer/fall (24-36%), and multiple times during the summer (21-29%). Most of the respondents who treated for cattle grubs and cattle lice treated once a year in the fall (Table 2, 36-37% of all respondents), though some treated twice a year, spring and fall primarily (Table 3, 12 and 23%, respectively), and a few treated three or more times per year (timing varied, Table 4, 5% for each). The minor pests, mange mites and ticks, were more often controlled with a once-per-year treatment (Table 2, 12% of all respondents in the fall for mites, 12% of all respondents in the spring for ticks) or twice per year, primarily during the spring and fall (Table 3).

Table 3
Time of Year for Treatment of Cattle Parasites/Pests for Respondents Treating Twice per Year

Pest	% respondents citing time of treatment							# responses (% of all respondents)
	Spring	Spring and Summer	Spring and Fall	Summer	Summer and Fall	Fall and Fall	Other*	
Internal parasites	0	0	91	0	9	0	0	22 (26)
Horn flies	0	20	60	20	0	0	0	10 (12)
Face flies	0	20	50	30	0	0	0	10 (12)
Cattle grubs	0	0	60	10	0	30	0	10 (12)
Cattle lice	11	0	68	5	0	5	10*	19 (23)
Mange mites	25	0	63	0	0	12	0	8 (10)
Ticks	25	25	50	0	0	0	0	8 (10)
Other external pest	0	0	100	0	0	0	0	2 (2)

*Treated for cattle lice either twice in winter, or fall/winter.

Table 4
Time of Year for Treatment of Cattle Parasites/Pests for Respondents Treating Three or More Times per Year

Pest	% respondents citing time of treatment								# responses (% of all respondents)
	Spring	Summer	Fall	Spring/ Summer	Spring/ Fall	Summer/ Fall	Spring/ Summer/ Fall	Other	
Internal parasites	0	0	0	0	0	0	0	0	0 (0)
Horn flies	0	21	0	36	0	0	36	7*	14 (17)
Face flies	0	29	0	23	18	0	24	6*	17 (20)
Cattle grubs	0	0	50	25	0	0	0	25*	4 (5)
Cattle lice	0	0	0	0	50	0	0	50*†	4 (5)
Mange mites	0	0	0	0	0	50	0	50*	2 (2)
Ticks	33	0	0	0	0	0	67	0	3 (4)

*Year-round. †Spring/Fall/February.

Table 5
Treatment Practices for Beef Cattle Internal Parasites by Region of State

Pest	% respondents in region citing practice				
	Western	Central	East Central	Northeast	Southeast
	35-41" *	8-9"	6-8"	16-17"	19-20"
Internal parasites					
Regularly treat	80	73	85	83	70
Treat as needed	20	21	8	0	17
Seldom treat	0	3	0	17	9
Never treat	0	3	8	0	4
Liver flukes					
Regularly treat	33	16	9	20	47
Never treat	67	84	91	80	53

*Region's annual precipitation appears below region.

Frequency of Treatment by Region

Survey responses indicated regional differences in treatment patterns for certain parasites and pests. Percentages in these tables reflect the relative frequencies among producers who responded to these questions. Fewer producers in the Central (73%) and Southeast (70%) districts regularly treated their cattle for internal parasites than those in the Western (80%), East Central (85%), and Northeast (83%) districts (Table 5). Differences in annual rainfall among regions cannot account for this variation; while differences in irrigation practices and/or rotational grazing practices could, these subjects were not covered in the survey. More producers (47%) in the Southeast region treated regularly for liver flukes than in other districts. Perhaps more telling are the large percentages of producers who reported never treating for liver flukes in the Central (84%), East Central (91%), and Northeast (80%) districts (Table 5). Liver flukes can be a problem in regions with heavy rainfall as well as over-irrigated regions and riparian zones. However, treatment decisions for liver flukes may be economically based as the market price for beef liver is very low; often the liver is discarded at the processing plant.

Liver flukes can be problematic under flood irrigation.

For external parasites, marked differences among regions emerged. Producers were more likely to treat for fly problems east of the Cascade Mountains than west of the mountains (Table 6). More producers in the East Central and Northeast districts were treating their animals for cattle grubs and cattle lice than in the Western, Central, and Southeast regions. Treatment for mange mites was more frequent in the Northeast region. A greater proportion of East Central and Northeast cattle producers were regularly treating their cattle for ticks compared to those in other regions.

Reasons for Initiating Treatment

Beef cattle producers were asked about their specific motivations to treat their animals and those results appear in Table 7. For internal parasites, veterinarian recommendation ranked as the first reason (30%) followed by the producer observing symptoms of parasite infestation in their cattle (27%). Not surprisingly, since flies and other external pests are generally easily observed, more cattle producers reported that high numbers of flies (44%) or high numbers of other external pests/parasites (48%) prompted them to initiate treatment of these pests on their cattle. Other reasons cited for treating

Table 6
Treatment Practices for External Parasites and Pests by Region of State

Pest	% respondents in region citing practice				
	Western	Central	East Central	Northeast	Southeast
	35-41" *	8-9"	6-8"	16-17"	19-20"
Horn flies					
Regularly treat	33	46	58	83	52
Never treat	11	14	8	0	4
Nonresponders	56	40	33	17	43
Face flies					
Regularly treat	40	52	46	83	64
Never treat	10	15	8	0	4
Nonresponders	50	33	46	17	32
Cattle grubs					
Regularly treat	60	67	100	80	61
Never treat	10	9	0	0	9
Nonresponders	30	24	0	20	30
Cattle lice					
Regularly treat	89	71	100	100	74
Never treat	11	9	0	0	9
Nonresponders	0	20	0	0	17
Mange mites					
Regularly treat	10	30	38	60	39
Never treat	20	12	0	0	9
Nonresponders	70	58	62	40	52
Ticks					
Regularly treat	10	30	54	60	35
Never treat	20	18	0	0	13
Nonresponders	70	52	46	40	52
Other external pest†					
Regularly treat	33	80	100	0	100
Never treat	67	20	0	0	0

*Region's annual precipitation appears below region. †Not specified.

for internal parasites included that they were considered an annual problem, that treatment was initiated as a preventative measure, that treatment occurred as an added benefit of using ivermectin, that treatment occurred because the respondent had changed pasture management tactics, and that treatment was initiated because of its effect on weight gains. Other reasons cited for treating for external parasites included the presence of pinkeye, a history of problems, effects on weight gains, to reduce scratching/rubbing impacts on facilities, and for better feed efficiency.

Table 7
Reasons for Treating Cattle for Pests/Parasites

Reason	% respondents citing reason		
	Internal parasites	Flies*	Other external pests/ parasites
Egg counts/pest counts	8	44	48
Symptoms observed	27	26	n.d.†
Vet recommendation	30	5	8
Neighbors are treating	4	0	2
Read it was a problem	19	6	15
Other reason	18	13	13

*Includes horn flies and face flies.
†n.d.--No data. This response was not among the choices.

Formulations Commonly Used

Applying pour-on product to control internal parasites.

Formulation of product varies with the target pest, but pour-ons were by far the most common product formulation cited by Washington beef cattle producers responding to our survey. Generally, chemicals in these products come in ready-to-use concentrations in oil-based, water-based, or emulsifiable solvents. The bottle is designed to be connected to a dispenser to allow easy and accurate dosing of each animal based on body weight. For treatment of internal parasites, 83% of the respondents chose a pour-on product, while 25% used an injectable product. According to the survey results, respondents used mainly dust bags (36-39%) to control flies, and pour-ons, dust bags, or sprays for treatment of cattle grubs, cattle lice, mange mites, and ticks. A minority of respondents reported using ear tags to control flies (18-19%). Other formulations mentioned were oilers and backrubbers for flies, cattle grubs, and mange mites; insect growth regulator (IGR) products for horn flies; wicks for flies; and drenches for cattle grubs.

Producers were also asked about the efficacy of the products they used (data not shown). Most respondents (58-61%) reported that the products they used for either internal or external parasites had stayed the same in effectiveness over the past five years though noteworthy percentages of the respondents reported more effective products (21% for internal control products and 11% for external pest control products).

Table 8
Formulations Used on Beef Cattle for Treatment of Pests/Parasites*

Pest	% respondents citing use of formulation						
	Pour-ons	Dust bags	Injection	Ear tags	Sprays	Blocks	Other
Internal parasites	83	n.d.†	25	n.d.	n.d.	1	6
Horn flies	8	36	n.d.	19	17	2	6
Face flies	7	39	n.d.	18	14	1	5
Cattle grubs	33	17	2	5	14	0	5
Mange mites	15	14	1	4	10	0	2
Ticks	12	13	n.d.	7	13	0	1

*Due to a misprint, responses for cattle lice were gathered only toward the end of the surveying period; they are not included in this table. Generally speaking, pour-ons, dust bags, and sprays were used to treat cattle for lice.
†n.d.--No data. This response was not among the choices.

Annual Costs of Control

The cost of controlling pests on crops or livestock can be a major factor in deciding whether or not to treat. However, controlling parasites as well as disease prevention in beef cattle is relatively inexpensive. The majority of respondents reported that they were spending $4 or less per head to control internal parasites (60%), and $4 or less to control external pests/parasites (56%) (Table 9). Only 12% of the producer respondents reported spending $6 or more per head on internal parasite control, and only 5% were spending that much per head for external parasite/pest control.

Table 9
Annual Cost of Controlling Beef Cattle Pests/Parasites

Cost/head	Internal parasites*	Cost/ head	External pests/ parasites*
< $3	29	< $2	20
$3 to $4	31	$2 to $4	36
$4 to $5	17	$4 to $5	19
$6 +	12	$6 +	5

*Percentage of respondents giving this answer; columns do not add up to 100 because some survey respondents did not provide an answer for this question.

Information Sources and Needs

When asked how they currently obtain knowledge on pest management strategies, producers responded: personal experience (63%), veterinarian (56%), chemical representative (31%), University Extension (21%), and other producers (20%). Other information sources noted were: private consultants, University-based pest management handbooks, the Internet, farm publications, trade magazines such as *Beef* or *Drovers*, cattle production education programs, and product containers. It was not surprising to see that University Extension was fourth down on the list for information sources because there has been a dearth of livestock pest/parasite information from Washington State University Extension in the past decade. When asked on what subjects they would like more information, approximately half indicated new control methods for internal parasites (48%) and new control methods for external pests/parasites (50%). Twenty-nine percent of the respondents wanted to know more about flies and liver flukes. Over a quarter of the respondents (27%) wanted more information on chemical control of both internal and external parasites.

Table 10
Pest Management Information Sources and Subjects Important to Producers

Information source	% with response	Need more information on	% with response
Personal experience	63	New controls for external pests	50
Veterinarian	56	New controls for internal pests	48
Chemical representative	31	Fly pests	29
University Extension	21	Liver flukes	29
Other producers	20	Chemical control of internal parasites	27
Private consultant	12	Chemical control of external parasites	27
University-based pest management handbooks	10	Stomach worms	23
Other*	11	Cattle lice	19
		Cattle grubs	14
		Cattle ticks	11
		Mange mites	8
		Other†	6

*Other information sources cited included: Internet, trade magazines, cattle production education programs, and product containers.
†Other topics of interest included: Ivomec bolus and raising natural beef.

Authors' Note

Information gathered from this survey served as a baseline for our cattle pest project, a partnership between WSU and the USDA Federal Crop Insurance Corporation (FCIC) Risk Management Agency (RMA). With this new project we plan to test and preserve novel, reduced-risk treatments for the control of internal and external pests in rangeland beef cattle. Outreach activities will disseminate our findings to producers who, as a whole, are underserved and not covered by crop insurance. Planned deliverables include Extension publications on survey and research results, handbooks in English and Spanish for beef cattle pest management, and a web page devoted to livestock IPM activities, http://ipm.wsu.edu/livestock/livestock.html .

Additional Resources

The Washington Cattlemen's Association and Website
This statewide non-profit organization is dedicated to promoting and preserving the beef industry through producer and consumer education, legislative participation, regulatory scrutiny, and legal intervention. http://www.washingtoncattlemen.org/

Drovers* and *Drovers Online
A magazine and website designed to provide concise, cutting-edge business information and editorial leadership to stakeholders within the beef food system while enhancing the industry's profitability, viability, and tradition. http://www.drovers.com/

Parasites of Cattle
Brief descriptions of the internal and external parasites of cattle. By N.L. Gates and R.B. Wescott. Available from the WSU Extension Bulletin Office, WSU, Pullman, WA, 509-335-2857. Extension Bulletin EB1742. Reprinted 2000.

Central Washington Animal Agriculture Team and Website
A workgroup and website designed to provide research-based information to Central Washington livestock producers and natural resource managers to improve their economic status and quality of life while they create a quality product in a sustainable manner. http://animalag.wsu.edu/

Agricultural Chemical Usage 1999 Cattle and Cattle Facilities
Provides data collected during a national 1999 survey, with separate figures for beef cattle and dairy cattle. NASS 2000. http://usda.mannlib.cornell.edu/reports/nassr/other/pcu-bb/agch0400.txt

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