1981 ANNUAL PROGRESS REPORT

Fish Health Management
Project 3811

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Introduction

Fish health programs conducted by the Montana Department of Fish, Wildlife, and Parks are based at the State Fish Health Lab at Bluewater Springs Trout Hatchery at Bridger, Montana. Most diagnostic work is conducted either at the lab or in the field where a fish health inspection is conducted. All routine health certification lab work as well as some trouble shooting diagnostic work is conducted by the U.S. Fish and Wildlife Service Fish Disease Control Center (FDCC), Fort Morgan, Colorado. In addition, the Fish Cultural Development Center at Bozeman, Montana assisted with several fish health problems. Both of these labs provide valuable assistance whenever they can and their help is greatly appreciated.

Detection and prevention of disease and other health problems at the state's eight fish hatcheries is the primary responsibility of the fish health program in Montana. But fish health problems in wild populations are also of concern and are dealt with as they arise in order to help meet the ultimate mission of the fish health program which is to protect the fisheries resources of Montana and produce the best possible fish for Montana's fisheries.

1981 Fish Health Inspections

A total of 26 fish health inspections were conducted in 1981. Of these, 16 were conducted on hatchery fish and 10 were conducted on wild populations. In addition, fish health samples were collected from 36 high mountain lakes in the Beartooth Mountains (Table 2). The Beartooth material is formalin preserved and will be analyzed in 1982.

Broodstock inspections were conducted at each of the brood stations:

1. Yellowstone River Trout Hatchery (McBride Cutthroat Trout)
2. Murray Springs Trout Hatchery (Westslope Cutthroat Trout)
3. Jocko River Trout Hatchery (Rainbow Trout)

Other hatcheries visited this year were the Washoe Park Trout Hatchery, Anaconda; Big Springs Trout Hatchery, Lewistown; and, of course, Bluewater Springs Trout Hatchery. Refer to Table 1 for results of these inspections as well as for other locations inspected. Though many of these inspections were routine or involved only minor fish health problems, several situations are matters of special concern. Some of these situations are discussed in more detail below:

A. Yersinia ruckeri (ERM) discovered in Arlee rainbow trout.

Fish health samples were collected from rainbow trout broodstock at the Jocko River Trout Hatchery on August 12. These samples were sent to the FDCC, Fort Morgan for the lab analysis as part of the annual disease certification of the broodstock. Of the 60 cultures inoculated, Yersinia ruckeri, serotype 2 was isolated from one fish. Yersinia ruckeri is the bacterial pathogen that causes enteric redmouth disease (ERM) in fish, and it is one of the three bacteria we routinely test for during health certification testing. The Jocko River Hatchery, until this year, has had a disease-free history. This is the first time we have found ERM bacteria at any state hatchery, and even though the bacteria hasn't caused disease symptoms or mortality, it has resulted in several order cancellations for Arlee rainbow eggs that has put a black mark on the integrity of one of the finest rainbow trout broodstocks in the country.

Two serotypes of Yersinia ruckeri are presently known. Type 1 causes the much feared redmouth disease that has claimed heavy mortality in fish hatcheries of the Western U.S., particularly Idaho. The type isolated at Arlee, type 2, has been found to be much less virulent and has not resulted in mortality. My assessment of this situation is; Yersinia ruckeri, type 2 is present at Arlee in very low numbers - enteric redmouth disease is not present. After reassurances by several fish health experts from Fort Morgan (FDCC) and Bozeman (FCDC) the decision was made to continue normal hatchery and spawning operations at Arlee. However, because ERM is on the list of certifiable pathogens of the U.S. Fish and Wildlife Service, the federal government cancelled its egg orders for this year, leaving many thousands of eggs homeless.

During the past two years we have been collecting cultures from lower gut tissue rather than the kidney, which was used previously. It's possible that ERM bacteria has been present in lower guts of fish at Arlee for years, but hasn't been discovered until we looked at gut material. The harder we look the more accurate we will be determining which pathogens are present, and I feel this is only the first discovery of Yersinia ruckeri in our hatchery stock. It was quite likely we will discover it in other hatcheries as well. So what do we do about it?

1. The incidence of ERM is on the rise. It is being discovered in more fish populations all the time and is certainly more widespread than we ever realized before. We will have to develop a policy pertaining to Yersinia ruckeri (specifically type 2) and live with it. We have already potentially spread the bug to all of our major production hatcheries and all waters where fish originating from Arlee were planted.

2. Jim Crepeau, manager of the Jocko River Trout Hatchery, initiated an erythromycin water hardening program for eggs taken at Arlee. This measure should help curb the spread of the pathogen in the egg. Erythromycin is an antibiotic that has worked well to eliminate bacterial kidney disease (BKD) from Yellowstone cutthroat eggs as the Yellowstone River Trout Hatchery. BKD is

known to be egg transmitted. Even though there is no evidence that Yersinia ruckeri is egg transmitted, use of erythromycin was a good move by the Arlee crew and may help eliminate the bug from the station.

3. Our first responsibility is to the fisheries of Montana. I feel type 2 Yersinia ruckeri is a situation we can live with now that we know we have it. We will continue to routinely check for Yersinia ruckeri in all fish populations and it will be one of the first considerations in any trouble shooting situation. Other states or agencies will have to make their own decisions whether they want Arlee eggs or not. Our responsibility will be to inform them of the presence of Yersinia ruckeri until such time that we again achieve a disease-free status at Arlee.

4. I intend to discuss the possibility of collecting health samples from any daily mortalities at Arlee with Jim Crepeau. Dead or moribund fish are more likely sources of pathogens than routine samples collected during certification.

B. Yersinia ruckeri discovered in Montana golden trout.

On July 1 fish health samples were collected from golden trout at Sylvan Lake during a spawning operation that resulted in the collection of 76,000 eggs. Eighteen cultures were collected and sent to the FDCC, Fort Morgan for lab analysis. Lab results revealed the following:

Yersinia ruckeri, type 1	3 fish
Yersinia ruckeri, type 2	11 fish
Yersinia ruckeri, type 1 and 2	1 fish

Since the golden trout eggs were to be taken from a wild population to the Yellowstone River Trout Hatchery and because we had no disease history on Sylvan Lake we took every precaution to eliminate the spread of a pathogen, even though at that time we were unaware of the bacteria in the Sylvan Lake population. Precautions included:

1. Water hardening eggs in 3 p.p.m. erythromycin.
2. Disinfecting eggs with betadine upon arrival at the hatchery.

These two measures are now routine in our hatchery system. Because these measures were taken we are hopeful that any ERM bacteria in or on the eggs was destroyed and we decided to keep the eggs rather than destroy them. The eggs were moved from the Yellowstone River Hatchery to avoid contamination of the McBride cutthroat brood, and taken to the Washoe Park Hatchery. The eggs hatched at Anaconda and after a bout with Hexamita and some nutritional problems are doing very well. As of December 1 they were 326-354 per pound and inventoried at 35,000 fish.

On September 15 a series of tests were conducted to determine if ERM bacteria could be isolated from these fish. They were 2100/pound at that time, which may be too small to give conclusive results. They will be sampled again in the spring before planting. The samples col-

lected in September were analyzed at three different labs. Results were all the same:

State Lab - Bridger	negative for ERM
FDCC, Fort Morgan	negative for ERM
*University of Idaho	negative for ERM

*University of Idaho testing conducted by Dr. G. W. Klontz.

Discovery of ERM bacteria among the Sylvan Lake golden trout prompted regional fisheries biologist from Red Lodge, Pat Marcuson, to embark on a survey of all golden trout populations in Montana in a search to locate a disease-free source of golden trout eggs for future use. Pat collected health samples from eight golden trout populations (including Sylvan Lake). ERM bacteria was isolated in six of the eight populations (Table 3). No ERM pathogens were isolated from Blue Danube Lake or Lower Lightning Lake.

At this point, it looks like Lower Lightning Lake is the best source of healthy golden trout eggs. However, access to Lower Lightning is much more difficult than Sylvan Lake. Also, the stock in Lightning Lake originally came from Sylvan Lake. I feel we should very actively follow the progress of the Sylvan Lake fish now being held at Anaconda. Constant health monitoring now and after they are planted will give us an idea how successfully we can attain a disease-free stock from infected parents. In regard to the Lightning Lake sample, it must be remembered that just because no pathogens were found during testing doesn't mean the bug isn't there - it just means it wasn't discovered at this time.

C. Nitrogen supersaturation at Bluewater Springs.

The possibility of excessive nitrogen supersaturation at the Bluewater Springs Trout Hatchery was discovered this year. A lot of brown trout received at the hatchery December 4, 1980 first brought the condition to light. Several minor infections plagued these fish constantly while at the hatchery. Bacterial gill disease, Costia, and a bacterial interitis were among the conditions afflicting these constantly ailing fish. Various treatments were given but fish continued weak and constant mortality was experienced until the fish were planted June 3. On March 11 several formalin preserved fish were sent to Fort Morgan for examination. On March 13, Rex Flagg, FDCC, reported that he had discovered fine bubbles in the gill tissue, lateral line and hearts of fish examined. This suggested the possibility of gas bubble disease, and on April 3 saturometer readings were taken at the hatchery which confirmed presence of gas supersaturation.

Location	Dissolved Oxygen	Total Gas Saturation	% Nitrogen Saturation
Bluewater Spring	2.5 mg/L.	103.5%	124%
Pond #6 (pond containing brown trout)	6.0 mg/L.	103.8%	114%

The high levels of dissolved nitrogen is felt to have kept the fish under constant stress. When the gas bubbles themselves did not do the fish in, the gas supersaturation weakened the fish to the point that other complications set in often resulting in death.

Recent research being conducted at the FDCC has revealed that marginal gas supersaturation may be much more of a stress factor than previously suspected. Marginal nitrogen supersaturation may often result in soreback or tailrot conditions, the cause of which has quite often been unexplained until recently. This particular side effect of nitrogen supersaturation is particularly interesting with the Bluewater situation because, though rainbow trout do very well at Bluewater, there quite often exists a soreback situation at the hatchery, especially among the larger production fish. The cause of the soreback at Bluewater has never been pinned down, and nitrogen supersaturation may be the culprit.

In November a Packed Column Degasser Unit was built and installed at the head of one raceway (Pond #9) at Bluewater. Construction of the unit was described by David E. Owsley, Dworshak National Fish Hatchery ("Nitrogen Gas Removal Using Packed Columns," 1979). The units consist of two 5-foot pieces of 10-inch PVC pipe filled with "koch" plastic rings. Incoming water runs through the koch rings and becomes denitrogenated and oxygenated as it enters the pond.

Saturometer testing has not been completed yet to determine how effectively nitrogen is being removed. However, dissolved oxygen has increased considerably. This benefit alone makes the packed column worthwhile for Bluewater. Considerable water testing is planned for 1982. If the packed column works well enough, others may be built for the other raceways at Bluewater. Oxygen was tested with a Hach kit. Preliminary results of dissolved oxygen in pond #9 with packed column and pond #10 without packed column were:

	Dissolved Oxygen Readings		
Pond number	November 20	November 23	December 8
9, Packed Column	8.5 mg/L	8.4 mg/L	8.2 mg/L
10, (Control); no column	6.6 mg/L	6.4 mg/L	6.6 mg/L

D. Nutrition.

Several nutrition related problems occurred at various hatcheries this year. Nutrition continues to be an area we have very little knowledge of in Montana. It is also an area we have very little control over. We rely very heavily on the quality of the commercially prepared diets we obtain from Silver Cup and Rangen's, Inc. If one feed doesn't perform we have the option of going to the other. One of the best things we can do for our fish in the area of nutrition is to feed the freshest feed we possibly can. This requires timely feed orders and accurate food requirement calculations. Nutrition related concerns this year included:

1. Murray Springs Trout Hatchery. Westslope cutthroat trout fry experienced mortality this spring due to nutritional deficiencies. Fish on Silver Cup feed experienced the greater loss. Another

product, Biodiet, was attempted and also resulted in nutritional problems. Charlie Smith, FCDC, examined these fish and found degeneration of liver cells. He suggested the feeding of liver, which helped remedy the situation. Hexamita was also a contributing problem with these fish.

2. Washoe Park Trout Hatchery. Golden trout experienced similar nutrition related problems to the westslope at Murray Springs. Liver fed to these fish also very much helped improve the situation. Hexamita was experienced in the golden trout along with their nutritional problems. Nutritional problems and Hexamita often go together and it's hard to define which problem started first, but they no doubt contribute to each other.

3. Yellowstone River Trout Hatchery. McBride cutthroat fry at Big Timber were examined in May and found to be suffering from a case of "dirty gill". Gills were swollen, mucous covered, and filled with debris clinging to gill filaments. These fish were on salmon mash prior to developing symptoms. I believe the salmon mash to be a predisposing factor. Mash is so fine that it may irritate gills, causing mucous secretion and gill swelling. A salt bath seemed to help these fish, and they improved after several days on a larger starter feed.

Other projects and concerns

Fisheries managers and fish culturists are discovering more and more that each of their fishery disciplines compliments the other. Fisheries managers need specific fish for specific fisheries and with the help of the hatcheries the right fish can be obtained to do the job. And it seems that what ever is asked of the hatcheries, they produce. Fish health management operations are geared to be a part of the whole operation. This year, aside from normal fish health projects, we became involved in other projects:

1. Broodstock committee: The broodstock committee got off to a good start in 1981. With consideration of wild broodstocks and use of hatchery rearing facilities, the committee is taking time to consider fish health concerns. I think all of the committee members realize the importance of taking precautions for fish health as we expand and develop our broodstock potential. Two specific areas of fish health protection have been considered and will continue to be studied in 1982:

   a. An isolation incubation area - preliminary discussion on this subject has resulted in selection of the Washoe Park Trout Hatchery for location of this facility. It will be designed to receive any eggs collected from wild sources. Eggs will be taken to the isolation area for eye-up while disease testing is being completed.

   b. Department fish health policy - I am currently preparing an outline of a policy to cover fish health concerns for our department. I feel a set policy should be established to deal with potential

fish health problems as well as the routine handling of both domestic and wild broodstocks, eggs, and fish. I will not outline this policy now as I am still seeking input from the broodstock committee and other fisheries experts.

One thing that will be addressed in the fish health policy is the shipping of eggs to one of our hatcheries. Two times in 1981 we placed our McBride cutthroat broodstock at the Yellowstone River Hatchery in jeapordy:

First time: Golden trout eggs shipped to the hatchery later were found to have come from parents carrying Yersinia ruckeri.

Second time: Lake trout eggs shipped to the hatchery came from a stock found to have BKD bacteria.

I seriously doubt if either pathogen infected the hatchery, but the risk was avoidable by use of an isolation area. This concern will receive priority in 1982.

2. Tetracycline marking. The tetracycline marking study continued this year and we are beginning to see some good results. Initial study proposals, goals, and methods were described in a progress report; Tetracycline Marking Progress Report, Bruce Chaney and Jim Peterson, 1979. A summary of 1981 results is also written up in a report to be presented to the annual Montana Chapter of the American Fisheries Society meeting to be held in Lewistown in February, 1982.

One lot of rainbow trout was marked on three different dates this year. Several of these fish are being held at the Bluewater Springs Hatchery in an outdoor dirt raceway (No. 17). These fish will be held until they die of "old age". Mark examinations will be conducted monthly to check on progress of mark retention.

Summary of 1981 experimental markings at Bluewater:

Mark Dates	No. Fish Per Pound	Initial Mark Success	To-Date Longevity of Mark	Comments
Oct. 20-29, 1980	884/lb.	100% - very good marks	1 month - rapid bleaching of marks	Marked outdoors
Dec. 3-8, 1980	60.6/lb.	100% - very good marks	1 year; good marks to present	anterior ribs have best marks
March 9-15, 1981	9.6/lb.	100% - very good marks	9 months; good marks to present	nice marks retained - double marks questionable

The rainbow marked at Bluewater are holding marks very well. Ribs and vertebra are the best bones to find good marks in. The October, 1980 marks were lost after about a month but the other two marks have held. Double marks are evident in some fish but not in all of those that were marked twice. However, I am confident that good double marks can be obtained if larger size fish are marked and care is taken during tetracycline feeding to insure good marks. We feel that the best tetracycline marks will be obtained when using fish 100 or less per pound. And fish 50 or less are preferable.

Both westslope and Yellowstone cutthroat trout were also marked this year. The westslope were marked at the Murray Springs Trout Hatchery. Initial marks obtained on these fish were only fair, and although none of these fish have been examined from the wild, I feel these marks may be difficult to see as these fish grow older. The Yellowstone cutthroat marked at Bluewater and the Yellowstone River Hatchery had excellent initial mark success. Several of these fish were examined in December (three months after marking) and found to have retained very good marks. Several of these are being held indoors at Big Timber as contols to check mark retention. The rest were planted into Hebgen Lake. Cutthroat collected from Hebgen will be collected and examined next year. Comparison to marked controls and unmarked fish will help us determine the usefulness of tetracycline for marking fish as a fisheries management tool in Montana.

A fluorescent vertical illuminator has been requisitioned for use with our lab microscope for mark identification. Primary use of the illuminator will be bacterial pathogen identification, but it may prove valuable for accurate tetracycline mark identification.

3. Fish health in the high mountain lakes of the Beartooths. Fish health samples were collected from fish in 36 lakes in the Beartooth Mountains (Table 2). Samples consisted mostly of formalin preserved lower intestine, kidney, or testi. Bacterial cultures were collected from a few lakes and specific tissues were taken from lakes where particular fish health pathogens were suspected to be present. Most samples were collected by Pat Marcuson or members of his summer crew and all were taken by gill net from fish sampled for routine population studies. (Note: Fish sacrificed by regional project biologists for population studies provided an excellent source of fish health tissues, and samples collected from these fish allow us to make more efficient use of fish which had to be sacrificed for other scientific work anyway.)

One of the primary objectives of this study is to determine if BKD bacteria are present in any of these fish populations. All of the lakes sampled were stocked with cutthroat trout from the Yellowstone River Trout Hatchery. Many of the lakes were stocked with fish that are known to have come from BKD infected stock. Plants were made prior to the discovery of kidney disease at Big Timber and many were made during the years when BKD was known to exist. BKD was discovered at Big Timber in 1976 although I greatly suspect it was present for many years prior to 1976. My objective is to examine these samples for BKD and attempt to make comparisons between known stocking

dates and the incidence of BKD. BKD is known to be egg transmitted, therefore, fish from infected parents very likely were also infected. However, since 1978 all fish spawned at Big Timber have been water hardened in erythromycin. I am hopeful this study will reveal some information as to the effectiveness of erythromycin and to the survival of BKD infected fish in the wild.

The best method of examining these tissues is by use of the fluorescent antibody technique. This technique requires sophisticated staining techniques and examination of prepared slides with a fluorescent microscope. We have requisitioned a vertial fluorescent illuminator for adaptation to our own microscope. But as of this date no definite word has been received as to whether or not we will be able to purchase the illuminator. Definite BKD diagnosis is very difficult without this unit. All samples are inventoried and preserved, and will be saved until we get the illuminator or a decision is made not to buy it. The old method of BKD identification is by use of Gram's stain. This method is very insensitive to minor BKD infections and can not be used to confirm presence of BKD. However, if many BKD cells are present we can use Gram stains to identify it. The tissue must then be sent to Fort Morgan for confirmation with the fluorescent antibody technique.

Fish tissues from six of the 36 lakes samples have been examined. The remaining 30 lake's samples will be examined in 1982. Lakes examined so far are:

Name of Lake	Results
Hellroaring Lake #18	BKD negative
Moon Lake	BKD positive, one 9-year-old fish
Line Lake	BKD negative
Margaret Lake	BKD negative
Lake Abundance	BKD negative
Cloverleaf Lake #215	BKD negative

Tissues from these lakes were examined by Gram stain methods. Cloverleaf Lake and Moon Lake samples were sent to Fort Morgan for fluorescent antibody testing. BKD was observed in one Moon Lake sample using Gram stain, but could not be confirmed. However, Fort Morgan was able to confirm presence of BKD bacteria, Renibacterium salmoninarum (ref: Fort Morgan case number 81-194).

The BKD organisms isolated from the Moon Lake tissues came from a cutthroat trout stocked from Big Timber in 1972. The organisms were isolated from the kidney.

This study will continue in 1982. At this time it is too early to draw any conclusions from the six lakes samples so far.

Correction:

The 1981 fish health progress report stated that Achtheres (gill copepod) was found on fish from Kain Pond and Barnett Pond near Red Lodge. I have since examined fish at Kain Pond and I now believe them to be Salmincola. Achtheres and Salmincola are very closely related and similar in appearance.

Table 1:

Inspection Date	Location & Specie	Type of Inspection	Observations	Diagnosis	Remarks
Jan. 22	Lake Inez westslope cutthroat	Observation from photo slide	External black spots on fish caught in lake	"black spot" disease (encysted trematodes)	Fish caught by angler hook and line. Photo slide sent to lab for comment.
Jan. 26	Bluewater Springs SFH Brown Trout	Lab exam	Gills swollen, increased & constant mortality	Gill bacteria costia	Fish are weak and very susceptive to minor infections. Constant mortality indicates a chronic disorder - unidentified to date. Hyamine, formaline, salt bath, TM-50 given at various times from 1/24 to 3/17.
Feb. 13	Yellowstone River SFH McBride cutthroat	Lab exam of micro slide from daily mortalities	White lines in kidney, fluid in body cavity	Nephrocalcinosis	Slides collected from daily mortalities (11/14/80 to 1/13/81). All slides negative for BKD.
March 13	Bluewater Springs SFH Brown trout	Lab exam, fish also sent to Fort Morgan	Continued mortality, Fort Morgan reports fine bubbles in gills & lateral line	Environmental, marginal nitrogen gas bubble disease	Fort Morgan suggested gas supersaturation may be at fault. Gas measurements revealed 124% nitrogen supersaturation of spring.
March 24, 25	Yellowstone River SFH McBride cutthroat	Routine annual broodstock certification	Fish look good		Negative for all pathogens.
April 15	Murray Springs SFH Westslope ct.	Routine annual broodstock certification	Some nephrocalcinosis observed		Negative for all pathogens.
April 18	Harold Ude private pond Rainbow trout	On-site trouble shooting	Increased mortality	Tapeworms; Eubothrium salvelini	Mortality related to spring stress factors.
May 12	Yellowstone River SFH McBride ct fry	On-site trouble shooting	Fish swimming on side, very low mortality	Dirty gills, some gill bacteria	Salt bath seemed to help. Dirty gills may be result of salmon mash diet, discontinue mash.

Table 1 (continued)

Inspection Date	Location & Specie	Type of Inspection	Observations	Diagnosis	Remarks
May 19	Red Rock Cr. Grayling	On-site Samples to Fort Morgan	Nice fish		Negative for all pathogens.
May 20	Yellowstone River SFH McBride ct fry	On-site trouble shooting	Much gill swelling, ride high in water	Formalin and salmon mash irritation	Formalin was used to treat fish for gyro, this probably irritated gills. Recommend withhold salmon mash and all chemical treatments.
May 21	Elk Lake (Red Rocks) McBride ct	Lab exam of formalin preserved tissue	Gram stain only	Negative for bacterial pathogens	
June 12	Deadmans Basin Rainbow trout	Lab exam	External lesions		Fish rotted before examination, diagnosis impossible.
July 1	Sylvan Lake Golden trout	Samples collected on-site, sent to Fort Morgan	Spawning populations	ERM 4-Ty. 1 11-Ty. 2	Eggs collected were taken to Big Timber initially, recommended remove eggs to Washoe Park SFH, test fry for ERM
July 6	Big Springs SFH Rainbow trout	On-site routine	Minor mortality	Hexamita	No treatment at this time, observe (Hexamita is common at Lewistown.
July 8	Murray Springs SFH Westslope ct fry	On-site trouble shooting	Increased mortality (200-400/day)	Nutritional deficiencies	Start fish on liver, most mortality noted among fish fed Silver Cup. Consider other diet possibilities including Biodiet and Rangens.
July 8	Reedenberg private hatchery (Eureka) rainbow trout	Lab exam	Gill swelling	External protozoans, Aeromonas isolated from gut	Examination for information to hatchery manager only, no recommendations offered.
July 9	Washoe Park SFH Westslope ct	On-site trouble shooting	Increased mortality, pin heads evident	Aeromonas hydrophylla septicemia	TM 50 for 10 days
July 18	Anaconda Co. Bioassay unit Nye, Mt rainbow trout	Lab exam	Frozen fish brought to lab	Death most likely due to pump outage	Power loss caused pump to quit - no fresh water to tanks, death followed.

Table 1 (continued)

Inspection Date	Location & Specie	Type of Inspections	Observations	Diagnosis	Remarks
Aug. 11	Island, Hart, Crescent lakes golden trout	Routine samples collected, sent to Fort Morgan	Nice fish	ERM, Ty. 2 in 15 of 60 fish sampled	All golden trout populations in Montana will be sampled for presence of pathogens, specifically ERM
Aug. 12	Jocko River SFH rainbow trout	Routine annual broodstock certification		ERM, Ty. 2 (1 fish out of 60) Fort Morgan	Yersinia ruckeri, Ty. 2 (ERM) is not as virulent as Ty. 1, no mortality observed. Montana will plant fish as usual.
Aug. 21	Kain Pond (Red Lodge) rainbow trout	On-site trouble shooting	Some mortality tapeworms observed	1. adult tapeworms Eubethrium salvelini 2. adult trematodes 3. Salmineola	Heavy parasite load resulting in degenerated condition. Di-N-butyl tin oxide at .3% for three days for tapeworms.
Sept. 15	Washoe Park SFH Willow Creek rainbow trout	On-site routine			No pathogens observed.
Sept. 15	Washoe Park SFH golden trout	On-site ERM cultures only		Negative for ERM	Tissues observed in three labs: 1. U of Idaho - negative ERM 2. Mont. fish health lab - neg. ERM 3. Fort Morgan - negative ERM
Sept. 18	Yellowstone River SFH McBride ct brood	Lab exam of micro slides		No pathogens observed	Slides were taken from daily mortalities from 5/1/81 - 8/31/81. (12 fish)
Oct. 29	Washoe Park SFH golden trout	On-site trouble shooting	Pin heads; mortality to 100-200 per day	Hexamita nutritional deficiencies	Epsom salts, 3%-3days, C. Smith, FCDC, observed nutritional disorders histopathologically. Liver in diet to improve nutrition, secondary Pseudomonas infection also observed.
Nov. 30	Bluewater Springs SFH rainbow trout	On-site trouble shooting	Frayed fins, swollen gills scoleosis	Nutritional imbalance, secondary motile Aeromonas infection	Fish were inventoried and split, feed was adjusted. Fish had been on Silver Cup until just prior to outbreak, then switched to Rangen.

Table 1 (continued)

Inspection Date	Location & Specie	Type of Inspections	Observations	Diagnosis	Remarks
Dec. 17	Yellowstone River SFH McBride ct. 1-year-old brood	On-site trouble shooting	Fish flashing	No pathogens observed	Negative for BKD.

Table 2:

List of Beartooth Mountain Lakes from which fish health samples were collected in 1981.

Hellroaring Lake #18
Moon Lake
Line Lake
Margaret Lake
Lake Abundance
Kookoo Lake
Marker Lake
Bowback Lake
Storm Lake
Avalanche Lake
Mountain Goat Lake
Mountain Sheep Lake
Triangle Lake (Main Fork Rock Creek)
Emerald Lake (Rock Creek)
Dude Lake
Cloverleaf Lake #223
Jasper Lake
Golden Lake
Albino Lake
Arch Lake
Lower Arch Lake
Cloverleaf Lake #215
Turgulse Lake
Froze to Death Lake
Upper Aero Lake
Leaky Raft Lake
Lake of the Winds
Lake of the Clouds
Fox Lake
Echo Lake
Fossil Lake
Bridge Lake
Blue Lake
Blacktail Lake
Triangle Lake (West Fork Rock Creek)
Ram Lake

Table 3

Summary of feral golden trout, and co-inhabiting species, sampled by Montana Department of Fish, Wildlife and Parks personnel from nine lakes during the period July-September 1981.

Table compiled by Fish Disease Control Center, Fort Morgan, Colorado

Sample Site Collection Date	Species: Age (Yrs.)	Samples Collected (no. of fish)							Significant Organisms Isolated or Detected
		o.f.	K/S	TSA	fecal	arch	Sample No's.	CHN	
Sylvan Lake 07/01/81	GOT:3-4	25	20	18	20	20		1-181	Yersinia ruckeri serotype 1-3 fish; serotype 2-11 fish; serotypes 1&2-1 fish.
Hart-Crescent-Island Lakes 08/11/81	GOT:2+		60	60	60	60	1-60	1-206	Yersinia ruckeri serotype 2-15 fish.
Hidden Lake 08/17/81 08/ /81	CUT:5+ GOT:2+		4 18	4 18	4 18	4 18	151-154 121-138	1-209 1-226	None. Yersinia ruckeri serotype 2-3 fish.
Sawtooth Lake 08/19/81	GOT:2+		30	30	30	30	61-90	1-210	Yersinia ruckeri serotype 2-3 fish.
Upper Four-Mile Basin Creek Lake 08/22/81	GOT:4+ GOT:fry BKT:2+		2 3WF 5	2 5	2 5	2	91-92 95-99	1-214 1-214 1-214	None. None. Yersinia ruckeri serotype 2-1 fish.
Lower Lightning Lake 08/21/81	GOT:3+		30	30	30	29	181-211	1-215	None.
Golden Trout Lake 08/ /81	GOT:2+		30	29	30	30	200-229	1-224	Yersinia ruckeri serotype 2-3 fish.

Table 3 (continued)

Sample Site Collection Date	Species: Age (Yrs.)	Samples Collected (no. of fish)							Significant Organisms Isolated or Detected
		o.f.	K/S	TSA	fecal	arch	Sample No's.	CHN	
Blue Danube Lake 08/ /81	GOT:2+		1	1	1	1	230	1-225	None.
Sylvan Lake 09/02/81	GOT:3+		30	30	30	30	235-264	1-233	Yersinia ruckeri serotype 2-10 fish serotype 1-1 fish