The Ichthyogram

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◆ Fish Survival Research

Lake pH Survey and Short-Term Post-Stocking Survival Tests with Rainbow Trout in Utah

This summer several staff members at the Fisheries Experiment Station (FES) contributed to a field effort to evaluate the potential for stocking stress due to extreme pH conditions at various Utah lakes. Previous stocking history databases (1988-1992) were queried by computer to determine candidate lakes with extremes in pH. At five of these lakes, 96-hour survival tests were run using floating net pens (10 feet deep). One hundred fish were divided into two live cages. Water quality tests were conducted every two hours to determine diel fluctuations. While out in the field, measurements of nearby lakes or other potential candidate waters were also taken.

Survival tests were run in four lakes in the Uinta Mountains to look at possible effects of acid conditions on short-term post-stocking survival. Results for Moosehorn, Mirror, Browne, and Spirit Lakes revealed excellent survival rates over the four-day period (Table 1). However, water quality tests revealed pH levels (6.1 - 6.4) that were not nearly as low as the stocking records indicated for previous years (4.0 - 5.0). In any event, these tests showed that the catchable rainbow stocking program in these Utah lakes was highly successful this summer and the fish appear quite hardy.

For alkaline waters, only one lake has been tested so far. Survival tests were run at Mantua Reservoir using subcatchables from FES. Poor survival (61%) was associated with high pH (9.68) and temperature levels (21.9° C). Late in the season, Strawberry Reservoir was experiencing some trouble with high pH (9.4), but the pH had dropped to non-lethal levels (8.8) before a survival test could be initiated. No other lakes were found with high pH so tests will have to be continued next summer. The task will be to determine if certain years (possibly drought years) cause differences in lake pH levels or if the extreme pH values in the database represent results of faulty equipment.

To evaluate the second option, an evaluation was performed to test the accuracy of pocket pH meters which are routinely used on stocking trucks. The overall deviation from a standard electrode set-up was 0.144 pH units (Table 2, page 4). Overall, the Pocket Pal performed well except in some of the Uinta Lakes with very soft waters (<6 mg/L). However, the Pocket Pal had to be calibrated at least once a

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◆ Fish Survival Research

Inshore vs. Offshore pH Measurements: How Close Are They?

When fish are stocked by the Utah DWR, a stocking slip is generally filled out, documenting numbers, size, and specie of fish. Water quality information is also collected, including pH and temperature. The question arises: Do the shore pH measurements accurately portray the conditions the fish will experience?

During the summer of 1993 rainbow trout were stocked into live cages to determine if any post-stocking mortality occurred and how it related to the water quality of the lake or reservoir (see related article in this issue). The pH of the inshore vs. offshore readings are summarized in table 1 (page 3).

The data indicate that there was little difference between offshore and inshore readings: the maximum difference was only 0.18 pH units. The difference varied such that the highest pH value was not consistently inshore or offshore. Most of the lakes sampled this year were relatively pristine with little shoreline vegetation which might bias the sample by consuming CO_2 and increasing pH. However, Mantua Reservoir had a large portion of the reservoir growing lush beds of the submergent aquatic plant *Ceratophyllum*, yet the pH at the boat ramp shore differed by only 0.03 pH units from values taken near the live cages.

Contrary to these results, C.B. Phillips (1927 Ecol. 8:73) found that pH was higher closer to shore in a Minnesota lake. Those measurements were made over mats of filamentous algae

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Recent and Fort-coming Publications from FES

Bosakowski, T. and E.J. Wagner. Assessment of fin erosion by comparison of relative fin length in hatchery and wild trout in Utah. **Canadian J. Fisheries and Aquatic Sciences**, in press.

Bosakowski, T. and E.J. Wagner. A survey of trout fin erosion, water quality, and rearing conditions at state fish hatcheries in Utah. **J. World Aquaculture Society**, in press.

Dewey, D., and E.J. Wagner. 1993. Inexpensive polyvinyl chloride egg incubation jar. **Progressive Fish-Culturist** 55:207-209.

Wagner, E.J. and T. Bosakowski. Performance and behavior of rainbow trout reared in covered raceways. **Progressive Fish-Culturist**, in press.

Wagner, E.J., T. Bosakowski, and S.A. Miller. Evaluation of the absorption efficiency of the low head oxygenation system. **Aquacultural Engineering**, in press.

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day with pH 7.0 buffer because nearly every day considerable drifting was observed. (To calibrate: just dip the pen directly into a wide-mouth bottle of buffer and gently stir. If the reading is off, there is a calibration screw on back which can be turned with a mini screwdriver to re-set the calibration back to 7.0). After about 3 months of heavy use, the pH pen finally broke down, but it was replaced free by the supplier because of the six-month warranty. Some of the newer models now offer a one-year guarantee, water-proof case, and temperature compensation for around $44.

In conclusion, the following management guidelines are suggested for stocking trucks until we have finished the study. 1) If pH is checked, the pH pen **must be calibrated just prior to each reading**!!!. Uncalibrated readings should not be permitted since they will continue to flaw the database and may cause a risky stocking. 2) Low alkalinity lakes (<6 mg/L) will probably require more sophisticated electrode systems, 3) If pH levels are below 5.0 or above 9.5 this will definitely cause some mortality, so the fish should be returned to the hatchery or have an alternate stocking location cleared in advance.

Tom Bosakowski

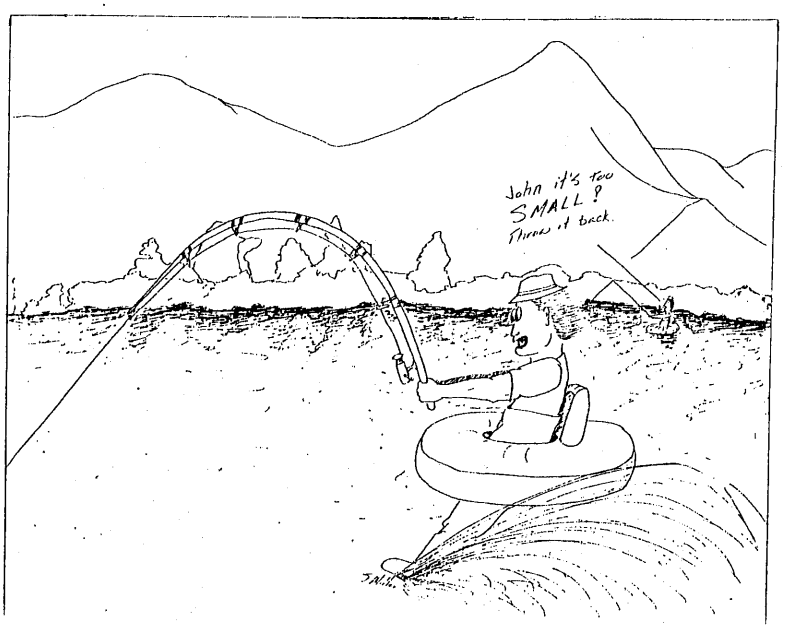
Table 1. Summary of Lake pH Survey Results and 96 Hour Survival Tests for Stocking Stress in Rainbow Trout

Lake	Date	Time	pH	Temperature (°C)	DO (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	96 hour survival**
Moosehorn	7/13-17/93	bi-hourly*	6.17-6.79	12.2-14.9	7.17-8.09	6.8	17.1	100%
Mirror	7/13-17/93	multiple*	6.14-6.73	13.6-14.8	7.87-8.33	6.8	6.8	99%
Pass	7/14/93	12:38	5.93	16.1	7.85	6.8	6.8	ND
Butterfly	7/15/93	10:30	5.78	15.9	8.31	6.8	6.8	ND
Teapot	7/16/93	08:30	6.38	14.3	7.69	6.8	6.8	ND
Washington	7/16/93	09:20	6.03	12.5	7.72	6.8	6.8	ND
Trial	7/16/93	09:45	6.17	13.4	8.03	6.8	6.8	ND
Lilly	7/13/93	3:00	6.1-6.2	ND	ND	6.8	6.8	ND
Lost	7/13/93	3:00	6.1-6.2	ND	ND	6.8	6.8	ND
Spirit	7/19-23/93	bi-hourly	6.79-7.41	11.2-14.0	7.85-8.54	17.1	13.6	97%
Browne	7/19-23/93	multiple	7.74-8.73	14.4-16.7	7.96-8.73	25.6	34.2	98%
Long Park Res.	7/21/93	07:50	7.36	13.5	7.88	ND	ND	ND
Sheep Creek Res.	7/22/93	07:35	8.36	14.2	7.54	54.4	13.6	ND
Jesson***	7/22/93	13:30	8.30	ND	ND	13.6	6.8	ND
First Dam-Logan	6/24/93	10:38	8.10	7.6	ND	ND	ND	ND
Hyrum	6/24/93	3:31	8.60	19.1	ND	ND	ND	ND
Wellsville	6/24/93	3:06	7.59	17.6	ND	ND	ND	ND
Newton	6/24/93	4:18	8.50-8.58	19.1-22.6	ND	ND	ND	ND
	8/3/93	4:34	8.69	23.9	ND	171.0	324.9	ND
Mantua	8/10/93	hourly	9.17-9.68	19.8-21.9	5.51-13.13	119.7	119.7	61%
Tony Grove	6/25/93	11:55	7.85	12.7	ND	ND	ND	ND
	8/16/93	2:45	8.93-9.06	18.7	12.3	136.8	136.8	ND
	8/27/93	12:00	9.00-9.10	17.8-18.1	ND	ND	ND	ND
Farmington Res.	8/31/93	11:25	8.13-8.23	19.9-20.2	8.27-8.59	ND	ND	ND
Strawberry Res.	9/29/93	5:40	9.43	15.0	10.8	ND	ND	ND

ND = not determined
* = range of water chemistries is reported
** 100 rainbow trout were stocked in net pens for each lake, 50 per each replicate net.
*** Hike-in lakes are not stocked with catchable rainbows, they receive aerial plants of fingerling brook trout

Table 2. Evaluation of Pocket Pal for Testing Lakes Stocked with Catchable Rainbow Trout

Lake	date	Orion pH Meter	Pocket Pal	Difference
Moosehorn	7/13/93	6.17	6.7	.53
Spirit	7/19/93	7.15	7.3	.15
	7/20/93	7.38	7.4	.02
	7/22/93	7.11	7.1	.10
Browne	7/19/93	8.37	8.4	.03
	7/20/93	8.66	8.6	.06
	7/21/93	8.30	8.3	0
	7/21/93	8.73	8.7	.03
	7/21/93	8.62	9.0	.38
	7/22/93	8.23	8.5	.27
Long Park Res.	7/21/93	7.36	7.3	.06
Sheep Creek Res.	7/22/93	8.36	8.2	.16
Wellsville	6/24/93	7.59	7.7	.11
Hyrum	6/24/93	8.60	8.7	.10
Newton	6/24/93	8.50	8.6	.10
	8/3/93	9.00	9.1	.10
First Dam-Logan	6/25/93	8.10	8.4	.30
Tony Grove	6/25/93	7.85	8.0	.15
Mantua	8/3/93	9.76	9.8	.04
Strawberry Res.	9/29/93	9.12	9.3	.18
			Mean =	0.144± 0.131



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where pH reached as high as 9.6. Clearly, measuring pH around algal mats or dense aquatic vegetation should be avoided when trying to get an accurate measurement. Wading in to get a measurement over a foot or two of water is also recommended.

Eric Wagner

Table 1. Comparison of surface pH measurements taken at the shoreline and offshore (water over 2 m deep) in 1993.

Water	Date	Time	Offshore	Inshore	pH diff.
Moosehorn L.,	7/13	1205	6.17	6.09	-0.08
		1400	6.20	6.38	0.18
		1605	6.24	6.27	0.03
		1800	6.48	6.31	-0.17
		2015	6.27	6.30	0.03
	7/01	1600	6.77	6.88	0.11
		1800	6.64	6.69	0.05
		2000	6.55	6.54	-0.01
	7/17	0555	6.28	6.38	0.10
		0748	6.44	6.36	-0.08
		0950	6.37	6.31	-0.06
Mirror L.	7/13	1100	6.29	6.14	-0.15
		1500	6.22	6.26	0.04
		1700	6.30	6.40	0.10
		1900	6.53	6.48	-0.05
Browne L.	7/19	1700	8.33	8.37	0.04
		1945	8.34	8.44	0.10
Spirit L.	7/19	1810	7.34	7.35	0.01
		2035	7.39	7.37	-0.02
	7/20	0600	7.23	7.11	-0.12
		0800	7.23	7.22	-0.01
		1000	7.21	7.27	0.06
		1400	7.28	7.23	-0.05
		1600	7.39	7.32	-0.07
		1800	7.41	7.38	-0.03
		2000	7.38	7.39	0.01
	7/21	0620	7.38	7.38	0.00
		0830	7.29	7.30	0.01
		1030	7.29	7.29	0.00
		1230	7.29	7.29	0.00
		1430	7.31	7.27	-0.04
		1630	7.33	7.35	0.02
		1830	7.30	7.32	0.02
		2030	7.33	7.35	0.02
	7/22	0615	7.22	7.11	-0.11
		0800	7.21	7.23	0.02
		1000	7.23	7.14	-0.09
		1200	7.23	7.27	0.04
		1400	7.21	7.24	0.03
		1600	7.26	7.24	-0.02
Mantua Res.	8/10	1445	9.60	9.63	0.03

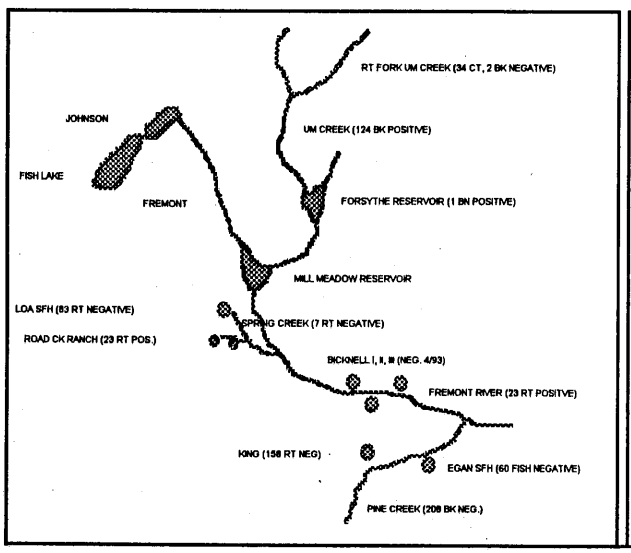
◆ Fish Health in Utah

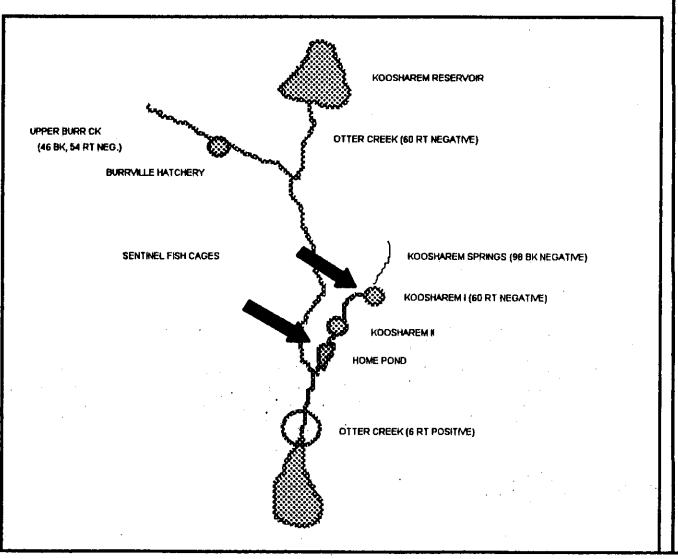
During August through October, UDWR biologists conducted another rotenone treatment of waters in southern Utah contaminated with *Myxobolus cerebralis*, the parasite causing whirling disease of salmonids. Fish were chemically eliminated from these waters again in an attempt to break the life cycle of the parasite by removing the fish host.

Biologists were disappointed to discover that a sizeable number of fish had escaped from adjacent fish culture facilities into the Fremont River system. A flash flood shortly before the treatments may have added to the escapees. Some private hatcheries in the area were reportedly flooded with river water in addition to losing the majority of their fish. Results of testing of fish obtained during the Fremont River drainage showed no new major trends. The right fork of UM Creek showed no positive fish after one year of treatment. However brook trout obtained below the confluence with the fishless left fork were still positive. Fish Lake and Johnson Reservoirs continue to test negative. The Bicknell Bottoms of the Fremont River had a few fish which tested positive. State hatcheries and private live trout growers continue to test negative. The entirety of Pine Creek was negative, despite an influx of escaped rainbow trout from private hatcheries and wild brook trout migrating from the headwaters.

In the Sevier River drainage, feral fish obtained from a previously positive area below Koosharem reservoir have tested negative. Six rainbow trout from the lower portion of the stream directly above Otter Creek Reservoir have tested positive for spores. Additional samples from the area are being sought to confirm the presence of the parasite by histopathology.

The arbitrary period of three years in a near fishless condition will be reached in the summer of 1994 in some areas of the Fremont River. Pathologists and fisheries biologists are drawing up final plans for placement of sentinel fish in strategic areas in 1994. Other biologic controls such as placement of nonsusceptible interspecies hybrids (tiger muskies, hybrid striped bass, triploid brake trout) are being tried or considered to provide public fishing opportunities in some of these waters. These efforts are part of the continuing effort to *control* the spread of the parasite and determine whether the life cycle interruption has been effective. Eradication of the parasite from the state was considered impossible by pathologists after the discovery of the parasite in northern Utah in January 1993.
Chris Wilson





◆ Passages

Budget Changes, Promotions Affect Experiment Station Personnel and Programs

The threat of budget cuts and employee promotions have greatly changed the makeup of personnel at the Fisheries Experiment Station. The new friendly voice on the phone belongs to **Lisa Morgan**, who has taken the position of office specialist vacated by Shirley Devenport. Lisa comes to Logan by way of Oregon and has 2 children.

Hatchery superintendant **Tim Miles** has been promoted to the position of assistant culture coordinator in Salt Lake City office, replacing Oscar Creer who recently retired. Tim made many improvements to the physical plant at FES. His expertise and experience will be greatly missed. **Doug Routledge**, acting superintendant at the Loa hatchery has been selected to replace him, effective November 15.

Wildlife Technician **Bart Burningham** has accepted a position with Wyoming Game & Fish at the Speece hatchery in Casper, Wyoming. Bart had to run the fish culture section of the station almost singlehandedly for the month prior to his departure and did an exceptional job. The emminent threat of a reduction in force played a major role in his decision to leave. Utah's loss is definitely Wyoming's gain! Interviews for Bart's replacement have not been conducted yet.

Dwight Aplanalp, Utah State University Coop student who was hired to care for the June Sucker project has accepted a position with Idaho Fish & Game at the Magic Valley hatchery at Twin Falls. The June Suckers have been noticeably depressed by his departure. **Curtis Knight**, a former technician at the DWR Wahweap facility, is occupying the position. Curtis has also done a great job in handling the culture facility solo since Bart Burningham left.

Finally, **Scott Miller**, a biologist (and cartoonist) working in a temporary position in the research department, was terminated in October as part of the first phase of budget reductions. Scott's absence has been a major loss and has resulted in slowdowns and reductions in the research projects. At the time of his departure, Scott had not found other employment.

The loss of the entire culture section has forced early stocking of several lots of fish in an effort to bring the work program in line with the available manpower. Research and Technical Services personnel are pitching in to help fill the gap.

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