Idaho Chapters
The Wildlife Society
and
American
Fisheries Society

Centennial Year Meeting
March 1 - 3, 1990
Boise, Idaho

Celebrate IDAHO
1890 • CENTENNIAL • 1990

JOINT MEETING OF THE
IDAHO CHAPTER OF THE WILDLIFE SOCIETY
AND THE
AMERICAN FISHERIES SOCIETY

AN ENDORSED IDAHO CENTENNIAL EVENT BY
THE LASTING LEGACY COMMITTEE

RED LION, DOWNTOWNER
BOISE, IDAHO
MARCH 1-3, 1990

TO 1990 AND BEYOND, PROVIDING PUBLIC SATISFACTION
IN FISH AND WILDLIFE MANAGEMENT

THURSDAY MORNING, MARCH 1
BALLROOM

7:20-8:20 REGISTRATION

8:20-8:30 Opening Remarks - **JACK CONNELLY, Idaho Chapter of the Wildlife Society and BERT BOWLER, Idaho Chapter of the American Fisheries Society**

SESSION 1 - When Were the Good Old Days? - MODERATOR: MIKE SCOTT, Idaho Cooperative Wildlife Research Unit, Moscow

8:30-8:55 Fish Resources and Management in Idaho, 1890-1990, the good old days? MONTE RICHARDS, Boise.

8:55-9:20 Wildlife Resources and Management in Idaho, 1890-1990, the good old days? MART MORACHE, Boise.

9:20-9:45 Fish and Wildlife Resources and Management in Idaho, 1990 and beyond, good days ahead?. JERRY CONLEY, Idaho Department of Fish and Game.

9:45-10:15 BREAK

SESSION 2 - Obtaining Public Input, What Does it Tell Us? - MODERATOR: BRUCE RIEMAN, Idaho Department of Fish and Game, Eagle

10:15-10:45 Results of elk, deer and shotgun hunting survey. WILLIAM J. MCLAUGHLIN, Department of Wildland Recreation Management, University of Idaho, Moscow.

10:45-11:15 Results of the Angler Opinion Survey. WILL REID, Idaho Department of Fish and Game, Boise.

11:15-11:35 Results of the Nongame Survey. CHUCK HARRIS, Department of Wildland Recreation Management, University of Idaho, Moscow.

11:35-1:00 LUNCH

SESSION 3 - Providing Public Satisfaction in Future Wildlife Management, Perspectives from Users - MODERATOR: KERRY REESE, University of Idaho, Moscow

1:00-1:10 A case for restricting access. BARRY GWIN, Boise.

1:10-1:20 A case for maintaining motorized access. ERNIE LOMBARD, Boise.

1:20-1:30 Maintaining opportunity for all users. GEORGE BENNETT, Boise.

1:30-1:40 Providing quality through restricting user participation. ED CHANEY, Boise.

1:40-1:50 A case for the nonconsumptive user. DR. CHUCK TROST, Pocatello.

SESSION 4 - Providing Public Satisfaction in Future Fisheries Management, Perspectives from Users - MODERATOR: RUSS THUROW, U.S. Forest Service, Boise.

1:50-2:00 A case for catch and release. CHRIS CORTE.

2:00-2:10 A case for maintaining harvest opportunity. BOB WAGEMAN, Twin Falls.

2:10-2:20 Providing quality through restricting participation. BARRY ROSS.

2:20-2:30 Maintaining opportunity for all users. GARY PEAK, Bellevue.

SESSION 5 - The 1990's and Beyond, the Public and Fish and Wildlife Management in Idaho - MODERATOR: JAY GORE, U.S. Fish and Wildlife Service, Boise.

2:30-2:50 The role of Health and Welfare in providing user satisfaction. JOE NAGEL, Idaho Department of Health and Welfare, Boise.

2:50-3:10 The role of the Forest Service in providing user satisfaction. JOHN ERICKSON, Boise National Forest, Boise.

3:10-3:40 BREAK

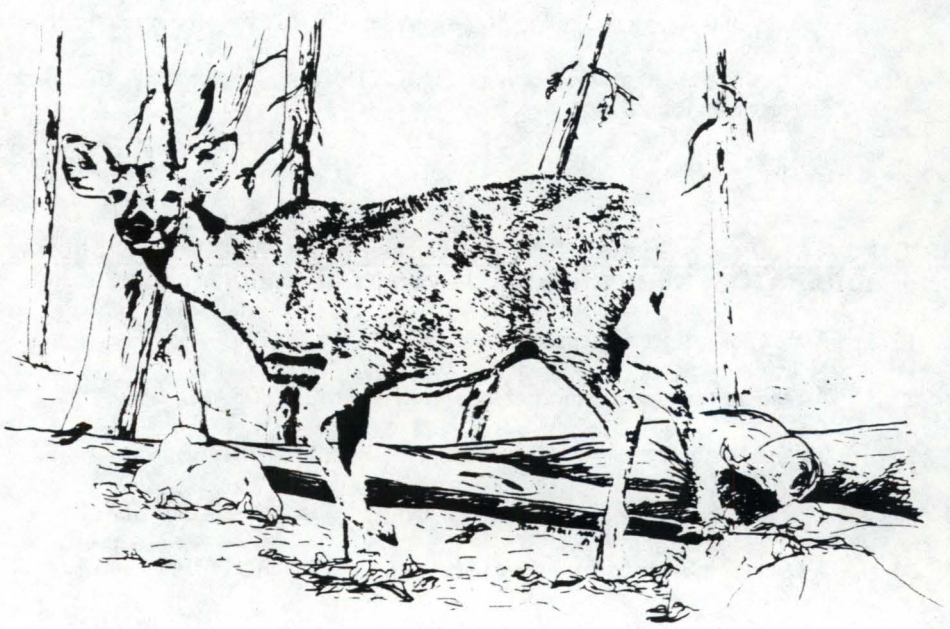
3:40-4:00 New public voices affecting future fish and wildlife management in Idaho. CAROL BACHELDER, Idaho Voice for Animals, Boise.

4:00-4:30 Incorporating the public in future fish and wildlife management in Idaho. JOHN FREEMUTH, Department of Political Science, Boise State University, Boise.

4:30-5:00 The role and need of the professional in future fish and wildlife management. HUEY JOHNSON, Resource Renewal Institute, Sausalito CA.

5:00-7:00 FREE TIME

7:00-12:00 SOCIAL MIXER IN BALLROOM. SEVERAL PROGRAMS INCLUDING NEW ELK MULTI-MEDIA PRESENTATION; THE WOLF, A HOWLING IN AMERICA'S NATIONAL PARKS (1989 RELEASE); CHIP CORSI PRODUCTIONS; AND SOME LOCAL MUSICAL TALENT.



FRIDAY, MARCH 2, 1990

FISHERIES TECHNICAL SESSION
TETON-SELWAY ROOM

SESSION A - MODERATOR: JOHN HEIMER, Idaho Department of Fish and Game, Pocatello.

8:00 Stream Sediment Inventory of the Little North Fork Clearwater River - JACK SKILLE, Idaho Department of Health and Welfare, Division of Environmental Quality, Coeur d'Alene

8:20 Protocols for Assessment of Dissolved Oxygen, Fine Sediment, and Salmonid Embryo Survival in an Artificial Redd - TIM BURTON, GEOF HARVEY, and MIKE HENRY, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

8:40 Adfluvial Westslope Cutthroat - Time to Pull the Plug? - NED HORNER, Idaho Department of Fish and Game, Coeur d'Alene

9:00 Effects of Temperature and Angling on Brown Trout and Rainbow Trout in the Firehole River, Yellowstone National Park, Wyoming - ED KOCH and JACK GRIFFITH, Idaho State University, Pocatello

9:20 Bull Trout Culture at Cabinet Gorge Hatchery - JOE CHAPMAN, Idaho Department of Fish and Game, Clark Fork

9:40 A Predator-Prey Bioenergetics Model for Bear Lake - LARRY LABOLLE, Pocatello and BRUCE RIEMAN, Eagle, Idaho Department of Fish and Game

10:00-10:20 Break

10:20 Two Views of Fish Populations and Implications to Problem Analysis - MELO MAIOLIE, Idaho Department of Fish and Game, Coeur d'Alene

10:40 Anglers, Attitudes, and Attorneys: A Case History of Conflicts in Resource Allocation - RUSS THUROW, U.S. Forest Service, Boise

11:00 Hatchery Fish - Nobody Likes 'Em Unless They Don't Have 'Em - MIKE LARKIN, Idaho Department of Fish and Game, Boise

11:20 Migration Rate-Discharge Relationships for Anadromous Smolts in Lower Granite Reservoir - ED BUETTNER, Idaho Department of Fish and Game, Lewiston

11:40-2:00 AFS Luncheon and Business Meeting

SESSION B - MODERATOR: LYNN FOSTER, CH_2M Hill

2:00 Spawning and Early Life History of White Sturgeon in the Columbia River Between Bonneville and McNary Dams - TEVIS UNDERWOOD and LANCE BECKMAN, U.S. Fish and Wildlife Service

2:20 The Role of Hatcheries in White Sturgeon Management in Idaho - KIM APPERSON, Coeur d'Alene; JACK SIPLE, Bonners Ferry; TIM COCHNAUER, Lewiston; Idaho Department of Fish and Game and TERRY PATTERSON, College of Southern Idaho, Twin Falls

3:40 Unique Aquatic Resources of the Snake River Plain - PAUL VALCARCE, Idaho Department of Fish and Game, Hailey

4:00 Winter Survival, Movement, and Cover Selection of Juvenile Rainbow Trout in the Henrys Fork of the Snake River - RON SMITH, Idaho State University, Pocatello

4:20 An Assessment of Winter Instream Flow Requirements for Salmon and Steelhead - MARK HILL, Chapman Consultants, Boise

4:40 Transect vs. Basinwide Inventory Procedures - A Comparison of Methods for Physically and Biologically Inventorying a Stream - TOM MENDENHALL, Nez Perce National Forest

5:00 Adjourn

6:00 Joint AFS/TWS Auction, Cash Bar, and Finger Foods

WILDLIFE TECHNICAL SESSION
BITTERROOT/SAWTOOTH ROOM

SESSION A - MODERATOR: JOHN ERICKSON, U.S. Forest Service, Boise

8:10-8:30 The distribution of amphibians and reptiles in Yellowstone National Park. E.D. KOCH and C.R. PETERSON, Department of Biological Sciences, Idaho State University, Pocatello.

8:30-8:50 A preliminary analysis of rock squirrel populations in southeast Idaho. R.S. BATTERTON and B.L. KELLER, Division of Biological Sciences, Idaho State University, Pocatello

8:50-9:10 A study of gray wolf history and status in the Cascade Mountains of Washington State. J. LAUFER, Washington Wolf Project, Olympia.

9:10-9:30 Taxonomy and distribution of the Idaho ground squirrel. E. YENSON, Department of Biology and Museum of Natural History, The College of Idaho, Caldwell.

9:30-9:50 Why is the northern Idaho ground squirrel so rare? A progress report. E. YENSON, Department of Biology and Museum of Natural History, The College of Idaho, Caldwell.

SESSION B - MODERATOR: SUE BRODERICK, Shoshone-Bannock Tribes, Ft. Hall

10:20-10:40 The goshawk: what is it telling us? M. MAJ, Targhee National Forest, Idaho Falls, and S. PATLA, Independent Consultant, Driggs.

10:40-11:00 Prey procurement time in prairie falcons in relation to prey abundance. A.M.A. HOLTHUIJZEN, Idaho Power Company, Environmental Affairs Department, Boise.

11:00-11:20 Three-year report on a long-term study of a population of American kestrels breeding in nest boxes. M. BECHARD, Raptor Research Center, Department of Biology, Boise State University, Boise.

11:20-11:40 Post-nesting movements of long-eared owls in southwest Idaho, part two. H. ULMSCHNEIDER, Raptor Research Center, Boise State University, Boise.

11:40-12:00 Factors affecting the distribution of wintering bald eagles in an urban area. R. SPAHR and M. BECHARD, Raptor Research Center, Department of Biology, Boise State University, Boise, and K. STEENHOF, Birds of Prey Research Project, Boise District, Bureau of Land Management, Boise.

12:00-1:30 LUNCH BREAK

SESSION C - MODERATOR: ALLAN ANSELL, Idaho Power Company, Boise

1:30-1:50 Trumpeter swan habitat improvement. G. WORDEN, Ashton Ranger District, Targhee National Forest, St. Anthony.

1:50-2:10 Elk habitat improvement. T. GELLAT, Island Park Ranger District, Targhee National Forest, St. Anthony.

2:10-2:30 Carp removal and duck breeding pair distribution at Bear Lake National Wildlife Refuge. S.H. BOUFFARD and G.L. DEUTSCHER, U.S. Fish and Wildlife Service, Pocatello.

2:30-2:50 A summary of Idaho's wildlife water developments and a report on wildlife use of guzzlers in southeastern Idaho. A. OGDEN, Idaho Department of Fish and Game, Boise.

2:50-3:20 BREAK

3:20-5:20 IDAHO CHAPTER BUSINESS MEETING

6:00-12:00 SOCIAL, HORS D'OEUVRES, AUCTION AND RAFFLE - IN CONJUNCTION WITH THE IDAHO CHAPTER OF THE AMERICAN FISHERIES SOCIETY

SATURDAY, MARCH 3, 1990

FISHERIES TECHNICAL SESSION
TETON/SELWAY ROOM

SESSION C - MODERATOR: MIKE ROWE, Shoshone-Bannock Tribes

8:00 Effects of Riparian Vegetation and Instream Cover Modification on Salmonids in a Second-Growth Forest of Southeast Alaska - ROBERT KEITH and TED BJORNN, Idaho Cooperative Fish and Wildlife Research Unit, Moscow

8:20 Contrasting Three Methods for Age and Growth Comparisons Using Largemouth Bass Scales - DOUG HATCH and DAVE BENNETT, Idaho Cooperative Fish and Wildlife Research Unit, Moscow

8:40 Kokanee in Lake Pend Oreille - On the Road to Recovery - ED BOWLES and BRIAN HOELSCHER, Idaho Department of Fish and Game, Coeur d'Alene

9:00 Otoliths - Lending an Ear to Science - BRIAN HOELSCHER and ED BOWLES, Idaho Department of Fish and Game, Coeur d'Alene

9:20 Aquaculture in Idaho and the World - ERNIE BRANNON, University of Idaho, Moscow

9:40 Lahontans - A Cutthroat with Teeth - RICK LOWELL, Idaho Department of Fish and Game, Nampa

10:00-
10:20 Break

SESSION D - MODERATOR: DAVE JENSON, Idaho Department of Health and Welfare, Division of Environmental Quality

10:20 Golden trout - Past, Present, and Future - BOB ESSELMAN, Idaho Department of Fish and Game, Hayspur

10:40 Evaluating Beneficial Use Support in the Rock Creek Rural Clean Water Program, 1981-1989, Twin Falls County - TERRY MARET, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

11:00 Opportunities for Improvement of Fisheries in Streams Impacted by Agricultural Activities - STEVE BAUER, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise and AL VAN VOOREN, Idaho Department of Fish and Game, Boise

11:20 After the Flood: Development and Implementation of the Teton River Fishery Enhancement Project - JODY BROSTRUM and MARK GAMBLIN, Idaho Department of Fish and Game, Idaho Falls

11:40 Implementing Idaho's Antidegradation Policy - BILL CLARK, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

12:00 Adjourn

WILDLIFE TECHNICAL SESSION
BITTERROOT/SAWTOOTH ROOM

SESSION D - MODERATOR: BRYAN PRIDGEON, U.S. Bureau of Reclamation, Burley

8:10-8:30 Habitat use and population densities of gray squirrels in South Alabama. RICHARD A. FISCHER, Department of Zoology and Wildlife Science, Alabama University, Auburn, Alabama, and NICHOLAS R. HOLLER, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, Alabama.

8:30-8:50 Seasonal habitat use and movements of sympatric female sage and sharp-tailed grouse in southeastern Idaho. A.D. APA and K.P. REESE, Wildlife Resources, University of Idaho, Moscow, and J.W. CONNELLY, JR., Idaho Department of Fish and Game, Pocatello.

8:50-9:10 Movements and habitat use of wintering sage grouse in southeastern Idaho. M.D. ROBERTSON and K.P. REESE, Wildlife Resources, University of Idaho, Moscow, and J.W. CONNELLY, JR., Idaho Department of Fish and Game, Pocatello.

9:10-9:30 Female Columbian sharp-tailed grouse in southeastern Idaho: seasonal movements, habitat use, and productivity. D.R. MEINTS and K.P. REESE, Department of Fish and Wildlife, University of Idaho, Moscow, and J.W. CONNELLY, JR., Idaho Department of Fish and Game, Pocatello.

9:30-9:50 Status of mountain quail in Idaho. M. ROBERTSON, A. OGDEN, and T. HEMKER, Idaho Department of Fish and Game, Boise.

9:50-10:20 BREAK

SESSION E - MODERATOR: STEVE SCHMIDT, Idaho Department of Fish and Game, Idaho Falls

10:20-10:40 Antelope utilization of lichens in the Birch Creek Valley of Idaho, an example of the value of biological diversity. A. THOMAS and R. ROSENTRETER, Bureau of Land Management, Boise.

10:40-11:00 Winter habitat selection of white-tailed deer in the Priest River drainage, north Idaho. G. PAULEY, Department of Wildlife Resources, University of Idaho, Moscow.

11:00-11:20 The use of artificially simulated animals (ASA) to apprehend wildlife law violators - Idaho 1989 results. L.C. JINDRICH and R.O. EVANS, Idaho Department of Fish and Game, McCall.

11:20-11:40 Measuring the activity patterns of free-ranging animals with radio-telemetry. M.J. McDONALD, C.R. PETERSON, A.J. VITALE, C.G. BROWN, V.A. COBB, and B.L. KELLER, Department of Biological Sciences, Idaho State University and Idaho Department of Fish and Game, Pocatello.

11:40-12:00 CLOSING REMARKS AND AWARDS

ABSTRACTS

FISHERIES TECHNICAL SESSION

STREAM SEDIMENT INVENTORY OF THE LITTLE NORTH FORK CLEARWATER RIVER - JACK SKILLE, Idaho Department of Health and Welfare, Division of Environmental Quality, Coeur d'Alene

The Little North Fork Clearwater River is a watershed of mixed land ownership made up of federal, state, and private forest lands. Much of the drainage has had extensive road building and logging over several years. There has been a growing concern that forest practice activities are increasing stream sediment and destroying fish habitat. Fish species in the river are predominantly westslope cutthroat and native rainbow. Kokanee trout from Dworshak Reservoir spawn in these streams.

In 1988 and 1989, the State Division of Environmental Quality measured sediment deposition in ten major tributaries and the Little North Fork Clearwater River. Study objectives were to determine baseline sediment levels and to monitor temporal changes in those levels.

A modified cobble embeddedness method was developed to measure instream sediment. An average of 18 samples (hoops) were measured at each stream reach. Cobble embeddedness in ten tributaries with varying amounts of roads and harvest ranged from 28 to 93 percent.

PROTOCOLS FOR ASSESSMENT OF DISSOLVED OXYGEN, FINE SEDIMENT, AND SALMONID EMBRYO SURVIVAL IN AN ARTIFICIAL REDD - TIM BURTON, GEOF HARVEY, and MIKE McHENRY, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

Salmonid spawning is a protected beneficial use of water quality in Idaho. Several nonpoint source activities cause accelerated sedimentation, which adversely effect salmonid spawning. An interim water quality criterion for intergravel dissolved oxygen has been developed to protect salmonid spawning. Validation of the interim criterion and the need for further data require methodologies for monitoring sediment effects, which develop data leading to more refined criteria.

A methodology for monitoring sediment impact has been developed. The techniques use intergravel dissolved oxygen, fine sediment, and salmonid embryo survival in artificial egg pockets. The technique permits measurement of the fine sediment infiltrating artificial egg pockets and the dissolved oxygen concentration in the gravels. These values are compared with egg survival and alevin escapement from the artificial egg pockets. Field testing of the methods on seven streams in Idaho have verified that the techniques are workable during different seasons and in different stream conditions.

Preliminary data analysis indicates that levels of fine sediment intrusion appear related to egg survival. Also, quantities of fine sediment found in substrate are related to watershed development. Streams studied in the Idaho batholith contained relatively coarser-textured intergravel fines, which resulted in little or no dissolved oxygen depression and, therefore, did not limit embryo development. Observed mortalities appeared to be the result of entrapment of alevins when fines were excessive. Streams in geologies which produce silt and clay-textured fines appeared to suppress intergravel oxygen concentrations and growth and survival of developing embryos.

ADFLUVIAL WESTSLOPE CUTTHROAT - TIME TO PULL THE PLUG? - NED HORNER, Idaho Department of Fish and Game, Coeur d'Alene

Indigenous populations of cutthroat trout provide fishery managers of the western United States unique management opportunities. Native cutthroat trout better utilize habitat they evolved in, are generally preferred by anglers over introduced species, and influence land use management through their elevated status of species of special concern. However, native cutthroat have been negatively affected by habitat loss and degradation, overharvest, and competition, predation, and hybridization from introduced exotic species.

Severely depressed populations of westslope cutthroat trout in northern Idaho waters have prompted the implementation of regionwide restrictive regulations. Fluvial populations in areas of good habitat and with catch-and-release regulations have responded well and are maintaining strong populations and excellent fisheries. A variety of other regulations and hatchery supplementation are being tried in an attempt to rebuild cutthroat populations and provide lake and river fishing opportunities for trout. Is it realistic to expect native cutthroat will meet angler expectations given the changes in habitat, species composition, increased angler effort, and changes in angler attitudes? Should fishery managers avoid other proactive fish management alternatives in an attempt to provide limited cutthroat fisheries? What constitutes an "acceptable" fishery? How would the loss of cutthroat populations influence habitat for all fish species through changes in land use management practices? Is it time to pull the plug?

EFFECTS OF TEMPERATURE AND ANGLING ON BROWN TROUT AND RAINBOW TROUT IN THE FIREHOLE RIVER, YELLOWSTONE NATIONAL PARK, WYOMING - ED KOCH and JACK GRIFFITH, Idaho State University, Pocatello

We measured the effects of water temperatures and angling on brown and rainbow trout in the Firehole River in Yellowstone National Park to assess whether either parameter has an effect on mortality of large (> 400mm in length) trout. We monitored angling pressure by creel survey, and fish behavior by snorkeling, in four test sections: a section open and a section closed to angling in both a coolwater reach and a warmwater reach.

Angling pressure was significantly greater in 1989 (38,000 angler hours) than in 1988 (12,000 angler hours), but in both years there was no observed effect of angling on trout in either reach. Warm summertime water temperatures was the overriding influence governing fish behavior. During midsummer, almost all fish from the lower, warmwater reach migrated 6-9 km upstream to the coolwater reach and tributaries above, with fish movement in the drought of 1988 occurring earlier and more extensively than in 1989. Growth appears to be limited by high water temperatures inhibiting growth of larger fish, perhaps combined with the fact that there are no large prey items available (i.e. sculpin).

BULL TROUT PRODUCTION AT CABINET GORGE HATCHERY - JOE CHAPMAN, Idaho Department of Fish and Game, Clark Fork

Cabinet Gorge Hatchery has been selected as a site to trap, spawn, and rear bull trout (Savelinus confluentus) and provide fingerlings to fisheries managers for reestablishment or enhancement of declining bull trout populations in Idaho.

In 1989, over 47,000 bull trout eggs were collected from parents in the Clark Fork River and Gold Creek, a tributary of Lake Pend Oreille. Problems associated with the culture of bull trout include: unwillingness of adults to enter trap, decrease in sperm production while in captivity, intolerable water temperature during incubation, initial feeding difficulties, and disease susceptibility. Of these problems, high water temperature appears to have the greatest impact on survival and yet is the most difficult to correct at Cabinet Gorge Hatchery.

A PREDATOR-PREY BIOENERGETICS MODEL FOR BEAR LAKE - LARRY LABOLLE, Pocatello, and BRUCE RIEMAN, Eagle, Idaho Department of Fish and Game

Bear Lake is an extremely unproductive natural basin of 29,000 Ha that supports four endemic fish species and is bisected by Idaho's southeast border with Utah. Although recognized as unproductive, management of the two predator populations, native Bear Lake cutthroat and introduced lake trout, has not been tied to any estimates of potential production for the system. Since the lake is productive and there is focused concern over the endemic species, principally Bonneville cisco, management of predators used to provide the sport fishery should be based conservatively on estimated surplus production of the forage. We

attempted to characterize predator potential by estimating cisco production and predicting consumption of cisco by existing and potential predators. Mean annual biomass of cisco was estimated by trawling and production to biomass was estimated to range from 0.5 to 1.0. A bioenergetics model and published data were used to estimate gross growth efficiency for predators of all sizes. We simulated food consumption and predator yield using an age-structured population model, and consumption and yield to a fishery were simulated under a range of values for natural mortality and exploitation in the predator population. Annual consumption of cisco by cutthroat and lake trout are similar. Because significant cutthroat production is supported by Bear Lake sculpin, however, the yield to consumption of cisco for both species varied greatly. Elimination of exotic predators from Bear Lake could make available additional cisco production for a two- to threefold increase in cutthroat fishery yield. If management of an exotic predator (> 10 kg) is an important part of Bear Lake's fisheries, then a more efficient and shorter-lived predator than lake trout could double fishery yields and provide an increased margin of safety in endemic forage management. Management of Bear Lake's predator fisheries within potential is critical for protection of the endemic species. Increased attention to changes in the lake's water chemistry, due to the artificial influence of the Bear River, however, may someday assure long-term stability of the system vital to the endemics.

TWO VIEWS OF FISH POPULATIONS AND IMPLICATIONS TO PROBLEM ANALYSIS - MELO MAIOLIE, Idaho Department of Fish and Game, Coeur d'Alene

The behavior of fish populations can be analyzed from (at least) two possible perspectives. The first perspective involves analyzing the fish population from within and then defining how it will react to outside perturbations or defining its characteristics at some point in the future. Computerized modeling is a typical example of this approach. For example, a fish population can be assigned mortality rates, age class strength, exploitation values, etc., and then predictions are made about abundance or size at some point in the future. Problems with this mechanistic approach are the inability to accurately define the myriad of needed variables and the near impossibility to model such things as compensatory changes among several fish populations.

A second approach to analyzing fish populations is to determine the behavior of populations in their entirety. It recognizes that the "whole" of the population is not reducible to the sum of its parts. This approach stresses that fish populations must be compared to other similar populations to determine its future condition or to predict its reaction of perturbations. Problems with this system's approach include the difficulty in determining what is a similar example for comparison, but it does overcome the problem of compensatory interactions.

With the increasing trend towards computer application, it is stressed that a systems approach should not be overlooked. Implications of this approach are the need for a broad ecological background, the need to review similar case studies, and the need for studies to cover a broader geographical area. Although the two approaches are theoretically mutually exclusive, using both of them in problem analysis may prevent overlooking valuable options. It may also prevent the quest for seemingly endless amounts of data to arrive at relatively simple conclusions.

ANGLERS, ATTITUDES, AND ATTORNEYS: A CASE HISTORY OF CONFLICTS IN RESOURCE ALLOCATION - RUSS THUROW, U.S. Forest Service, Boise

Fisheries resources are finite and conflicts may arise when several groups compete for the same resource. Diverse groups of anglers often derive different benefits and possess very different preferences concerning the way a resource should be managed. This paper examines the conflict which arose when new regulations were proposed for reaches of the Big Wood River and Silver Creek. One group of anglers lobbied for the expansion of restrictive regulations. Regulations passed by the Idaho Fish and Game Commission in April 1989 were challenged in court by a second group of anglers and prevented from being implemented. The regulations were amended in August 1989 and have again been challenged in court. Factors contributing to

the controversy and measures to help improve the level of cooperation between angling groups and management agencies are discussed. The case history raises vital philosophical questions concerning the management of wild trout streams.

HATCHERY FISH - NOBODY LIKES 'EM UNLESS THEY DON'T HAVE 'EM - MIKE LARKIN, Idaho Department of Fish and Game, Boise

Traditions, speculations, and a few facts concerning Idaho's resident hatchery fish stocking program. Idaho has the tradition of stocking catchable-sized trout in nearly every water with road access. Catchable trout production will probably decrease significantly in the future as managers document successful fisheries maintained by stocking fingerling trout, as fish strains become available which exhibit better long-term survival, and as Idaho diversifies its stream management into more wild trout production.

Idaho has 20 million dollars invested in resident hatcheries, with annual operating costs of approximately 2 million dollars. Future expenditures should be oriented towards increased hatchery maintenance, program diversification, and reduced emphasis on catchable trout production.

MIGRATION RATE-DISCHARGE RELATIONSHIPS FOR ANADROMOUS SMOLTS IN LOWER GRANITE RESERVOIR - ED BUETTNER, Idaho Department of Fish and Game, Lewiston

Many studies have shown a strong relationship between survival of chinook salmon, Oncorhynchus tshawytscha, and steelhead trout, O. mykiss, and river discharge. One variable that changes with flow and can be measured is smolt migration rate. Smolts were marked with PIT tags at the Snake River trap at Lewiston, Idaho, and interrogated at Lower Granite Dam, Washington. Median migration rates through Lower Granite Reservoir (LGR) were calculated for daily release groups and a linear regression analysis conducted between migration rate and discharge. The analysis showed a very strong relationship between migration rate and discharge (r^2 = 0.916 for hatchery steelhead, 0.933 for wild steelhead, and 0.951 for chinook salmon). Chinook salmon, PIT tagged in 1987-1989, migrate approximately two to five times faster at 100 kcfs than at 60 kcfs. Both hatchery and wild steelhead migrate approximately two to three times faster at 100 kcfs than at 60 kcfs.

Analysis of covariance showed that wild steelhead migrated faster than hatchery steelhead but both were influenced equally by changes in river discharge. In 1989, the migration rate for wild steelhead was 2.5 km/d faster through LGR than for hatchery steelhead.

There was a statistically significant difference in the chinook salmon migration rate-discharge relationship between years, 1987-1989. A significant difference in this relationship existed for hatchery steelhead and wild steelhead, as well. For all stocks of fish, the odd year in the relationship was 1988.

SPAWNING AND EARLY LIFE HISTORY OF WHITE STURGEON IN THE COLUMBIA RIVER BETWEEN BONNEVILLE AND McNARY DAMS - TEVIS UNDERWOOD and LANCE BECKMAN, U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) is one of four agencies participating in research efforts to determine the status and habitat requirements of white sturgeon (Acipenser transmontanus) populations in the Columbia River downstream from McNary Dam. Specific responsibilities of the USFWS are to describe reproduction and early life history characteristics and to define habitat requirements for spawning and rearing of white sturgeon between Bonneville and McNary Dams. Field sampling was initiated in 1987 in the Dalles Pool, 1988, in the Bonneville Pool and 1989 in the John Day Pool. High-rise and beam trawls and D-shaped larval nets have been the principle sampling gears used to collect eggs, larvae, and young-of-the-year white sturgeon.

During 1989, we estimated spawning first occurred on 11 May in the Bonneville Pool, and 24 May in the Dalles Pool, and on 6 June in the McNary Pool. Spawning activity of white sturgeon has been observed below the Dalles Dam. Eggs and larvae were collected in the tailrace areas of all three pools with the highest catches occurring in the Bonneville Pool. Catches of larval white sturgeon were 72, 25, and 6 in Bonneville, the Dalles, and the John Day Pools, respectively. Predation on sturgeon eggs by large-scale suckers and carp occurred in the spawning area below McNary Dam. Fifty-six post larval (young-of-the-year) white sturgeon were collected in Bonneville Pool; no young-of-the-year white sturgeon were captured in the upper two pools. Total lengths of young-of-the-year white sturgeon ranged from 20-312 mm.

UNIQUE AQUATIC RESOURCES OF THE SNAKE RIVER - PAUL VALCARCE, Idaho Department of Fish and Game, Hailey

One of the largest spring complexes in North America flows from the Snake River Canyon in an area from Twin Falls to Bliss. These springs provide aquatic biologists with the opportunity to observe aquatic life in some of the clearest water in the world. However, only a few of the springs remain in their natural state. The others have been developed for hydroelectric power and aquaculture. This slide talk notes those spring systems that remain pristine and their aquatic life and those that have been developed and those that are slated for development.

WINTER SURVIVAL, MOVEMENT, AND COVER SELECTION OF JUVENILE RAINBOW TROUT IN THE HENRYS FORK OF THE SNAKE RIVER - RON SMITH, Idaho State University, Pocatello

This study was conducted during the winters of 1988-89 and 1989-90 on the Henrys Fork of the Snake River as a follow-up to studies conducted by Craig Contor during the winter of 1986-87. Contor indicated that juvenile rainbow trout Oncorhynchus mykiss were using concealment cover along the bank during the day. The objective of my study was to evaluate the effect of concealment cover availability and quality on the winter survival of juvenile rainbow trout.

Study sites were located in the Box Canyon, Last Chance, Harriman East, and Cold Springs sections of the river. Eight 1.5 m^2 enclosures were installed at each site. Four contained an unembedded cobble substrate and four enclosures contained a gravel/sand substrate. Fifteen juvenile rainbow trout were weighed, measured, marked, and placed in each enclosure in late fall (October). Condition factor (K) was monitored at eight-week intervals for juvenile fish inside, as well as outside, the enclosures throughout the winter. Bailey's triple-catch method was used to estimate juvenile fish abundance, mortality, and movement outside the enclosures in the Last Chance site.

During late fall, juvenile rainbow trout used both bank and mid-channel habitat areas in the Last Chance study site. Concealment cover along banks was characterized by unembedded cobble and boulders while concealment cover in mid-channel consisted of dense aquatic macrophyte beds. In mid-winter (January), fish densities were lower than those observed during late fall in both the mid-channel and bank habitat areas with a relatively greater reduction being observed in the mid-channel areas. Fish that were marked and released in mid-channel areas during late fall were observed in bank habitat areas by mid-winter. This movement was apparently triggered by a reduction in the density of the aquatic macrophyte beds in the mid-channel areas.

During mid-winter, the mean condition factor of individual juvenile rainbow trout was 18% lower than that observed in late fall. The range of individual condition factors was 1.10 to 0.60 during late fall and 0.90 to 0.82 at mid-winter. Fish with low condition factors (0.60 to 0.80) during late fall were not observed during the mid-winter sampling, apparently reflecting substantial mortality.

AN ASSESSMENT OF WINTER INSTREAM FLOW REQUIREMENTS FOR SALMON AND STEELHEAD - MARK HILL, Chapman Consultants, Boise

Habitat suitability index (HSI) curves used in PHABSIM to identify instream flow requirements for salmonid species are based upon observed summer habitat usage. Few, if any, IFIM recommendations include salmon and steelhead winter habitat requirements. It is assumed that late summer, low flow represents one of the most limiting conditions in salmonid streams. This assumption may be inappropriate in light of recent research into chinook salmon (Oncorhynchus tshawytscha) and steelhead-rainbow trout (Oncorhynchus mykiss) winter habitat use in ice-free streams. I compared the IFIM output for instream flows on a low-elevation Idaho stream using summer and winter chinook salmon and steelhead HSI curves. Results of this test indicate that significantly different instream flow recommendations can be made for winter months. Although more water may be available for out-of-stream purposes when winter HSI curves are used, and the stream is not subject to icing, winter withdrawal should not exceed base flow regardless of IFIM results.

TRANSECT VS. BASINWIDE INVENTORY PROCEDURES - A COMPARISON OF METHODS FOR PHYSICALLY AND BIOLOGICALLY INVENTORYING A STREAM - TOM MENDENHALL, Nez Perce National Forest

Fish biologists are currently searching for a stream inventory procedure that assesses both physical and biological parameters of a stream in a short amount of time and is statistically defensible. Two commonly used inventory methods, transect and basinwide stream surveys, were compared on the Nez Perce National Forest. The transect method relies on micro-habitat information collected along stream transects and extrapolates the results to areas not physically inventoried. The distance between transects varies in length from 3 to 400 meters, depending on survey intensity. The basinwide inventory surveys the length of the stream using a macro-habitat approach (i.e., the entire stream volume is partitioned into macro-habitat units). One stream on the Forest was recently inventoried using both methods for comparison. The transect method overestimated pool area by a factor of three when compared to basinwide results. The transect approach also proved more costly: $450/mile - transect versus $250/mile - basinwide. The basinwide inventory method is currently being recognized as a survey method applicable to most streams. There is a national move by the U.S. Forest Service to incorporate the procedure throughout its forests.

EFFECTS OF RIPARIAN VEGETATION AND INSTREAM COVER MODIFICATION ON SALMONIDS IN A SECOND-GROWTH FOREST OF SOUTHEAST ALASKA - ROBERT KEITH and TED BJORNN, Idaho Cooperative Fish and Wildlife Research Unit, Moscow

We examined the effect of manipulating second growth alder canopy and instream cover on the abundance of juvenile salmonids present in small streams on Prince of Wales Island, Southeast Alaska. Sections of alder canopy were removed so the response of salmonids to open canopy sections could be compared to sections where the canopy was left intact. At the start of the study, all potential instream cover was removed from the study pools. In half the pools, brush bundles were installed to provide cover. The number and biomass of age 0 and age 1 coho salmon Oncorhynchus kisutch and all species combined did not differ significantly in response to canopy or instream cover modification.

CONTRASTING THREE METHODS FOR AGE AND GROWTH COMPARISONS USING LARGEMOUTH BASS SCALES - DOUG HATCH and DAVE BENNETT, Idaho Cooperative Fish and Wildlife Research Unit, Moscow

Largemouth bass (Micropterus salmoides) scale data was obtained from two Idaho lakes and also from lakes in Washington, Missouri, and Nebraska. Using the data from age 5 fish, three measures of growth were compared: 1) back-calculated length at age using the Fraser-Lee equation, 2) back-calculated length increments, and 3) actual scale increment measurements.

The traditional approach to age and growth comparisons has been to use back-calculated lengths at age as the unit of comparison. Recent literature suggests using back-calculated length increments or actual scale measures as the unit of comparison. Comparing confidence intervals placed on back-calculated lengths at age among lakes provided the fewest significant differences. Using back-calculated length increments was slightly more sensitive at determining growth differences. Actual scale increment measurements showed the most significant differences when comparing growth among lakes. Scale increment measurements are fundamentally the correct measure to use since distances on the scales are our only observed data.

KOKANEE IN LAKE PEND OREILLE - ON THE ROAD TO RECOVERY - ED BOWLES and BRIAN HOELSCHER, Idaho Department of Fish and Game, Coeur d'Alene

The kokanee restoration program for Lake Pend Oreille has shown tremendous progress since the construction of Cabinet Gorge Hatchery in 1985. Kokanee abundance has increased from a low of 4 million fish in 1985 to 8 to 10 million fish in 1988 and 1989. This increased resulted predominantly from improved survival of wild and/or hatchery-reared kokanee fry during 1987-1989. The objective of this project is to evaluate and improve the hatchery contribution to the kokanee fishery.

Six fry release strategies are being evaluated to enhance fry survival and returns to the fishery and egg-take stations. Hatchery fry survival in Lake Pend Oreille has been enhanced fivefold by improving fry release strategies. Kokanee fry released from Cabinet Gorge Hatchery during 1988 and 1989 comprised over 50% of total fry recruitment in Lake Pend Oreille, which are the largest contribution since hatchery supplementation began in the 1970s. This increase will be evident in the fishery and escapement beginning in 1990 and 1991, respectively.

OTOLITHS - LENDING AN EAR TO SCIENCE - BRIAN HOELSCHER and ED BOWLES, Idaho Department of Fish and Game, Coeur d'Alene

Otoliths from kokanee reared at Cabinet Gorge Hatchery exhibit an obvious change in width of daily growth increments at the time of their release. This time-of-release mark on the otolith microstructure was used between 1987 and 1989 to successfully differentiate hatchery release groups and wild fry.

Sagitta otoliths were excised from fry caught during trawling and embedded in a low viscosity medium. The proximal surface was polished with 600 grit sandpaper and otolith miscrostructure observed with an oil immersion compound microscope interfaced with a video camera and monitor.

Kokanee fry released on different dates were identified by counting daily growth increments from the release mark to the otolith margin or by the appearance of a wide, translucent band (thermal mark) at the time of their release. During the study, approximately 68% of the counts of daily growth increments from the time-of-release mark to the otolith margin fell within the expected number of days from the release to fall sampling. Ninety-eight percent of the counts were within two days of the expected dates.

Daily growth increments on otolith microstructure can also be used to compare relative growth of hatchery-reared fry during hatchery and lake residence and between wild and hatchery-reared fry during lake residence. Otoliths are also being evaluated for use in differentiating hatchery release groups and hatchery vs. wild origin for older kokanee.

GOLDEN TROUT - PAST, PRESENT, AND FUTURE - BOB ESSELMAN, Idaho Department of Fish and Game, Hayspur

Golden trout (Oncorhynchus aquabonita) have been stocked in Idaho since 1939. Introductions have been intermittent due to availability of gametes and fry. In order to provide a diversity of opportunity in mountain lakes and to meet annual management requests of about 14,000 golden trout, Baker Lake was selected as a

broodstock lake. Stocked with golden yearlings in 1987, a management plan was developed to include: catch-and-release regulations, annual stocking rate of 600 fingerlings per year, cutthroat removal, and monitoring of fecundity and length frequency. Success of the Baker Lake project should be determined by 1992. Suggested criteria for golden trout introductions include: suitable spawning tributaries, maintain lake exclusively for goldens and stock at 250 fry/surface acre on alternate years. The impact of golden trout on native species should be considered.

EVALUATING BENEFICIAL USE SUPPORT IN THE ROCK CREEK RURAL CLEAN WATER PROGRAM, 1981-1989, TWIN FALLS COUNTY - TERRY MARET, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

Water quality monitoring for the Rock Creek Rural Clean Water Program (RCWP) in Twin Falls County is one of 21 national projects funded to evaluate best management practices (BMPs) on cropland and resulting trends in off-site water quality. The major goal of this ten-year, interagency program is to reduce the amounts of sediment and associated pollutants entering Rock Creek. Monitoring has shown a reduced loading of sediment from cropland drains, with a 78% reduction in sediment delivered into the Snake River via Rock Creek between 1982 and 1988. Mean sediment concentrations were reduced by almost half for this same time period. Sediment contributions from actively eroding stream banks on Rock Creek and major tributaries (approximately 48% of total length) are masking the off-site benefits from cost-share efforts. Estimated annual sediment contributions from these actively eroding stream banks exceed sediment delivered to Rock Creek from all cropland receiving treatment by three to five times. Designated beneficial uses including coldwater aquatic life and primary contact recreation are key components used to evaluate the success of this program. Instream monitoring has been targeted at fish and macroinvertebrate community composition, habitat quality, and comparison of specific parameters to water quality criteria. Trout standing crops have increased compared to preproject data. Preliminary data reveals that salmonid spawning, a designated use in Rock Creek, remains impaired. Fine sediment appears to be reducing intergravel dissolved oxygen below the proposed criterion of 6.0 mg/L at some locations. Rainbow trout embryo survival in artificial egg pockets has been limited to stations above the agricultural impact areas. Macroinvertebrates collected during August between 1981 and 1988 have not shown improving trends in taxa numbers or densities due to land treatment. However, macroinvertebrate abundances appear adequate as a food source to support a good trout fishery with means of 2,298-4,193 organisms per square meter.

OPPORTUNITIES FOR IMPROVEMENT OF FISHERIES IN STREAMS IMPACTED BY AGRICULTURAL ACTIVITIES - STEVE BAUER, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise, and AL VAN VOOREN, Idaho Department of Fish and Game, Boise

Agricultural nonpoint source pollution has severely reduced the carrying capacity in Idaho valley streams and rivers. These waters were historically some of Idaho's most productive waters for fisheries production. These waters are traditionally written off by fisheries professionals because of the seemingly unsurmountable technical, social, and political obstacles.

The state of Idaho has implemented a State Agricultural Water Quality Program since 1979 to address the nonpoint source pollution problems. Since 1979, this program has funded 21 planning projects and 25 implementation projects. In 1989, over $900,000 were spent on water quality improvement projects. The program is administered by the Division of Environmental Quality in concert with the Idaho Soil Conservation Commission. Individual watershed projects are implemented by the local Soil Conservation District. Funds from the State Water Pollution Control Account are used to cost-share best management practices with cooperating farmers.

To date, the program has focused on reducing sediment from erosion sources. Recent program reviews have pointed out the need to expand the program to such issues as stream bank stability, riparian enhancement, and treatment of dairies and feedlots. This new emphasis creates the opportunity for significant improvement in these waters with corresponding increases in fishing opportunities. Involvement of fisheries professionals in the formulation of instream objectives and design of stream enhancement projects has a high potential for improving fisheries in streams close to population centers.

AFTER THE FLOOD: DEVELOPMENT AND IMPLEMENTATION OF THE TETON RIVER FISHERY ENHANCEMENT PROJECT - JODY BROSTRUM and MARK GAMBLIN, Idaho Department of Fish and Game, Idaho Falls

In 1986, the Idaho Department of Fish and Game received a settlement of 1.4 million dollars from the U.S. Bureau of Reclamation (BOR) for Teton River fishery resources destroyed by the 1976 Teton Dam flood.

In April 1988, the Idaho Fish and Game Commission approved a four-year enhancement plan for the Teton River drainage, funded by the BOR settlement.

The four-year enhancement plan targets improvements for riparian and instream fish habitat, fish migration barriers, the hatchery program, fishing regulations, angler access and landowner/sportsmen relations in the Teton River drainage. Habitat improvements will be made by fencing river and stream corridors for grazing protection, stabilizing eroding river and stream banks with tree revetments, and reestablishing riparian vegetation. Project goals for the fishery include increasing the overall catch rate from 0.75 trout/hour to 1.5 trout/hour (1.0 cutthroat/hour) and increasing the mean trout catch size to 14 inches overall (25% of the cutthroat catch at 16 inches).

The success of this program depends on cooperative agreements with private landowners. Specific strategies for negotiating riparian agreements with landowners will be discussed.

IMPLEMENTING IDAHO'S ANTIDEGRADATION POLICY - BILL CLARK, Idaho Department of Health and Welfare, Division of Environmental Quality, Boise

In August 1988, an Antidegradation Agreement for Idaho was finalized. This landmark agreement was reached after months of negotiations between agricultural, timber, and mining interests, Indian tribes, sportsmen, and the conservation community. The key provisions of the agreement are: Basin Area Meetings (BAMs) to be held biennially across the state to discuss water quality and to allow citizens to nominate stream segments of concern; establishment of a coordinated nonpoint source water quality monitoring program; and a process for designating outstanding resource waters. This agreement marks a new era for water quality awareness and protection in the state of Idaho.

The Basin Area meetings were held in July 1989, with approximately 800 people attending. The meetings had an information fair format, with participants displaying information on water quality monitoring and status and nonpoint source activities scheduled for the next two years. A video of the slide/tape program presented at the BAMs is available on loan from IDHW-DEQ. Nearly 3,500 individual stream segment nomination forms were received by DEQ from the combined efforts of the BAMs and the mail-in campaign. Governor Andrus has selected a Water Quality Advisory Working Committee which has prioritized the nominated segments.

The coordinated nonpoint source water quality monitoring program plan was developed by an eight member technical advisory committee to maximize water quality data collection efforts in Idaho. Key aspects are to eliminate duplication of monitoring effort and develop a shared common database. The program will require cooperation by all involved with water quality monitoring in Idaho. The monitoring program is addressing trends in major river basins, beneficial use support status, and best management practice effectiveness. The document concentrates on the three major nonpoint source activities in the state: agriculture, forestry, and mining. It lists appropriate parameters, protocols, and a monitoring plan checklist for all to use as a monitoring guide in Idaho.

Draft sediment criteria have been produced to facilitate instream monitoring of BMP effectiveness for protection of beneficial uses. The criteria are currently being tested for validity. They include turbidity, intergravel dissolved oxygen, and cobble embeddedness. Monitoring programs for agriculture are subdivided into irrigated cropland, dryland agriculture, and rangeland/riparian.

Outstanding resource waters (ORW) will be waters that cannot be lowered in quality as a result of a nonpoint source activity. Only the Legislature can designate an ORW based on recommendations from the Board of Health and Welfare. No ORWs have been submitted for consideration by the Legislature this year.

ABSTRACTS

WILDLIFE TECHNICAL SESSION

A PRELIMINARY ANALYSIS OF ROCK SQUIRREL POPULATIONS IN SOUTHEAST IDAHO - R.S. BATTERTON and B.L. KELLER, Division of Biological Sciences, Idaho State University, Pocatello

Rock squirrels (Spermophilus variegatus), a newly described species for Idaho, were studied in southeastern Idaho to obtain information for the northernmost extension of their range. The first summer of study concentrated on an analysis of populations in the Oneida Narrows area where two hydroelectric projects are being considered. Live trapping, direct observation, and area surveys were undertaken to obtain data on population size, food habits, activity patterns, and growth rates. New range information was obtained that suggests rock squirrels are active in the Malad and Wasatch ranges, as well as the Oneida Narrows.

THE DISTRIBUTION OF AMPHIBIANS AND REPTILES IN YELLOWSTONE NATIONAL PARK - ED KOCH and C.R. PETERSON, Department of Biological Sciences, Idaho State University, Pocatello

To determine the occurrence and distribution of amphibians and reptiles in Yellowstone National Park, we compiled data from 14 museum collections, Park files, and field observations. From approximately 600 specimen records and observations, we determined that ten species of amphibians and reptiles occur in Yellowstone (1 salamander, 3 anuran, 1 lizard, and 5 snake species). Questionable occurrences include two anuran, one turtle, one lizard, and one snake species. Surprisingly, little is known about the detailed distribution of amphibians and reptiles within the Park. The majority of collecting sites are near roads, and over half of the records are for a single species: the spotted frog. The small size and uneven nature of this data set preclude meaningful analyses of the distributions of most of the species. We, therefore, recommend that future research focus on developing a systematic sampling program with increased number, diversity, and range of localities (especially in backcountry areas) and on confirming the occurrence of questionable species. Once the distribution patterns have been documented adequately, we can examine the basis of these patterns by correlating them with environmental features and historical events.

A STUDY OF GRAY WOLF HISTORY AND STATUS IN THE CASCADE MOUNTAINS OF WASHINGTON STATE - J. LAUFER, Washington Wolf Project, Olympia

This report compiles and analyzes information regarding the historical and present status of Canis lupus in the Cascades Mountains of Washington. It appears that historically wolf numbers were higher on the east side of the Cascades than the west. During the mid-1800s, the Hudson's Bay fur trade greatly reduced wolf numbers and led to eradication in many areas. Since the mid-1980s, there has been an increase in wolf sightings in the study area.

TAXONOMY AND DISTRIBUTION OF THE IDAHO GROUND SQUIRREL - E. YENSON, Department of Biology and Museum of Natural History, The College of Idaho, Caldwell

The Idaho ground squirrel, Spermophilus brunneus, occurs in five counties in west-central Idaho. Marked differences in pelage related to soil color between northern and southern portions of this limited range were investigated using univariate and discriminate function analyses of external, cranial, bacular, and pelage characters. The analyses indicated that there are two taxa of Idaho ground squirrels and that they are approaching species-level differentiation.

WHY IS THE NORTHERN IDAHO GROUND SQUIRREL SO RARE? A PROGRESS REPORT - E. YENSON, Department of Biology and Museum of Natural History, the College of Idaho, Caldwell

The northern semispecies of Idaho ground squirrel is known from ca. 24 localities which are more or less isolated from each other and contain < 1000 to < 100 adults. Several hypotheses to explain their rarity were tested: dietary specialization, narrow habitat requirements, competition with Columbian ground squirrels. A study of burrow structure provided an unexpected hypothesis which will be tested this summer.

THE GOSHAWK: WHAT IS IT TELLING US? - M. MAJ, Targhee National Forest, Idaho Falls, and S. PATLA, Independent Consultant, Driggs

The Targhee National Forest Land Management Plan (TNFLMP), 1985, identifies the goshawk (Accipiter gentilis) as an ecological indicator of the forest's mature and old growth timber component, primarily the Douglas fir and mixed fir habitats. At that time, there were 10 known nest sites on the forest. The total forest population was estimated at approximately 40 pairs. The Five-Year Monitoring Report for the TNFLMP, 1987, identified 16 known nests on the Forest. Ten of the 16 nests had been disturbed by human activities, of which 5 had not been used since their disturbance. Until 1989, the source of most goshawk sightings had come from timber marking crews. After 5 years of plan implementation, the question of goshawk's suitability as a habitat indicator species was not answered. In 1989, the Forest contracted the monitoring of goshawks. Information collected included: 1) current status of known nest sites, 2) habitat description of known nest stands, and 3) evaluation of survey methods. Monitoring, on the Forest, appears to indicate the goshawk is vulnerable to some timber harvest activities that occur on the Forest. The Forest recognizes there are limitations in the concept of one species being used solely to indicate the habitat quality for another species. The Forest, however, will continue to monitor the goshawk to assure that timber harvest activities are not causing serious reductions in Forest-wide goshawk numbers. The appropriate questions and monitoring plan design need to be rethought. Monitoring of known nest sites alone will not provide adequate information on goshawk population trends. A monitoring design that inventories for goshawk use in control and treated areas may better answer the questions of the cause and effects of timber activities on the goshawk.

PREY PROCUREMENT TIME IN PRAIRIE FALCONS IN RELATION TO PREY ABUNDANCE - A.M.A. HOLTHUIJZEN, Idaho Power Company, Environmental Affairs Department, Boise

In 1986 and 1987, 28 prairie falcon nesting attempts were observed for 336 days. Observations began 1 to 2 weeks prior to egg laying and continued until chicks were 30-35 days old. Foraging time was estimated from the time falcons spent away from the nesting territories. The proportion Townsend's ground squirrel (Spermophilus townsendii) in the falcons' diet was used as an index of prey abundance. Falcons spent at least twice as much time foraging during the low than during the high prey abundance year. Females increased their foraging time when male delivered prey items declined.

THREE-YEAR REPORT ON A LONG-TERM STUDY OF A POPULATION OF AMERICAN KESTRELS BREEDING IN NEST BOXES - M. BECHARD, Raptor Research Center, Department of Biology, Boise State University, Boise

Occupancy of nest boxes by American Kestrels (Falco sparverius) and European starlings (Sturnus vulgaris) was monitored in a 85 km^2 study area near Fairfield, Idaho, during 1987-89 as part of a long-term population study. All boxes were occupied during the three-year period, with occupancy by kestrels ranging from a low of 50% in 1987 to a high of 80% in 1989. Clutch sizes of kestrels averaged 4.1 eggs/occupied box and fledging success averaged 3.2 and 2.5 young/successful and occupied nests, respectively. Prey remains

indicated the diet of these birds include voles (Microtus montanus), deermice (Peromyscus maniuclatus), desert horned lizards (Phrynosoma platyrhinos), and insects. Eight kestrels were recaptured in years subsequent to their first being banded. Birds of both sexes banded as adults moved an average of 0.8 km (range 0-1.6) to new boxes where females and males banded as nestlings moved an average of 3.2 and 1.5 km, respectively. Future directions of this continuing study will be discussed.

POST-NESTING MOVEMENTS OF LONG-EARED OWLS IN SOUTHWEST IDAHO, PART TWO - H. ULMSCHNEIDER, Raptor Research Center, Boise State University, Boise

In 1988, I reported that long-eared owls leave the desert abruptly after breeding in the Snake River Birds of Prey Area, but I did not discover where they go. In 1989, I radio-tagged 4 adult female, 4 adult male, and 5 juvenile owls. Of these, 3 females, 2 males, and 2 juveniles went 70-125 km north into the mountains after the nesting season. Females left a mode of 19 days before the males and juveniles, before the young reached independence. Of 4 owls tracked for up to 4 weeks, 3 eventually moved into forested areas near fresh logging.

FACTORS AFFECTING THE DISTRIBUTION OF WINTERING BALD EAGLES IN AN URBAN AREA - R. SPAHR and M. BECHARD, Raptor Research Center, Department of Biology, Boise State University, Boise, and K. STEENHOF, Birds of Prey Research Project, Boise District, Bureau of Land Management, Boise

Bald eagle (Haliaeetus leucocephalus) distribution in an urban area was studied for 2 winters in relation to habitat characteristics and urban development along the Boise River in Idaho. Eagle locations were compared to random locations along the river, and regression models to predict the presence or absence and abundance of eagles in an area were developed. Eagles were found at pools more often than expected, and at areas of low development with a high number of perch trees. Variables that predicted eagle use of an area were the number of perch trees and the number of commercial buildings present, the river habitat type, and the river width.

TRUMPETER SWAN HABITAT IMPROVEMENT - G. WORDEN, Ashton Ranger District, Targhee National Forest, St. Anthony

In the past eight years, 63 trumpeter swans have fledged from nesting areas on the Ashton District of the Targhee National Forest. The Ashton District has undergone intensive timber harvest during the past decade in a salvage program to harvest bettle-killed lodgepole. Maintaining the security of these nesting areas is an important district objective. Timber sale design, road closure, and timing of activities are tools that have been used in protecting swan habitat. In addition, many habitat enhancement projects have been implemented including: cattle exclosures, water level stabilization, artificial nest construction, and dredging organic material from wetlands.

ELK HABITAT IMPROVEMENT - T. GELLAT, Island Park Ranger District, Targhee National Forest, St. Anthony

In the summer of 1989, approximately 40 wildlife ponds averaging 10,000 cubic feet in size were constructed on the Moose Creek Plateau in the Targhee National Forest. The project was a cooperative effort between various federal, state, and private agencies. Due to the porous nature of the obsidian soil in the project area, large quantities of bentonite clay were used to seal the ponds. Measures of success will not be available until spring, 1990. Preliminary observations made in fall, 1989, indicated the majority of the ponds to be retaining water. A brief slide presentation and discussion of the project are planned.

CARP REMOVAL AND DUCK BREEDING PAIR DISTRIBUTION AT BEAR LAKE NATIONAL WILDLIFE REFUGE - S.H. BOUFFARD and G.L. BEUTSCHER, U.S. Fish and Wildlife Service, Pocatello

We compared distribution of duck breeding pairs and after carp (Cyprinus carpio) removal in the Rainbow Unit of Bear Lake NWR. Carp were removed from Rainbow Unit in 1983 and 1988. Duck breeding pairs were counted each year from the same route in early May. The proportions of redheads (Aythya americana) and of total ducks, observed on the Rainbow Unit relative to the rest of the marsh, increased significantly after carp removal. The proportion of total dabblers and of total divers did not change after carp removal.

A SUMMARY OF IDAHO'S WILDLIFE WATER DEVELOPMENTS AND A REPORT ON WILDLIFE USE OF GUZZLERS IN SOUTHEASTERN IDAHO - A OGDEN, Idaho Department of Fish and Game, Boise

A survey of Bureau of Land Management and United States Forest Service personnel in the southern part of Idaho was conducted to ascertain numbers, types, and qualities of water developments, installed for wildlife in the last ten years. Ponds, dugouts, and catchments were the most frequently used techniques, followed by 500 gallon guzzlers, spring improvements, and 1000 gallon guzzlers and other techniques. Preferred designs (in order of satisfaction) were: 500 gallon guzzlers, ponds, spring improvement, and "flying saucer" guzzlers.

Wildlife use of guzzlers in the Big Desert area in southeastern Idaho is also evaluated.

HABITAT USE AND POPULATION DENSITIES OF GRAY SQUIRRELS IN SOUTH ALABAMA - RICHARD A. FISCHER, Department of Zoology and Wildlife Science, Alabama University, Auburn, Alabama, and NICHOLAS R. HOLLER, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, Alabama

We studied habitat use and determined population densities of the gray squirrel (Sciurus carolinensis) in Alabama. Three stands of even-aged pine, mixed pine-hardwood, and hardwood were selected for study, and a 50-station trapping grid was established in each. We captured 603 squirrels 1,586 times. Squirrel populations in hardwood habitat did not differ from those in mixed pine-hardwood habitat, but both differed from those of even-aged pine. Moderately open understories with a denser shrubcrown component appear to be important to gray squirrel abundance. Radio-telemetry indicated that hardwood stringer cover type was important in even-aged pine and mixed pine-hardwoods.

SEASONAL HABITAT USE AND MOVEMENT OF SYMPATRIC FEMALE SAGE AND SHARP-TAILED GROUSE IN SOUTHEASTERN IDAHO - A.D. APA, K.P. REESE Wildlife Resources, University of Idaho, Moscow, and J.W. CONNELLY, Jr., Idaho Department of Fish and Game, Pocatello

Sage and Columbian sharp-tailed grouse are currently being investigated in the Curlew Valley region of southeastern Idaho. Research was initiated in the spring of 1988 and is currently in progress. Grouse were captured and radio-tagged both years. Preliminary findings indicate two habitat specific groups of sharp-tails. Sage and sharp-tailed grouse specific nest site selection varies from shrubs to herbaceous cover. Sage and sharp-tailed grouse hen success was 46% and 50%, respectively. Sharp-tail movements to nesting habitat from the lek of capture ranged from 0.5 to 3.0 km, and sage grouse movements ranged from 1.0 to 34.0 km. This study will provide information for management of grouse where they coexist.

MOVEMENTS AND HABITAT USE OF WINTERING SAGE GROUSE IN SOUTHEASTERN IDAHO

M.D. ROBERTSON and K.P. REESE, Wildlife Resources, University of Idaho, Moscow, and J.W. CONNELLY, JR., Idaho Department of Fish and Game, Pocatello

We investigated movements and habitat use by sage grouse (Centrocercus urophasianus) during winters 1987-88 and 1988-89. The winter of 1987-88 was considerably milder than that of 1988-89. Sage grouse exhibited shorter daily movements ($\bar{x}$ = 522 m, N = 7) and remained closer to their leks in the milder winter than in the harsher winter (daily movements averaged 949 m, N = 46, P = 0.05). Sagebrush canopy cover at grouse use sites was greater in 1987-88 ($\bar{x}$ = 19.6, N = 15) than in 1988-89 ($\bar{x}$ = 9.4, N = 24) (P = 0.003). Sagebrush height was also greater at grouse use sites during the milder winter ($\bar{x}$ = 47.6 cm) than the harsher winter ($\bar{x}$ = 37.9) (P = 0.05).

FEMALE COLUMBIAN SHARP-TAILED GROUSE IN SOUTHEASTERN IDAHO: SEASONAL MOVEMENTS, HABITAT USE, AND PRODUCTIVITY

D.R. MEINTS and K.P. REESE, Department of Fish and Wildlife, University of Idaho, Moscow, and J.W. CONNELLY, JR., Idaho Department of Fish and Game, Pocatello

The seasonal movements, habitats, and nesting ecology of Columbian sharp-tailed grouse were determined on two wildlife management areas in southeastern Idaho. From 1988 through 1989, 109 grouse were captured on both areas; of these, 52 were equipped with radio transmitters. The average distances moved from lek to nest sites on Tex and Sand creeks were 1.11 $\pm$ 0.97 (N = 10) and 1.43 $\pm$ 0.92 (N = 6), respectively. Nest success on Tex Creek was 81% (13-16), while that on Sand Creek was 55% (5-9). Vegetation analysis from 23 nests showed that hens appeared to select nest sites where 0 degree cover was heavier than average. Nesting cover boards showed 98 $\pm$ 5% cover at nest sites compared to 74 $\pm$ 28% (N = 51) cover at dependent and independent 55 $\pm$ 34% (N = 51) sites.

STATUS OF MOUNTAIN QUAIL IN IDAHO

M. ROBERTSON, A. OGDEN, and T. HEMKER, Idaho Department of Fish and Game, Boise

A survey was made of recent and historical sightings of mountain quail (Oreortyx pictus) in Idaho during the spring of 1989. Field surveys were made of locations where birds have been seen in the last five years, which total 21. Only two populations were confirmed in the state by the survey, though other populations undoubtedly exist. This compares with distributions across western Idaho as late as the 1970s. The Chukar Foundation, in cooperation with the Bureau of Land Management, the U.S. Forest Service, and the Department, expect to produce a publication on habitat management guidelines in 1990.

ANTELOPE UTILIZATION OF LICHENS IN THE BIRCH CREEK VALLEY OF IDAHO, AN EXAMPLE OF THE VALUE OF BIOLOGICAL DIVERSITY

A. THOMAS and R. ROSENTRETER, Bureau of Land Management, Boise

There are extensive windswept calcareous gravel benches and flats in southcentral Idaho. These sites support a sparse cover of vascular plants and an abundance of lichens growing loose over the soil. Seasonally, as antelope migrate in early spring, winter, and late fall through lower Birch Creek Valley most of the vascular plants are dormant, encouraging utilization of the lichens. During certain stress periods lichens may be the major food source for antelopes in the area. Stomach analysis by weight contained over 50% lichens in a sample taken in the winter by Bernt (1976).

WINTER HABITAT SELECTION OF WHITE-TAILED DEER IN THE PRIEST RIVER DRAINAGE, NORTH IDAHO - G. PAULEY, Department of Wildlife Resources, University of Idaho, Moscow

I examined winter habitat selection of white-tailed deer during 1987 and 1988. Mid-winter use of old growth was greater than expected, while pole timber and non-forested habitats were avoided. During early and late winter, old growth and mature timber were used proportionately, while deer selected pole timber and avoided non-forested habitats. Early and late winter habitats were characterized by moderately closed canopied stands of seral conifers and lush understory cover, while climax stands with depauperate understories characterized mid-winter. A large component of old growth should be maintained on whitetail winter range.

THE USE OF ARTIFICIALLY SIMULATED ANIMALS (ASA) TO APPREHEND WILDLIFE LAW VIOLATORS - IDAHO 1989 RESULTS - L.C. JINDRICH and R.O. EVANS, Idaho Department of Fish and Game, McCall

In order to maximize a Fish and Game Officer's enforcement effort and reduce the frequency of violations by apprehending violators, the use of ASA's in Idaho has increased over the past several years. In 1989, ASA deer were used a total of 54 separate times by Fish and Game Regions 1, 2, 3, and 6. During these 54 ASA sets, occupants of 159 vehicles observed the ASA; 45 (28%) of these vehicles were involved in a violation to take the ASA; 121 total violations were detected, and 54 citations were issued. The use of ASA's have been generally approved of by the courts and the public: they have proven to be an effective deterrent measure for wildlife violations.

MEASURING THE ACTIVITY PATTERNS OF FREE-RANGING ANIMALS WITH RADIO-TELEMETRY - M.J. McDONALD, C.R. PETERSON, A.J. VITALE, C.G. BROWN, V.A. COBB, AND B.L. KELLER, Department of Biological Sciences, Idaho State University and Idaho Department of Fish and Game, Pocatello

There is little information concerning the daily activity patterns of many free-ranging animals because of their secretive habits, susceptibility to disturbance, and the time required to gather behavioral data. We have developed a radiotelemetry system that will help to solve each of these problems and applied it to field studies of garter snakes, rattlesnakes, and mule deer. Key components of the system include radiotransmitters containing motion-sensitive switches and a microdatalogger programmed to sample the telemetry signals and to calculate the number of switch changes per time interval. Comparisons of the observed activity of captive animals with the number of switch changes showed that activity levels could be predicted accurately. Our initial field tests indicated that in the summer, wandering garter snakes (Thamnophis elegans) were most active during the morning and early evening. Preliminary studies of hibernating Great Basin Rattlesnakes (Crotalus viridis) have revealed that they exhibit limited activity even when underground. We also have used this system to study the effect of hunting on the activity patterns of mule deer (Odocoileus hemionus).

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