

Jim Fessler



American Fisheries Society

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1984 ANNUAL MEETING

JULY 16-19, 1984

EMPRESS HOTEL

VICTORIA, BRITISH COLUMBIA

PROGRAM & ABSTRACTS

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1984 ANNUAL MEETING
OF THE
WESTERN DIVISION
AMERICAN FISHERIES SOCIETY

JULY 16-19, 1984
EMPRESS HOTEL
VICTORIA, BRITISH COLUMBIA

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PROGRAM

WESTERN DIVISION, AMERICAN FISHERIES SOCIETY
WESTERN ASSOCIATION OF FISH AND WILDLIFE AGENCIES

Monday, July 16, 1984

Committee Meetings

- 9:00 - noon Habitat Procedures Committee
- 1:00 - 3:00 p.m. Western Division, AFS, Executive Committee
- 3:00 - 5:00 p.m. Pacific Salmon, long-range issues and role of fishery scientists. Presentation and discussion on an issues document developed by the WDAFS Marine Fisheries Committee.

Tuesday, July 17, 1984

General Sesseion

- 9:00 a.m. Call to Order: Donald J. Robinson, President, WAFWA
- 9:30 a.m. Welcome to British Columbia:
Premier William R. Bennett
- 9:45 a.m. President's remarks:
Donald J. Robinson, President, WAFWA
Stanley A. Moberly, President, WDAFS
- 10:15 a.m. Keynote Address:
"Our Clients and Their Changing Expectations"
Mr. Y. Edwards, Director, Provincial Museum of
British Columbia
- Panel: "User Response"
Mr. K. Brynaert, Executive Director, Canadian
Wildlife Federation
Mr. B. Wright, Marine and Charter Boat Operator,
Salt Water Sport Fish Advisory Board Member
Mr. H. Paish, Howard Paish and Associates Ltd.,
Natural Resource Planning and Analysis

Wildlife Technical Sessions

- 1:00 - 5:00 p.m. Game Management: Managing prey and predator in response to the scientist and the public's changing perceptions.
- 1:00 - 5:00 p.m. Wild Fur Management: The Challenge of the 1980's.
- 1:00 - 5:00 p.m. Guiding: Accommodating non-residents in light of limited resources and resident demands for priority in allocation.

Fisheries Technical Sessions

- 1:00 - 3:00 p.m. The Role of Woody Material in Salmonid Habitat
- 3:15 - 5:15 p.m. Aquatic Habitat Improvements
- 1:00 - 5:00 p.m. Establishing the economic value of fish and fish utilization
- 1:00 - 5:00 p.m. Impacts of El Nino in the central and western Pacific Ocean

Enforcement Technical Session

- 1:00 - 5:00 p.m. This session will include segments on the following:
- "Sting" operations: Their planning and implementation. What are the advantages and disadvantages to the resource manager and to public perception?
- General enforcement reports: An omnibus panel on a variety of enforcement issues.
- Evaluating fish and wildlife enforcement: What techniques are being applied to evaluate the effectiveness of enforcement as a component of the management program?
- "Game wardens" or "environmental cops": The challenge of responding to the traditional role of fish and wildlife enforcement and the need for environmental surveillance and investigation. New approaches in training and function - satisfying both "masters."
- The Bill Morris presentation: A report on the enforcement activities of member agencies.

Wednesday, July 18, 1984

General Session

"Our Clients and Their Changing Expectations - Canadian Experiences"

- 9:00 - 10:00 a.m. "Habitat Canada" and Other Approaches
Dave Neave, Coordinator, Wildlife Habitat Canada
"Will the Real Wildlife Stand Up"
Mike Halleran, Media and Film Producer
- 10:30 - noon Fur Industry's Expectations
Mr. L. Werner, General Manager, Hudson's Bay Company,
International Fur Sales Centre
Economic and Social Trends
Wildlife (Canadian Wildlife Service)
Economic and Social Trends
Fisheries (Department of Fisheries and Oceans)

Fisheries Business and Committee Meetings

- 1:00 - 3:00 p.m. Business Meeting, Western Division, American Fisheries Society
- 3:15 - 5:00 p.m. Report of the Habitat Procedures Committee with a discussion of the report to follow.

Wildlife Technical Sessions

- 1:00 - 5:00 p.m. Non-Game Management: An increasing potential clientele and source of support that needs to be fostered. How do we respond?
- 1:00 - 5:00 p.m. Technical Development: What promising new tools and techniques are available for future wildlife management?
- 1:00 - 5:00 p.m. Wildlife Management General Session: A "Show and Tell" of current wildlife topics, limited only by imaginativeness in presentation.

Habitat Protection and Management Technical Sessions (Fish and Wildlife Aspects)

- 1:00 - 3:00 p.m. Wilderness protection and intensive management: A panel discussion on the role of the fish and wildlife agency in rationalizing present trends toward intensive management with the demand for more protection of natural wilderness areas. What is the proper ratio of "natural" versus "artificial" production to satisfy the public? Four speakers representing the agencies, sportsmen and the "environmentalists."
- 3:15 - 5:00 p.m. Working with industry and other users: Presentations of specific case studies of cooperative programs between government, industry and the public for enhancement or protection of habitat. Emphasis on new approaches and "path-finding" initiatives.

Conservation Education Technical Session

- 1:00 - 5:00 p.m. At this time proposals for this session include presentations on the following:

Project Wild: A progress report and discussion of problems, future prospects, financing, etc.

Who cares about wildlife? A speaker from the Canadian federal government reviewing the 1981 national survey, "The Importance of Wildlife to Canadians."

Attitudes and expectations in British Columbia: A review of the B.C. survey of hunters and sportsfishermen, and of non-consumptive user wildlife in B.C.

Commissioners Session

- 1:00 - 5:00 p.m. A panel is scheduled for general discussion of topics such as the role of the Commissioners and their involvement in legislation and obtaining support for programs.

Banquet and Awards Ceremony

- 6:00 - 9:00 p.m. Western Banquet and Social Hour

Thursday, July 19, 1984

Habitat Protection and Management Technical Sessions

This session will cover the evaluation of habitat under two headings:

- 8:30 - 10:00 a.m. The physical evaluation of habitat: What are the "workable" techniques for the evaluation of habitat? Have we gone into too much detail for the type of assessments needed? Given reduced resources in the 1980's, what are the best ways to capitalize on the dollars spent for evaluation?
- 10:15 - noon The economic evaluation of habitat: With the need for trade-offs in protecting habitat, has the economic approach really worked to our benefit? What progress has been made in evaluating intangibles such as non-consumptive use, threatened species, etc.? What are some case studies of four short presentations followed by a panel discussion.

Fisheries Technical Sessions

- 8:00 - noon Changing expectations for management of ocean fisheries.
- 8:00 - noon Fisheries contributed papers.
- 8:00 - noon Contributed papers: Management of Salmonid Habitat.
- 1:00 - 3:00 p.m. Perspectives in Salmonid Management.
- 1:00 - 3:00 p.m. Fisheries contributed papers.

Western Division American Fisheries Society
Victoria, British Columbia

SESSION A-1

Tuesday, July 17, 1984 (afternoon)

Moderator: James R. Sedell, USFS,
Experiment Station, Corvallis,
Oregon

FISHERIES TECHNICAL SESSION: THE ROLE OF WOODY MATERIAL IN SALMONID HABITAT

Role of Large Organic Debris as Winter Habitat for Stream Rearing Salmonids.
Mike Murphy, National Marine Fisheries Service, Auke Bay, Alaska

The Effects of Instream Structure on Salmonid Habitat and Populations in a
Coastal Oregon Stream.

Bob House, Bureau of Land Management, Salem District Office, Oregon

The Influence of Stream Habitat Structure on the Foraging Activity of Cutthroat
Trout.

Peggy Wilzbach and James Hall, Oregon State University, Corvallis, Oregon

The Abundance and Role of Large Organic Debris in Juvenile Salmonid Habitat
in Small Streams in Second-Growth and Unlogged Forests.

Glenn Grette, University of Washington, Seattle, Washington

The Influence of Large Organic Debris on Channel Morphology of Queen Charlotte
Island Streams -- Physical Characteristics.

Dan Hogan, University of British Columbia, Vancouver, British Columbia

SESSION A-2

Tuesday, July 17, 1984 (afternoon)

Moderator: Robert House, BLM,
Salem, Oregon

AQUATIC HABITAT IMPROVEMENTS

The Effects of Various Stocking Strategies on the Survival and Growth
of Headwater Stocked Steelhead.

Jeremy Hume, British Columbia Fish and Wildlife Branch

A Method for Monitoring and Evaluating Salmonid Habitat, Carrying Capacity for
Natural and Enhanced Oregon Coastal Streams.

John Anderson, Bureau of Land Management, Coos Bay District Office, Oregon

Comparison of Habitat Conditions in Altered and Rehabilitated Reaches of a
Coastal Drainage.

Robert House, Bureau of Land Management, Salem District Office, Oregon

Anadromous Salmonid Enhancement Projects in Northern California: Public and
Private.

Terry Roeloffs, Humboldt State University and Kerry Overton, Sixes National
Forest, California

Stream Rehabilitation on Queen Charlotte Island, British Columbia.

Herb Klassen, British Columbia Fish and Game, Delta, British Columbia

SESSION B-1

Tuesday, July 17, 1984 (afternoon)

Moderator: Jeff Tobolski, Private
Consultant, Seattle,
Washington

ESTABLISHING THE ECONOMIC VALUE OF FISH AND FISH UTILIZATION

Seafood Trade and Value of Fish.

Richard S. Johnston, Department of Agriculture and Resource Economics, Oregon
State University, Corvallis, Oregon

Assessing the Economic Impacts of El Nino in the Northeast Pacific.

David L. Fluharty, Institute for Marine Studies, University of Washington,
Seattle, Washington

Insights from the Market for Limited Entry Permits in Alaska.

Jonathon M. Karpoff, Department of Finance and Business, University of Washington,
Seattle, Washington

Delphi Method: Estimation of Fish Catches and Associated Probabilities for
Planning Purposes.

Jack R. Davidson and Susan K. Miller, University of Hawaii Sea Grant Program

SESSION B-2

Tuesday, July 17, 1984 (afternoon)

Moderator: Jeff Tobolski

ESTABLISHING THE ECONOMIC VALUE OF FISH AND FISH UTILIZATION (Continued)

The Value of Freshwater Fishing in British Columbia.

Roger Reid, Economic and Social Policy Unit, Ministry of Environment, British
Columbia

Valuation of Fisheries Resources: U.S. Forest Service Perspective.

TBA, U.S. Forest Service

A Cooperative Study to Estimate Economic Values of Fisheries in Idaho.

Louis J. Nelson, Idaho Department of Fish and Game

Fisheries Evaluations: A Montana Perspective.

Patrick Graham, Montana Fish, Wildlife and Parks

SESSION C-1

Tuesday, July 17, 1984 (afternoon)

Moderator: Mike Laurs, NOAA,
La Jolla, California

IMPACTS OF EL NINO IN THE CENTRAL AND WESTERN PACIFIC OCEAN

Atmospheric Conditions Over the Equatorial Pacific and West Coast of the
Americas Associated with the 1982-1983 El Nino.

Dr. John Horel, Scripps Institution of Oceanography, La Jolla, California

SESSION C-1 (Continued)

Sea Surface Temperature Distributions in the Tropical Pacific During the 1982-1983 El Nino.

Mr. Forrest Miller, Inter-American Tropical Tuna Commission, La Jolla, California

Ocean Circulation, Heat Content and Thermocline Conditions in the Tropical Pacific During the 1982-1983 El Nino.

TBA

Biological Implications of El Nino off South America.

Dr. Richard Barber, Duke University, Beaufort, North Carolina

Impact of the El Nino on Fisheries in the Western Pacific.

Dr. Ichiro Yamanaka, Tokai University and Japan Fisheries Information Center, Japan

El Nino and Tuna Fisheries in the Pacific.

Dr. James Joseph, Inter-American Tropical Tuna Commission, La Jolla, California

Catastrophic Impacts of El Nino on Invertebrate and Avian Resources Off Peru.

Dr. Vincent Gallucci, University of Washington, Seattle, Washington

SESSION A-1

Thursday, July 19, 1984 (morning)

Moderator: John P. Harville, Pacific Marine Fisheries Commission, Portland, Oregon

CHANGING EXPECTATIONS IN MANAGEMENT OF OCEAN FISHERIES

Pacific Salmon: Changing Expectations of Producers, Harvesters and the Public.
Bill Wilkerson, Director, Washington Department of Fisheries, Olympia, Washington
TBA, Canada Department of Fisheries and Oceans, Vancouver, British Columbia

Groundfish: International Markets, Joint Ventures, and Domestic Industry.
Sarah Hemphill, Trading Company of Alaska/Alaska Contact Ltd., Anchorage, Alaska

Central Pacific Tunas and Billfish: Management of Mixed Fisheries Under Interlocking Jurisdictions.

TBA

Tropical Tunas: Changing National and International Expectations.

E. C. Fullerton, Regional Director, Southwest Region, National Marine Fisheries Service, Terminal Island, California

Guillermo Gomez Sanchez, Mexico Ministry of Fisheries, Mexico City, Mexico

SESSION B-1

Thursday, July 19, 1984 (morning)

Moderator:

MANAGEMENT OF SALMONID HABITAT

Recovery, Growth and Habitat Utilization of Spring Stocked Fingerling Brown Trout (Salmo trutta) in Six Northeast Iowa Streams.

Steve A. Marshall, Iowa State University, Ames, Iowa

Experimental Release of Coho Salmon (Oncorhynchus kisutch) into a Stream Impacted by Mt. St. Helens Volcano.

Peter A. Bisson, Jennifer L. Nielsen and James W. Ward, Weyerhaeuser Company, Tacoma, Washington

The Influence of Water Temperature on Interactions Between Redside Shiners (Richardsonius balteatus) and Juvenile Steelhead Trout (Salmo gairdneri).

Gordon H. Reeves, Fred Everest and Jim Hall, Oregon State University, Corvallis, Oregon

Patterns of Resource Partitioning in Juvenile Coho Salmon/Dolly Varden Communities.

C. Andrew Dolloff, Forestry Sciences Laboratory, Juneau, Alaska

Indigenous Steelhead Trout Populations in the Middle Fork Salmon River, Idaho. Russ Thurow, Idaho Fish and Game, McCall, Idaho

Effects of Boulder Berms on Habitat Structure of a Fifth Order Stream Basin.

James R. Sedell, Fred H. Everest, Lee Benda and Frank Leone, USDA, U.S. Forest Service, Forestry Sciences Laboratory, Corvallis, Oregon

Effects of Woody Debris and its Removal on the Physical Habitat of Anadromous Salmonids, Prince of Wales Island, Southeast Alaska.

Tom Lisle, U.S. Forest Service, Arcata, California

The Influence of Large Organic Debris in Retaining Coho Salmon Carcasses in Small Streams: An Experiment.

Jeff Cederholm, Washington Department of Natural Resources, Forks, Washington

SESSION C-1

Thursday, July 19, 1984 (morning)

Moderator:

CONTRIBUTED PAPERS

Japan's Salmon Culture Program and Coastal Salmon Fishery.

Thomas M. Kron, Alaska Department of Fish and Game, Juneau, Alaska

Status of Oregon Chub (Hybopsis crameri).

Dr. Carl E. Bond, Oregon State University, Corvallis, Oregon

Session C-1 (Continued)

How Fish Respond to Organic Contaminants in the Environment: Uptake and Fate of Materials from Water and the Diet.

D. D. Dauble; R. M. Bean; R. W. Hanf, Jr., and B. L. Thomas, Battelle Pacific Northwest Laboratories, Richland, Washington

Suction Dredge Mining and Anadromous Fish in Canyon Creek, California.

Thomas J. Hassler, Humboldt State University, Arcata, California

Fertilization of Coastal Montane Lakes to Increase Juvenile Cutthroat Trout Survival.

John Werring, University of British Columbia, Vancouver, British Columbia

SESSION A-2

Thursday, July 19, 1984 (afternoon) Moderator:

PERSPECTIVES IN SALMONID MANAGEMENT

A Holistic, Watershed Approach to Salmonid Habitat Management.

David T. Hoopes, R. W. Beck and Associates, Redmond, Washington

Management and Protection of Baja California, Mexico, Trout.

Carlos Yruretagoyena, Direccion de Pesca, Ensenada, B.C., Mexico

My Life with Salmon.

Anthony Netboy, author, Gauges, British Columbia

SESSION B-2

Thursday, July 19, 1984 (afternoon) Moderator:

CONTRIBUTED PAPERS

Monitoring Stream Riparian Vegetation Using Large Scale Color Infrared Aerial Photography.

Michael R. Crouse and Jean Findley, Bureau of Land Management, Vale District Office, Oregon

Artificial Fish Habitat.

Bob Sneitzer, Advanced Products Division, Spirit Lake, Iowa

Summary of the WDAFS Draft Position Statement on Small Scale Hydro Development.

Tom A. Wesche, Wyoming Water Research Center, Laramie, Wyoming and Dudley W. Reiser, Bechtel Group, Inc., San Francisco, California

Western Division
American Fisheries Society

Executive Committee

Officers

Chairman, Stan Moberly, President

Neil Armantrout, President-Elect

James Fessler, Secretary/Treasurer

Don Duff, Immediate Past President

John Rinne, National Nominating Committee

Committee Chairman

Membership Concerns Committee
Chairman, David Bennett

Time & Place Committee
Chairman, Ross Peterson

Membership Committee
Chairman, Steve Grabacki

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Program Committee
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Awards and Nominating Committee
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Audio-Visual Committee
Chairman, Michael L. Johnson

Habitat Inventory Procedures Comm.
Co-Chairman, Bill Helm

Audit Committee
Chairman, Bob House

Water Development & Stream Flow Comm.
Co-Chairman, Tom Wesche

Western Association
of
Fish and Wildlife Agencies
Officers

Dave Narver, President, British Columbia Fish and Game Branch

Robert Salter, Secretary, Idaho Department of Fish and Game

James B. Ruch, First Vice-President, Colorado Department of Game

John P. Donaldson, Second Vice-President, Oregon Department of Fish
and Wildlife

William Geer, (Acting) Third Vice-President, Utah Division of Wildlife
Resources

Western Division Chapter Presidents

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Auke Bay, AK 99821

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727 NE 24th Avenue
Portland, OR 97232

Steve Wolff, President
Dept. of Zoology & Physiology
University of Wyoming
Laramie, WY 82071

Business Meeting

AGENDA

1. Call to Order and Determination of Quorum
2. President's Remarks
3. Introduction of Guests/Comments
4. Secretary/Treasurer's Report, Approval of 1983 Minutes
5. Budget Presentation
6. Chapter Reports
 - Alaska
 - Arizona/New Mexico
 - Bonneville
 - California/Nevada
 - Colorado State University
 - Colorado/Wyoming
 - Hawaii
 - Humboldt
 - Idaho (A. Palouse Unit)
 - Montana
 - New Mexico State University
 - North Pacific International
 - Oregon
 - Portland
 - Sacramento
 - University of Arizona
 - University of Wyoming
7. Committee Reports
 - Audio-Visual
 - Audit
 - Awards
 - Endangered Species
 - Marine Fisheries
 - Membership
 - Membership Concerns
 - Newsletter
 - Nominating
 - Public Lands
 - Riparian Habitat
 - Resolutions
 - Self-Evaluation and By-Laws
 - Student Concerns
 - Time & Place
 - Water Development and Stream Flow
8. Other Business
9. Installation of New Officers

Officer Candidates for 1984-1985

President-Elect

Anthony J. Novotny
Patrick Graham

Vice-President

Delbert G. Skeesick
Donald M. Martin

Secretary-Treasurer

Ellen Gleason
Louis H. Carufel

Representative to Parent Society Nominating Committee

Robert W. Phillips
Jack Griffith

TUESDAY, JULY 17, 1984

Session A-1: Fisheries Technical Session: The Role
of Woody Material in Salmonid Habitat

Moderator: James R. Sedell
USFS, Experiment Station
Corvallis, Oregon

Role of Large Organic Debris as Winter Habitat for Stream Rearing Salmonids.
Mike Murphy, National Marine Fisheries Service, Auke Bay Laboratory,
Auke Bay, Alaska.

Results from an extensive comparison of fish and habitat in streams in old-growth forests with streams in areas logged with and without buffer strips showed that logging increased fry production in summer because of increased production of benthic invertebrates. Survival of fry to smolt size, however, depended on abundance of large organic debris (LOD) in the streams. Buffered streams, because of blowdown, contained more LOD than did old-growth streams and also harbored 50% more smolt size coho salmon in late winter than did old-growth streams. Clearcut streams without buffers, because of LOD removal, contained less LOD than old-growth streams and harbored only half the number of smolt size coho salmon in late winter than was in old-growth streams. Proper management of LOD, therefore, appears to be the key to enhancing coho salmon smolt production after logging. Some sort of buffer strip can be effective in providing short and long term sources of LOD for the stream after logging.

The Effects of Instream Structure on Salmonid Habitat and Populations in
a Coastal Oregon Stream. Robert House and Paul L. Boehne, Bureau of
Land Management, Salem District Office, Salem, Oregon.

Tobe Creek, Oregon was studied in 1982 and 1983 to compare physical and biological differences between a young alder stream section logged and cleaned of large debris 20 years ago and a mature mixed conifer section unlogged and containing large amounts of large woody debris. Stream enhancement techniques, constructed in 1982, were used to stimulate large woody debris in the logged alder section to try to increase salmonid use. Large woody debris intervening the channel developed secondary channels, meanders, pools, and undercut banks in the logged mature conifer stream section, whereas these elements were noticeably missing in the young alder section. The mature conifer section had more than twice as many pools and 10 times the amount of spawning gravel. Salmonid biomass was significantly greater in the mature conifer than the young alder section prior to stream enhancement, whereas after enhancement to significant difference in salmonid biomass was found between stream sections. Prior to enhancement, three times as many coho and trout fry were rearing in the mature conifer stream section. Also, there was a positive correlation between coho numbers and large woody debris interventions, with coho numbers increasing as debris interventions increased. Results of the study reveals that structure is a more important factor than shade in governing a stream's capability of producing salmonids.

The Influence of Stream Habitat Structure on the Foraging Activity of Cutthroat Trout. Peggy A. Wilzbach, J. D. Hall, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon.

The foraging activity of cutthroat trout was documented and compared in adjacent sites of a Cascade Mtn. stream that differed in riparian setting (logged vs. forested) and habitat structure. Differences in microdistribution, seasonal patterns of foraging, and foraging efficiency of the trout were observed. Energetic constraints appear to restrict the trout to specific feeding locations within each site, irrespective of prey distribution. Trout fed actively throughout the winter in the logged site but not in the forested site. Associated with winter feeding were higher drift levels in the logged site that may be resulted from greater sediment instability. At low summer flows, overhead shading and visual obstructions reduced foraging efficiency of trout in the forested site related to the logged site. As shading and visual obstructions provided shelter to fish from predation and/or physical displacement and injury, a tradeoff may be involved in habitat selection between foraging efficiency and risk of mortality.

The Abundance and Role of Large Organic Debris in Juvenile Salmonid in Small Streams in Second-Growth and Unlogged Forests. Glenn B. Grette, Fisheries Research Institute, University of Washington, Seattle, Washington.

Twenty-one sites on small, low gradient (0.5 to 2.0%) streams in second-growth forests (logged 10 to 62 years ago) and seven sites in unlogged forests were studied on the Olympia Peninsula of Washington. The intent of the study was to determine trends in abundance of debris and the role of debris in juvenile salmonid habitat. Stream channel large organic debris (longer than 3 m and greater than 10 cm in diameter) was more abundant and provided more cover for juvenile coho salmon, steelhead trout, and cutthroat trout in unlogged sites than in second-growth sites. Debris increased habitat diversity by aiding the formation of more individual pool and riffle habitats. Debris derived from the second-growth forests accumulated very slowly in the stream channels and comprised 20 to 30 percent of the total volume of debris in the oldest second-growth sites. Debris derived from the pre-logging stands comprised the bulk of stream channel large organic debris in all the study sites. Numbers of juvenile coho in individual pools were not significantly correlated with area of cover during summer low flow. However, coho were observed to be closely associated with debris and other forms of cover during the winter. Numbers of steelhead and cutthroat yearlings were significantly correlated with area of cover during the summer and winter.

Comparison of Habitat Conditions in Altered and Rehabilitated Reaches of a Coastal Oregon Drainage. Robert House, Bureau of Land Management, Salem District Office, Salem, Oregon.

Upper Lobster Creek Drainage, comprising 11,300 acres, contains 10.3 miles of stream in various habitat conditions. Approximately 90% of the drainage has been logged and most streams were sluiced during the 1964 100-year flood event. After this event, most log jams were removed and some stream sections were completely cleared of large woody debris (LWD). The drainage was separated into five habitat categories, including: continuous high gradient ($>3\%$) reaches, reaches cleaned of all LWD; reaches partially cleaned of LWD; a reach partially cleaned of LWD and partially rehabilitated; and reaches never cleaned of LWD. Analysis of instream habitat conditions and summer rearing salmonid populations in these reaches showed direct positive correlations between the increase and/or addition of LWD or rehabilitation structures and fish use.

Anadromous Fisheries Restoration and Enhancement in Northern California: Public and Private Programs. Terry Roeloffs, Humboldt State University and C. Kerry Overton, Six Rivers National Forest.

The anadromous fish resource in Northern California has experienced a two-thirds decline over the last 35 years. The decline has been attributed to habitat degradation due to watershed disturbances (logging, roads, mining, grazing), floods, drought, ocean-currents, impoundments, and to over-harvest of the fish. Federal, state and private non-profit groups have attempted to reverse these declines. The California Department of Fish and Game has awarded almost a million dollars annually for the past three years to private, non-profit groups for a variety of anadromous fisheries enhancement projects. These projects will be reviewed and summarized.

Six Rivers National Forest of the USDA Forest Service initiated an extensive anadromous fish habitat restoration and enhancement program in 1978. The program consists of: 1) identifying major fish producing watersheds historically; 2) conducting watershed inventories to identify factors that are limiting anadromous fish productions; 3) developing a systematic plan to correct those factors; and 4) designing and evaluating techniques to restore and/or enhance anadromous fish habitat and populations.

Instream structures to create spawning areas for King Salmon and rearing habitat for yearling steelhead have been constructed of logs, gabions and large rock. Structures and vegetation have been utilized to reduce stream sedimentation from landslides, old-roads, flood terraces and failing banks. Biological enhancement projects to reestablish populations in spawner-limited streams have consisted of streamside egg-incubation boxes, salmon yearling ponds and salmon smolt enhancement facilities.

Structures to increase spawning habitat have increased gravel areas from 40 to 70%, and currently support from 30 to 90% of the salmon and steelhead spawning populations within the project streams. A two to seven-fold increase in yearling steelhead trout has resulted from rearing enhancement projects. Active and potential stream sediment sources have been reduced.

Stream Rehabilitation on Queen Charlotte Island, British Columbia. Herb Klassen, British Columbia Fish and Game, Delta, British Columbia.

Tandem V-shaped gabion weirs for improving spawning habitat for pink (Oncorhynchus gorbuscha) and chum salmon (O. keta) in landslide-damaged streams were installed and examined in Sachs Creek, Queen Charlotte Islands. Spawner utilization, egg survival, as well as stability and quality of gravels entrapped by the structures were compared to that of natural control sites. Two gabion sites at 1% slope gradient attracted moderate spawner usage within weeks of installation; a third gabion site at a 3% slope gradient was beyond the upstream limit of pink and chum salmon but was utilized by coho (O. kisutch) spawners. Pink salmon egg survival appeared high in the first autumn-winter season after installation (ca. 11% to the "eyed" stage) with improvement anticipated as the gabion sites undergo natural stabilization of streambed configurations. Gravel stability at all three gabion sites was poor over the first winter, and excessive scour threatened the integrity of the upstream, steeper slope gabion site within one year. However, the two gabion sites at 1% slope gradient successfully stabilized gravel over their second season of stormflows through local reductions in streambed slope gradients. The effects of gabions on gravel composition and intragravel permeability were variable. Demonstrated improvements in intragravel dissolved oxygen probably resulted from channel "roughness" added by the gabions. Intragravel dissolved oxygen had a significant ($p < .05$) positive correlation with egg survival. High juvenile coho and steelhead (Salmo gairdneri) densities at the gabion sites (average $1.6/m^2$ compared to $0.9/m^2$ at control sites) indicated high quality rearing habitat as an additional benefit. Achievement of cost effectiveness (recovery of construction costs through increases in returning adult pink salmon) was attainable in gabion sites well utilized by spawners. The stability in streambed configurations provided by gabions in their second year would be useful in rehabilitating low gradient reaches of streams damaged by landslides. Recommendations for gabion installation included restriction to downstream reaches at $< 2\%$ slope gradient where moderate to heavy spawner usage would occur.

Session B-1: Establishing the Economic Value of Fish and Fish Utilization

Moderator: Jeff Tobolski
University of Washington
Seattle, Washington

Seafood Trade and Value of Fish. Richard S. Johnston, Department of Agriculture and Resource Economics, Oregon State University, Corvallis, Oregon.

No abstract submitted.

The Influence of Large Organic Debris on Channel Morphology of Queen Charlotte Island Streams -- Physical Characteristics. Dan Hogan, Department of Geography, University of British Columbia, Vancouver, British Columbia.

In streams large organic debris along two unlogged and three logged gravel bed channels was investigated in a federal provincial program to resolve official forestry interaction conflicts on Queen Charlotte Island. Surveys determined the influence of large organic debris on channel long profile and plan form. All stream reaches had average gradients of less than 3 degrees (5%).

Large organic debris frequently forms steps in unlogged channels, accounting for about 10% of the change in channel bed elevation. In logged channels, large organic debris exerts a minor influence on the longitudinal profile. There are insignificant differences between the number of pieces of woody material per unit area of channel between logged and unlogged reaches but in all cases there are significantly higher volumes of woody materials in unlogged channels. Woody material in logged reaches are usually smaller in size and more mobile. Hence, channels through logged reaches are usually less stable and subject to more frequent classic sediment movements. Large organic debris also exerts a major influence on channel plan form configuration. These include flow diversion, causing channel widening and increases in proportion of riffle area. Pool and riffle characteristics associated with organic debris in logged and unlogged channels will be illustrated.

Session A-2: Aquatic Habitat Improvements

Moderator: Robert House
Bureau of Land Management
Salem District Office
Salem, Oregon

The Effects of Various Stocking Strategies on the Survival and Growth of Headwater Stocked Steelhead. Jeremy Hume, Fisheries Research Section, Fish and Wildlife Branch, Province of British Columbia.

Many coastal B.C. steelhead streams have useable rearing habitat upstream of barriers to adult spawning migration. In 1978 we initiated a study to investigate the feasibility of fry stocking in these areas, as a steelhead enhancement technique. We investigated the effects of stocking density, time of release, size at release, and environmental effects on the subsequent growth and survival of stocked steelhead fry. Best survivals were achieved by release of large fry (4 to 6 g) in early October, after low summer flows but before winter floods and cold water temperatures. Increased stocking density also adversely affected fry survival but there appeared little effect at densities below 0.5 fry/m². Severe fall floods drastically reduced survival of fry stocked at densities >.5 fry/m² but had little effect on fry stocked at .2 fry/m². Overall survival to smolt has proved difficult to determine and may lower than expected (~10%).

Assessing the Economic Impacts of El Niño in the Northeast Pacific.
David L. Fluharty, Institute for Marine Studies, University of Washington,
Seattle, Washington.

Assessing the economic impact of natural events that may influence fisheries is difficult. However, this assessment is of practical value to fisheries managers and to governments from which relief is demanded. The problems of this type of analysis are discussed with respect to salmon fisheries and the impact of the 1982-1983 El Niño. The main conclusion is that economic analysis is hamstrung by the problems of separating biological impacts from natural fluctuations and other factors affecting stocks, yet the gross economic loss justifies significant expenditure in fisheries oceanographic research.

Insights from the Market for Limited Entry Permits in Alaska. Jonathan M. Karpoff, Department of Finance, Business Economics, and Quantitative Methods, School of Business Administration, University of Washington, Seattle, Washington.

Under Alaska's entry limitation program, transferable permits convey fishing rights. Information from permit markets is used to study several key issues regarding the behavior of fishermen and the effects of fishery management policy. I conclude that: (1) expectations of future fishing incomes are the primary determinants of permit prices, (2) Alaska Department of Fish and Game forecasts of fish recruitment are capitalized in permit values, (3) a state program which provides low-interest loan money to some purchasers of permits has coincided with a significant increase in permit prices, (4) the "average memory" of fishermen in projecting future incomes is about 2.5 years, and (5) it is possible to infer the rate at which the markets discount future fishing income flows.

Delphi Method: Estimation of Fish Catches and Associated Probabilities for Planning Purposes. Jack R. Davidson and Susan K. Miller, University of Hawaii Sea Grant Program.

During the past few years fishery development facilities and various management boundaries have been proposed for the Northwestern Hawaiian Islands. Resource potential estimates for the area were available; however, in order to assess the effects of each of the development proposals, estimates of the economic benefits derived from the potential fisheries catches were required. To supplement the limited information on impacts of development on the resources of the area, the Delphi method, an expert opinion technique, was used to estimate expected fisheries catches. Participants in the Delphi were asked to: (1) estimate fisheries catches for eight different species or species categories over a 10-year period; and (2) estimate the probabilities associated with the different trend curves. Expected catch results from the Delphi were less than the resource potential estimates. Since the rationales given for the estimates in the Delphi included the recognition of market factors, it appears that this technique provided more realistic estimates for the assessment of the proposed fishery development alternatives.

ABSTRACT: ECONOMIC ANALYSIS OF FISHERY RESOURCES IN NATIONAL FOREST PLANNING

Both anadromous and resident fish resources are valued in National Forest planning. Anadromous fish provide value in two ways-fish harvested commercially are valued on a per pound basis based on market evidence and the recreation derived from anadromous fish is valued on the basis of willingness to pay for the recreation experience. Resident fishery resources are valued only for the recreation that is provided.

Anadromous fish differ from other resources in that most of the resource utilization occurs away from the National Forests that provide the spawning habitat. This resource use is valued in National Forest planning irrespective of where the use actually occurs. Recreation related to resident fishery resources is valued based on the on-site use. Fishery resource values are included in present net value calculations of National Forest planning alternatives to determine the cost efficiency of the various alternatives

Terry Raettig
U.S.F.S. Regional Economist
Missoula, Montana

Session B-2: Establishing the Economic Value of Fish
and Fish Utilization. (Continued)

Moderator: Jeff Tobolski
University of Washington
Seattle, Washington

The Value of Freshwater Fishing in British Columbia. Roger Reid, Economic
and Social Policy Unit, Ministry of Environment, British Columbia.

This paper reports and discusses the results of a survey of anglers licensed by the Province of British Columbia to fish in freshwater during 1981. The survey questionnaire, sent to 9,946 residents of the province and 9,856 non-residents, asked anglers about their fishing activity during 1981, their associated expenditures and the value that they placed on their experience. The economic values were obtained using the contingent valuation method. The paper describes how the information from this survey is used in fisheries management. The estimates of effort and harvest provide data used in the design of fisheries management plans for each of the eight Environmental Management Regions of the province. Economic values are used as one component in the evaluation of fisheries programs such as enhancement proposals. Fishery resource impacts due to dam construction, forestry, mining, etc., are frequently assessed using these economic values and form one criterion in mitigation-compensation claims against project proponents.

Valuation of Fisheries Resources: U.S. Forest Service Perspective.
TBA, U.S. Forest Service.

No abstract submitted.

A Cooperative Study to Estimate Economic Values of Fisheries in Idaho.
Louis J. Nelson, Idaho Department of Fish and Game.

No abstract submitted.

Fisheries Evaluations: A Montana Perspective. Patrick Graham, Montana
Fish, Wildlife and Parks.

Economics attempts to measure the values human beings place on commodities, resources, and experiences. Certain commodities lend themselves to analysis because they are market goods. Other resources and experiences are more difficult to quantify, but no less valuable. Historically, fish and wildlife agencies have avoided economics for several reasons, including the inadequacy of techniques to measure non-market values. They were left with a sense that fish and wildlife resources could not be protected with economics. To a large degree, I believe this perception is fostered by the misapplication of economics in valuing "market" natural resources, such as timber. I will review the Forest Service 1985 RPA program as an example. I also recommend some areas for improvements in valuing fishing and hunting. Improving measures of non-market goods, such as fishing and hunting, will not alleviate problems in allocation of natural resources. But as fish and wildlife agencies actively enter the arena of resource economics, they will be able better to challenge existing practices and provide viable alternatives.

Session C-1: Impacts of El Niño in the Central and
Western Pacific Ocean

Moderator: Mike Laurs

National Oceanic and Atmospheric Administration
La Jolla, California

Atmospheric Conditions Over the Equatorial Pacific and West Coast of the
Americans Associated with the 1982-1983 El Niño. Dr. John Horel, Scripps
Institution of Oceanography, La Jolla, California.

Excessive rainfall during the 1982-83 along the coasts of Ecuador and northern Peru led to considerable economic hardship within those countries. These regional weather anomalies were but one manifestation of the planetary-scale fluctuations associated with the El Niño/Southern Oscillation (ENSO) episode of 1982-83. The temporal evolution of the 1982-83 ENSO episode will be summarized. The effects of ENSO upon the regional atmospheric circulation along the west coast of South America will be emphasized.

The relationship between the ENSO phenomenon and weather changes along the west coast of North America is complex. Subtle differences in the position and in the intensity of the tropical atmospheric heating may result in substantial differences in the circulation patterns in the mid-latitudes. For example, California received above normal rainfall during the winter of 1982-83 while below normal rainfall was observed in most of California during the ENSO episode of 1976-77. The possible dynamical mechanisms by which the tropical and mid-latitude atmospheres interact will be reviewed.

Sea Surface Temperature Distributions in the Tropical Pacific During the 1982-83 El Niño. Forrest R. Miller, Inter-American Tropical Tuna Commission, La Jolla, California.

Periodically, a large part of the surface layer of the eastern Pacific Ocean warms up abnormally. This is known as the El Niño phenomenon. The anomalously warm sea surface temperatures (SST) appear initially several hundred miles off the west coast of Peru and subsequently spread along and away from the equator and toward the coast of Peru, where normal upwelling is greatly diminished. The warming is often followed by ocean warming along the west coast of North America. The rapid warming of tropical waters occurs most often when the atmospheric and oceanic circulations are displaced from their seasonal positions for periods in excess of six months. When this occurs, especially in the tropics, surface winds decrease, in situ heating of the ocean surface increases, and upwelling along the equator and in the Peru Current near the coast is reduced markedly. Subsequently, nutrient enrichment decreases along the equator and in coastal regions due to weak upwelling and a shift in ocean currents. To fishermen and coastal villagers of South America, notably Ecuador and Peru, El Niño has meant unusually warm coastal waters, red tide, poor fishing, and frequent torrential rains all reaching peak intensities in December. Seafarers have often experienced a southward moving current along Ecuador and northern Peru during El Niño. The current flows counter to the Peru Current, which becomes much weaker than normal, and this "Corriente del Niño" may be an eastern extension of the North and/or South Equatorial Countercurrent.

During July and August 1982 in the eastern tropical Pacific, SSTs increased rapidly to more than 1 degree C. above normal over a large part of the equatorial Pacific between 85 degree W. and 160 degrees W. During September, SSTs continued to increase at greater than seasonal rates, and by October 1982 the warm water reached the coast of Peru, where SSTs were 3 degrees to 4 degrees C. above normal. A large area along the equator between 120 degrees W. and 140 degrees W. also experienced SSTs more than 4 to 6 degrees C. above normal at this time. From November through December 1982, SSTs continued to increase, becoming 5 degrees to 6 degrees C. above normal along the coast of Peru and along the equator centered at 130 degrees W. During the first quarter of 1983, SSTs remained 5 degrees to 6 degrees C. above normal along the coast of Peru. However, along the equator, SST anomalies were gradually reduced to 2 degrees to 3 degrees C. above normal. The SSTs along the coast of Peru from November 1982 to February 1983 were some of the highest on record for an austral summer; and they indicated an absence of any significant coastal upwelling of cold, nutrient rich water. By the end of March 1983, there was an indication that this extensive and unusually warm El Niño would abate somewhat by mid-winter 1983 in the southern hemisphere. However, the ocean and atmosphere circulation did not return to normal conditions and ocean temperatures remained well above normal off South America until December 1983.

The impact of the 1982-83 El Niño on the oceanography and fisheries in the eastern tropical Pacific remains to be determined. However, catches of tuna along the coast of Ecuador dropped dramatically after the El Niño set in along the coast. Anchovy fishing along Peru was markedly reduced also after mid-1982, whereas it had been good during the first half of the year. The El Niño of 1982-83 may have a more severe effect on the fisheries in the eastern tropical Pacific than did the El Niño of 1972-73.

Ocean Circulation, Heat Content and Thermocline Conditions in the Tropical Pacific During the 1982-1983 El Niño. TBA.

No abstract submitted.

Biological Implications of El Niño off South America. Dr. Richard Barber and Francisco Chavez, Duke University, Beaufort, North Carolina.

Time series observations from shore stations and cruises enable us to describe the 1982-83 El Niño with relatively good spatial and temporal resolution. The progression of biological anomalies is clearly related to the sequence of physical changes. This talk will discuss the biological anomalies caused by El Niño. During non-El Niño years, a basin-wide thermocline and nutricline tilt is set up by large-scale trade winds blowing across the Pacific from east to west. This tilt brings both the thermocline and nutricline to a favorable, shallow depth in the eastern boundary and results in relatively high concentrations of surface nutrients. During El Niño, the thermocline and nutricline are progressively depressed along the equator and eastern boundary so upwelling transports smaller and smaller quantities of nutrients to the surface. El Niño affects productivity by decreasing the nutrient supply to the surface. This decrease in the amount of new organic matter available to the food chain causes proportional reductions in the growth of zooplankton, fish, birds, and marine mammals. The losses in biological production in the eastern Pacific are not compensated by enhanced production in the western Pacific because the nutricline oscillation is not symmetrical with respect to the surface. In the eastern boundary, deepening of the nutricline puts high nutrient water below the depth of entrainment by upwelling; in the west, the nutricline may rise, but at its shallowest the nutricline in the western Pacific during an ENSO event remains too deep to make significant enhancement of surface layer productivity. The overall effect of the nutricline anomaly in 1982 and 1983 was a large-scale and ten month long decrease in biological production; the primary production anomaly in the 1982-83 event could have been as large as 1.2 gigatons of carbon not fixed into organic matter. By using the Ryther model of food chain transfer, it is possible to calculate that the growth of marine fish during 1982-83 should be several million metric tons less than the growth during a "normal" year.

Impact of the El Niño on Fisheries in the Western Pacific. Dr. Ichiro Yamanaka, Tokai University and Japan Fisheries Information Center, Japan.

The oceanographic feature of the northwestern Pacific around Japan is characterized as the abnormal cold sea water associated to the cold weather, particularly in the northern part of Japan. This phenomenon is lasting at May this year, even after the El Niño ceased.

The Oyashio made a historical strong southward intrusion along the eastern coast of Honshu in the spring of 1984.

Such cold sea was also experienced in 1963 and 1974, which followed a weak and a strong El Niños respectively.

At the western tropic Pacific, the evident low temperature seen at the 1972 El Niño was not so remarkable.

Fur seal and walrus were found at the Kii Peninsula, southern Honshu, in February 1984. Salmon were found swimming up the river in the same district. Mass mortality of abalone and other shells was reported along the northeastern coast of Honshu, while the catch of the Pacific Krill (E. Pacifica) was high in this district.

El Niño and Tuna Fisheries in the Pacific. Dr. James Joseph, Inter-American Tropical Tuna Commission, La Jolla, California.

No abstract submitted.

Catastrophic Impacts of El Niño on Invertebrate and Avian Resources Off Peru. Dr. Vincent Gallucci, University of Washington, Seattle, Washington.

The effects of El Niño as seen in the nearshore environment of Paracas, Peru (12 degrees South) are reviewed. The catastrophic impacts upon the invertebrate and avian resources are most dramatic and obvious. Mortality, however, is not uniform since some populations undergo dramatic increases. The ecosystem linkages are reviewed as a basis for discussing the impact upon the large artisanal fishery that supplies Lima and other lesser cities with near-shore fish and invertebrates.

THURSDAY, JULY 19, 1984

Session A-1: Changing Expectations in Management of
Ocean Fisheries

Moderator: John P. Harville
Pacific Marine Fisheries Commission
Portland, Oregon

Changing Expectations for Management of Ocean Fisheries, Abstract for Introductory Remarks, John P. Harville, Moderator.

Sweeping shifts in public attitudes and concepts, "megatrends" in the restructuring of human society, major changes in the governance of fisheries resources, and quantum expansions of management purviews and responsibilities all influence public and professional expectations for management of ocean fisheries in the decade of the 1980's.

Today, the educated public accepts the reality of both the ecosystem concept of oceanic food webs and biogeochemical interactions, and the finite limits of the ocean's resources. At least five of John Narsbitt's "megatrends" sharply influence both research and decision-making processes of fishery management: dominance of an information society with implications for quantum expansions in data collection, transfer and interpretation; the trend toward truly participatory democracy with direct public involvement in decision-making; emergence of long-term concerns and objectives vs. short-term "fire-fighting"; multiple options for decision-making rather than simplistic yes or no choices; and a world economy as a marketplace for fishery products.

The Magnuson Fishery Conservation and Management Act (MFCMA) brought the United States in conformance with most of the other nations of the world in establishing national jurisdiction over marine and anadromous fisheries out to 200 miles. It also mandated extensive direct public involvement in a regional fishery management process, which transcended traditionally local controls over ocean fisheries, requiring that, to the extent practical, species be managed as units throughout their geographic range. Finally, MFCMA dramatically expanded the purview and responsibility of fishery managers to promote economic efficiency and reduction of waste in management, and to manage for optimum yield -- to provide the greatest overall benefit to the nation, taking into account relevant economic, social, and ecological factors.

Our panel today will explore new expectations for management of salmon, groundfish, and tuna fisheries, in light of these and other influences upon our research, information transfer, and decision processes.

Pacific Salmon: Changing Expectations of Producers, Harvesters and the Public. Bill Wilkerson, Director, Washington Department of Fisheries, Olympia, Washington; Rob Morley, Canada Department of Fisheries and Oceans, Vancouver, British Columbia.

No abstract submitted.



Alaska Contact Ltd.

TO: John P. Harville
FROM: Sara S. Hemphill
DATE: June 20, 1984

[Handwritten signature]

Re: Changing Expectations For Management of Ocean Fisheries;

Groundfish: International Markets, Joint Ventures, and Domestic Processors.

ABSTRACT

The considerations that prompt fisheries management decision-making in 1984 are not the same ones that motivated decisions in 1976 with the passage of MFCMA. This change has been a gradual one and the situation is still dynamic. Decisions today are based, more and more, on considerations of both the private and national pocketbooks, rather than on historic Law of the Sea principles. While conservation of the resource is still a primary concern today, the motive behind conservation is different from what it was five years ago. We conserve today to insure there is a resource to exploit tomorrow, rather than conserving in order to maintain an historically-balanced ecosystem.

These shifts in thinking on the part of the decision-makers are a result of several developments, and they will necessitate a change in the information base the decision-makers are going to require, in the decade ahead. The focus is toward economically oriented considerations. For example, while social issues continue to be a concern; it is the economic self-sufficiency of shoreside communities that is of primary concern today rather than maintenance of life style.

Decline of the crab and shrimp fisheries has forced the domestic industry to look to other species. The harvesting sector has been the first to respond to this phenomenon. When domestic processors were unable to provide markets for groundfish, the fishermen encouraged the development of joint fishing ventures with foreign processors. In five years a whole new industry has developed; and, it is changing and evolving daily.

As we move into the last half of the 80's, the management decisions for fisheries will become more and more complex and difficult because we will be allocating access to the resource among U.S. citizens. Heretofore, the majority of the allocation decisions have been choices between American fishermen and foreign fishermen. In the coming months, allocation decisions will consider domestic users and potential users, throughout the range, from fishermen all the way to the consumer and the peripheral industries. Joint ventures have presented one of the first major challenges to fishery managers: how to balance the benefit to one segment of our society against the detriment to another.

Should the halibut resource be rebuilt to record levels, or should growth of that fishery be traded off somewhat to encourage the developing trawl fishery?

Should the foreign operators be thrown out completely and domestic harvesters deprived of an immediate market? Will this force the foreign markets open to the U.S. processors? Can we expect to reshape the foreign market to our requirements?

Also, while many of the same players are still involved, their use of the process has changed because their needs have changed. Furthermore, there are many new players who approach the situation with totally different perceptions and needs from those who have been involved all along.

New product, such as surimi, tailored to the expanding U.S. market, is a break through that has dramatically influenced the existing industry and its perception of the options. It should make possible the full domestic utilization of fish harvested, as well as full commercial utilization of all species.

Decision-makers are going to be looking for more economically-oriented materials to guide and support their actions. Regional considerations are going to be weighed in the light of national concerns. Single species management, such as we have had in halibut, is, I predict, an anachronism. Fishery management decision-making will become less regional and more complex; there are no easy answers. An appropriate information base will be critical in the decade ahead.

REGIONAL COOPERATION: THE KEY TO THE
FUTURE MANAGEMENT OF TROPICAL TUNAS

Abstract for Remarks by

E. Charles Fullerton
Southwest Regional Director
National Marine Fisheries Service

The negotiation and ultimate adoption of the Costa Rican agreement are interim steps toward achieving regional cooperation in the international management of the eastern tropical Pacific Ocean tuna resources. Although not all Latin American coastal states are in full agreement with the accord, the U.S. remains firmly committed to the principle that tunas can be effectively managed only through an international arrangement that covers the various species throughout their range.

The new Costa Rican agreement is a positive step toward reinstating regional authority for the conservation and management of eastern tropical Pacific tunas. Upon entering into force, it will replace the Inter-American Tropical Tuna Commission, authorized by the Tuna Conventions Act of 1952, with a council and charter that recognize coastal state sovereignty while providing for access to tuna resources within the 200-mile economic zones of neighboring coastal states. The council will be responsible for issuing regional licenses and distributing receipts from license fees among member states proportionally to the amount of tuna harvested from their respective 200-mile economic zones.

Once in operation, the new council must begin the task of developing a more permanent international arrangement that addresses researching optimum yields and annual allowable harvests, allocation of these harvests, and international enforcement of its regulations. Despite its political shortcomings, the past success of the Inter-American Tropical Tuna Commission demonstrates that an international management regime for highly migratory tunas can be achieved.

With the establishment of a system for coastal state compensation and allocation, a new management framework may exist that would have implications for achieving regional agreements in other oceans. The successful implementation of such schemes, however, will require compromise to achieve the full cooperation of scientists, managers, industry and governments to extract maximum benefits from one of the world's most valuable fishery resources.

SOME CONSIDERATIONS ON THE MEXICAN POSITION
REGARDING THE CONSERVATION AND MANAGEMENT -
OF TUNA RESOURCES IN THE EASTERN PACIFIC -
OCEAN.

By Guillermo Gómez.

ABSTRACT

The author presents some views on the mexican position regarding the establishment of a conservation and management regime for the Eastern Tropical Pacific tuna fishery. Emphasis is placed on a description of the most recent developments in which Mexico has been actively participating for the establishment of a new management regime for the tuna resources of the region.

Groundfish: International Markets, Joint Ventures, and Domestic Industry.
Sarah Hemphill, Trading Company of Alaska/Alaska Contact Ltd., Anchorage,
Alaska.

No abstract submitted.

Central Pacific Tunas and Billfish: Management of Mixed Fisheries Under
Interlocking Jurisdictions. TBA

No abstract submitted.

Tropical Tunas: Changing National and International Expectations. E. C.
Fullerton, Regional Director, Southwest Region, National Marine Fisheries
Service, Terminal Island, California; Guillermo Gomez Sanchez, Mexico Ministry
of Fisheries, Mexico City, Mexico.

No abstract submitted.

Session B-1: Management of Salmonid Habitat
Moderator:

Recovery, Growth and Habitat Utilization of Spring Stocked Fingerling Brown
Trout (Salmo trutta) in Six Northeast Iowa Streams. Steve A. Marshall, Iowa
State University, Ames, Iowa; Bruce W. Menzel, same address.

We investigated the relative merits of two methods of stocking in marginal trout waters: spot-stocking, whereby a large number of fish are introduced at one site, and scatter-stocking, whereby fish are introduced in smaller numbers over a length of stream. This study was also designed to provide baseline data concerning trout habitat requirements in the Midwest. In May 1983, three streams were spot-stocked, and three were scatter-stocked, each with 1200 brown trout. In June and September 1983, and March 1984, trout were collected by electrofishing from eight 0.1 km study sections in each stream. A habitat survey was conducted in the scatter-stocked streams in July. A chi-square test performed on the data from the first collection in June showed that spot-stocked fish did not form a normal distribution around the stocking point. Recovery and growth of stocked fingerlings at age one was similar in the two stream groups. Multiple correlation analysis indicated that percent cobble substrate, mean depth, overhanging vegetation and water type accounted for 84% of the variation in trout biomass in scatter-stocked streams. The data from this study indicate that spot or scatter stocking produces no difference in the number of fish recovered or in growth of fish. Therefore, the most economically efficient method, spot-stocking, should be used for marginal trout waters in Iowa.

Indigenous Steelhead Trout Populations in the Middle Fork Salmon River, Idaho.
Russ Thurow, Idaho Fish and Game, McCall, Idaho.

The Middle Fork Salmon River is one of the two major Idaho rivers which sustain wild steelhead runs unaltered by introduction of non-indigenous stocks. During the last decade, dams on the Columbia and Snake rivers have severely reduced survival of migrating steelhead and Middle Fork spawning escapements diminished significantly. Consequently, since 1974, the Middle Fork has been closed to steelhead fishing in an attempt to restore the wild stock.

Status of wild steelhead was evaluated in fourteen tributaries to the Middle Fork from 1981 to 1983. Harvest of wild stocks was monitored in the main Salmon River. Emphasis was directed on collection of data to assist future management in restoration of wild stocks.

Middle Fork steelhead appear to be most similar to "B" stock Columbia River fish. Electrophoretic analysis suggest that the steelhead are similar to other inland summer steelhead populations sampled in the Snake River basin. The data illustrates that locally isolated populations may exist within the Middle Fork drainage.

A majority of the drainage lies within the River of No Return Wilderness and most of its aquatic habitat is in a pristine condition. More than 560 km of stream are accessible in the twelve tributaries supporting viable steelhead populations. Current rearing densities of age I and older juvenile steelhead are insufficient to seed the available rearing habitat. The stock recruitment relationships between spawner escapements and resultant rearing densities suggest that larger escapements would result in increased numbers of juvenile steelhead until an optimal level was attained. Full seeding of rearing areas would result in maximum production of smolts.

Adult steelhead destined for the Middle Fork remain in the Salmon River for several months prior to a spring spawning migration into the Middle Fork and tributaries. The fish are susceptible to an intensive mixed-stock sport fishery in the Salmon River, and wild steelhead exploitation rates have exceeded 50% in recent years.

In September 1982, a differential harvest regulation based on a dorsal fin measurement was instituted. As a result, anglers have harvested a maximum number of hatchery reared steelhead, while releasing most wild steelhead destined for the Middle Fork.

Several factors will influence the restoration of wild steelhead populations in the Middle Fork-Salmon River drainage. These encompass: the regulation of sport and non-sport mixed stock fisheries, the improvement of migrant fish passage through downstream dam projects, and the maintenance and restoration of quality habitats within the Middle Fork system.

inhabited areas similar to those inhabited by trout in the other streams. Habitats occupied by shiners in the presence of trout (intermediate temperatures) differed significantly from those occupied in allopatry.

Water temperature and the presence of the other species influenced production and habitat distribution in laboratory streams. Production by steelhead trout was 2.5 times greater at cool water temperatures (12-15 C) than at warm temperatures (19-22 C). At warmer temperatures, production by trout was 2 times greater in the absence than the presence of redbside shiners. Production by trout was not affected by the presence of shiners at cool temperatures. Production by shiners was 2.5 times greater at warm temperatures than at cool temperatures, but decreased by an average of 13% in the presence of trout at warm temperatures. At cool temperatures, production by shiners was more than 6 times greater in the absence than the presence of trout. Distribution of trout was not affected by shiners at cool temperatures but was more restricted at warm temperatures. Distribution of shiners was not affected by trout at warm temperatures but was more restricted at cool temperatures.

Results from this study indicate the need to consider the cumulative impact of land management activities on water temperature and on the composition of the fish community.

Patterns of Resource Partitioning in Juvenile Coho Salmon/Dolly Varden Communities.
C. Andrew Dolloff, Forestry Sciences Laboratory, Juneau, Alaska.

This study examined the microhabitat preferences and resource partitioning mechanisms used by juvenile coho salmon and Dolly Varden in southeast Alaska streams. Two coho and three Dolly Varden age classes were studied in four small (<2 m wide) streams on Prince of Wales Island.

Coho occupied midwater positions that they defended from other fish. Dolly Varden were more closely associated with the stream bottom and were largely non-territorial. For each species, the depth of water, depth of focal point and distance to nearest fish increased with fish size, while the distance to nearest cover decreased with increasing fish size. Most fish selected focal points having water velocities between 0.0-9.0 cm/second. Wood debris was the most frequently used cover type and most fish occurred over gravel substrates ranging from 2-100 mm in particle size diameter.

Analysis of stomach contents showed that coho selected most dietary items from the drift whereas Dolly Varden primarily exploited benthic prey. Prey item size appeared to be allocated according to fish size, with larger fish capturing larger items but large fish also utilized prey from the small end of the prey size spectrum.

Discriminant analysis showed that depth of focal point, depth of water, distance to nearest fish, and distance to nearest cover were the most important variables accounting for discrimination of the five species-age class groups. The primary separation occurred between species with the various age classes occupying distinct positions along gradients of resource use. Discriminant analysis using species as groups and incorporating the proportion of diet from terrestrial sources as an independent variable revealed that dietary differences also contributed to group separation. Segregation was apparently more of the selective as opposed to the interactive type.

Experimental Release of Coho Salmon (*Oncorhynchus kisutch*) into a Stream Impacted by Mt. St. Helens Volcano. Peter A. Bisson, Jennifer L. Nielsen and James W. Ward, Weyerhaeuser Company, Tacoma, Washington.

The May 18, 1980 eruption of Mt. Saint Helens caused catastrophic disturbance to the Toutle River and many of its tributaries, resulting in the nearly complete elimination of fishes in the upper watershed. We studied the ability of Hoffstadt Creek, a North Fork Toutle River tributary, to rear juvenile coho salmon during the summer and fall of 1983. Hoffstadt Creek has a drainage area of 33 km² and is located on the edge of the blast zone where trees were either blown down or left standing and dead. The area received a thick layer of volcanic tephra, which continues to erode and provide fine sediment to the stream. In addition, Hoffstadt Creek experienced a large debris torrent in December 1981 that scoured the channel to bedrock in many places. With the exception of a single age 4 cutthroat trout, no fish were discovered in the stream in 1983.

The poor habitat conditions that existed in Hoffstadt Creek provided an opportunity to examine the ecological resiliency of coho salmon in streams. The absence of topographic shading and trees in the riparian zone resulted in temperatures that reached 27 degrees (80 degrees F) and exceeded the Washington State "temperature sensitivity" threshold of 15.6 degrees (60 degrees F) on 47% of the days during which temperature was monitored (August-October). Pool habitat was scarce and comprised only 27% of the study area, while low gradient riffles and cascades were the dominant habitat types. Large wood debris was nearly absent from the channel and the only abundant cover consisted of boulders.

Despite the apparently unfavorable environment, survival and growth of coho in Hoffstadt Creek in summer and early fall were surprisingly high. Approximately 15,000 hatchery coho fry (Cowlitz River stock) were planted in a 1.1 km long study reach (5,860 m²) on June 22, 1983, and censused in mid-August and late October. Although the fish were free to leave the study area, an estimated 7,700 remained in the reach in August and 7,300 were still there in October. Average population biomass declined from 5.76 g/m² at stocking to 3.69 g/m² in mid-August and then rose to 5.98 g/m² in late October. Instantaneous growth rates were twofold higher during the August-October interval than during the June-August interval. Condition factors ranged from an average of 1.02 in summer to 1.17 in fall. Total production of coho in Hoffstadt Creek was similar to production estimates of coho that have been reported in the literature from other Pacific Northwest streams. Suggested explanations for the relative success of coho in Hoffstadt Creek during summer and fall included lack of competitors and predators, and an abundant supply of terrestrial invertebrates from vigorous herbaceous vegetation next to the stream.

The Influence of Water Temperature on Interactions Between Redside Shiners (*Richardsonius balteatus*) and Juvenile Steelhead Trout (*Salmo gairdneri*).

Gordon H. Reeves, Fred Everest and Jim Hall, Oregon State University, Corvallis, Oregon.

Water temperature influenced interactions between redside shiners and juvenile steelhead trout (>1+) in the field and the laboratory. Habitat distribution of the two species was determined in three streams with different temperature regimes. Trout distribution was the same in allopatry (cool temperatures) and sympatry (intermediate temperatures). Shiners in allopatry (warm temperatures)

Effects of Boulder Berms on Habitat Structure of a Fifth Order Stream Basin.
James R. Sedell, Fred H. Everest, Lee Benda and Frank Leone, USDA, U.S. Forest Service, Forestry Sciences Laboratory, Corvallis, Oregon.

Fish Creek is a fifth order stream that drains a 106 km² basin. The channel gradient is steep throughout the anadromous fish zone, generally exceeding 5% except for the lower 6 km where gradients average 2%. The steep gradient and volcanic geology create a stream with predominantly riffle environment and boulder substrates.

Twenty-one boulder berms constructed on Fish Creek and Wash Creek in 1983 made significant changes in the overall habitat structure of the stream. The berms were designed primarily to enhance spawning habitat for chinook salmon. Each berm that spanned the stream functioned as a low dam that initially created pool habitat. A total of 18 berms created pool habitat totaling 5,763 m² and 2,644 m³. Average depth of pools at low flow was 0.43 m. Construction of the berms increased pool habitat for the entire anadromous fish reach of Fish Creek by about 24% and reduced total riffle habitat by about 2%. The increased pool area enhanced the preferred habitat available to 1+ steelhead. The increased pool area and volume created by the berms will slowly develop into spawning habitat for chinook as the pools fill with bedload gravels.

Effects of Woody Debris and its Removal on the Physical Habitat of Anadromous Salmonids, Prince of Wales Island, Southeast Alaska. Tom Lisle, U.S. Forest Service, Arcata, California.

The effects of woody debris on substrate composition, debris dam frequency, pool dimensions, and mean hydraulic variables were investigated by comparing low-gradient (1 to 9 percent) first or second order streams flowing through either spruce-hemlock forests or 6-to-10 year-old clearcuts on Prince of Wales Island, Southeast Alaska, and by observing changes after selectively removing debris from clearcut reaches. Greater volume and surface area of woody debris in clearcut streams produced greater storage of fine sediment (<4 mm in diameter) unless stream gradient was sufficiently high to flush sediment from storage. One half of the debris dams broke up or were newly formed over a three year period, and thus most dams released sediment and woody debris before debris-dammed pools providing living space for anadromous salmonids were filled. Debris dams, ponding water in pools upstream of shallow riffle crests or rock steps, were more frequent in clearcut streams (16/100 m) than in forested streams (4.2/100 m). As result, total residual pool length (when pools are filled but there is no flow) and length of channel with residual depth greater than 14 cm (depth range found by Dolloff (1983) to be favored by coho salmon (*Oncorhynchus kisutch*)) were greater in clearcut streams (54 percent and 50 percent, respectively) than in forested streams (33 percent and 29 percent). There were no significant differences, however, in pool frequency or mean residual pool depth. Woody debris creates large scale roughness which decreases the rate of shallowing as discharge decreases, thus helping to preserve living space at critical low flow periods. At a given discharge, friction and mean depth were greater and mean velocity less in streams with more debris (clearcut) than with less (forested).

Woody debris removal decreased debris covered area, debris dam frequency, and hydraulic friction in some cases, but in others they were unaffected or recovered within two years after erosion and adjustment of the streambed. There were also no consistent differences in pool dimensions between treated and untreated clearcut

Suction Dredge Mining and Anadromous Fish in Canyon Creek, California.

Thomas J. Hassler, California Cooperative Fishery Research Unit, Humboldt State University, Arcata, California.

The popularity of the suction dredge for use in gold mining has increased greatly in recent years. The effect of dredge mining on anadromous fish and habitat is poorly understood and there is a need to assess its impacts. The Unit has been studying suction dredge mining in relation to stream invertebrates, and growth, relative abundance, and spawning habitat of anadromous salmonids along with the physical environment in Canyon Creek, California. The lower 13 miles of Canyon Creek and its tributaries are the only areas currently being suction dredge mined. In 1980 nineteen locations were dredged, in 1982 seventeen and in 1983 seven. High stream flow and low gold price probably accounted for the low number of dredges in 1983.

Suction dredge mining in Canyon Creek is permitted from June 1 to September 15. Miners are permitted to dredge until October 15 on tributary creeks. The maximum regular permitted dredge intake hose size is six inches; however, an eight inch dredge is being operated by special permit. The Canyon Creek drainage has been actively mined for over 100 years for gold, and later, quartz. Dredging operations are concentrated on the upper road accessible stream areas. This is due to the deep layers of overburden in lower stream reaches that must be displaced to access the gold. For small suction dredges, such work is economically unfeasible.

Gold is found near bedrock, or is associated with a manganese-iron mud layer. This soil layer is often extracted and sold for the gold dust contained within it. Gold samples assayed from Canyon Creek have been found 92 to 94 percent pure, making it a desirable ore to mine.

Canyon Creek is an important spawning and nursery stream for king salmon and steelhead trout and limited habitat for silver salmon. Other species present include: brown trout, resident rainbow trout, Klamath small scale sucker and speckled dace. Canyon Creek provides limited habitat for adult summer steelhead and spring king salmon.

Initial data from Canyon Creek indicates that recent dredge operations has created spawning habitat for salmon and steelhead and rearing habitat for juveniles. However, dredging has caused silting of runs and pools immediately below dredge sites. The spawning habitat that has resulted from dredging was still being used three years later. The rearing habitat, deep cone shaped holes up to eight feet deep, is used by juveniles after the dredge moves, but only during the current season as most holes are filled by gravel transport during the next winter. The silted areas are flushed during the winter so that by the following summer sediment in those areas is not a problem. Alteration in benthic invertebrate communities are usually localized, and associated with changes in the degree of embeddedness of cobbles and boulders in sand or silt. The invertebrate community usually recovers in one to three months.

Japan's salmon returns. Success of the salmon enhancement program is credited to the strong support given by the government and fishermen and to the technical expertise the Japanese have achieved in the field of chum salmon enhancement. In future years, increasing emphasis will be placed on cherry (O. masou), pink (O. gorbuscha) and sockeye (O. nerka) salmon enhancement as well as salt water net pen rearing of cherry and coho (O. kisutch) salmon to market size.

Status of the Oregon Chub (*Hybopsis crameri*). Dr. Carl E. Bond and James J. Long, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon.

The Oregon chub (*Hybopsis crameri*), which was once present at many sites in the Umpqua and Willamette drainages, does not appear to have as wide a distribution as it formerly had. Of 16 sites in the Willamette system where the Oregon chub was present prior to 1970, only three now have populations of the species. Two new sites have been discovered in recent years in the North Santiam drainage. In the Umpqua system, five of nine historical collection sites now have chub populations. No new sites have been discovered.

How Fish Respond to Organic Contaminants in the Environment: Uptake and Fate of Materials from Water and the Diet. D. D. Dauble; R. M. Bean; R. W. Hanf, Jr., and B. L. Thomas, Environmental Sciences Department, Battelle, Pacific Northwest Laboratory, Richland, Washington.

Current and planned energy technologies in western regions produce liquid fuels or solid and liquid wastes that may be disposed to aquatic environments. These materials contain residual organic compounds known to be toxic and which may be accumulated in aquatic food chains leading to man. Our studies dealt with the fate of compounds that are associated with a broad range of energy technologies and which, because of their persistence and/or mobility in the environment, could pose a potential hazard to human health.

Recent efforts at PNL have compared the uptake, tissue distribution, metabolism, and elimination of radiolabelled quinoline when taken up via the water and in the diet. Quinoline was accumulated rapidly from the water and was readily metabolized by rainbow trout. In subsequent experiments, feeding studies with radiolabelled quinoline were conducted with trout. Tissue distribution, as a result of uptake from the diet, differed from those obtained from direct water uptake; however, the gall bladder was the major storage site for both routes of uptake. Concentrations of parent compound plus metabolites in edible portions of trout were relatively low, but elimination from these tissues was slow.

Our results indicate that elevated concentrations of contaminants in prey organisms may present a significant route of uptake for predators such as rainbow trout. Although fish are usually the organism of concern in bioaccumulation studies because of their position in aquatic food webs, assessment of ecological hazard from organic contaminants should include knowledge of the fate of contaminants in other ecosystem components. This knowledge should include food chain transfer mechanisms and factors influencing adaptive metabolic processes.

reaches. Comparisons of habitat in forested and clearcut streams and the high density and production rates of juvenile salmonids in debris-influenced habitats (Dolloff, 1983) suggest that debris removal from clearcut streams would reduce salmonid carrying capacity to natural conditions in the short term. Retention and natural reformation of debris dams in treated reaches prevented the expected deterioration of habitat, but increased exports of woody debris may hasten the eventual depletion of debris before riparian trees grow and furnish new supplies of debris to the clearcut streams.

The Influence of Large Organic Debris in Retaining Coho Salmon Carcasses in Small Streams: An Experiment. Jeff Cederholm, Washington Department of Natural Resources, Forks, Washington; N. P. Peterson, Washington Department of Fisheries.

Twenty marked coho salmon (*Oncorhynchus kisutch*) carcasses were placed in each of 9 small streams near Forks, Washington, on the upper Olympic Peninsula Coast. The distribution of these carcasses, within the 500 meters of stream below the release site was followed over a four week period.

The 500 m study reaches had a mean channel width of 10.8 m, and an overall mean channel wetted area of 5,340 m². The large organic debris (LOD) loadings in the study reaches ranged between 1.28 and 5.04 pieces per 100 m² of channel wetted area.

One week following the initiation of the experiment a total of 78 carcasses were found in the nine study reaches. Of these carcasses, 62 (80%) were found in the first 200 m downstream of the release site. A positive trend was observed between the number of LOD pieces per 100 m² and the number of carcasses located (linear correlation coefficient $r = 0.611$).

An additional finding of this experiment was the rapid consumption of the experimental carcasses by animals. After one week, 6% of the located carcasses had been partially consumed by animals, 77% after the second week, and 94% had been consumed by scavengers after the fourth week.

These experimental findings point out the influence of LOD in retaining salmon carcasses in small streams.

Session C-1: Contributed Papers
Moderator:

Japan's Salmon Culture Program and Coastal Salmon Fishery. Thomas M. Kron, Alaska Department of Fish and Game, Juneau, Alaska.

The Japanese salmon culture program and coastal salmon fishery were examined between April 1983 and March 1984. A variety of interesting equipment and techniques for adult capture, egg takes, fish and egg transport, incubation, rearing and release were observed at the 123 hatcheries and 76 egg take stations visited. A record salmon return (coastal catch + returns to the rivers) of an estimated 36 million fish occurred for the 1983 season. Chum salmon (*Oncorhynchus keta*) represented approximately 91% of the return. The catch in the coastal fisheries of Hokkaido Island and parts of Honshu Island was more than twice the historic peak of the late 1800's. Fish traps are the most commonly used gear type employed in the coastal salmon fishery. Hatcheries produce more than 90% of

Fertilization of Coastal Montane Lakes to Increase Juvenile Cutthroat Trout Survival. John Werring, University of British Columbia, Vancouver, British Columbia.

Several large limno-coralls were fertilized with inorganic fertilizers (NH_4NO_3 and $(\text{NH}_4)_2\text{PO}_4$) at concentrations of $\text{PO}_4\text{-P}$ in the range of 20ugl^{-1} and an N:P ratio of 30:1. Responses of the phytoplankton, zooplankton and fish communities were monitored for five months during the summer of 1982. Phytoplankton showed an average 7-fold increase in biomass over controls. Zooplankton response was on the order of a 4-fold increase in biomass. Fish netted from each of the enclosures had significant differences in their gut contents. Fish from the fertilized enclosures had their guts full of zooplankton, while fish from unfertilized enclosures contained very few plankton and some insects. Results are quite preliminary at the moment.

Session A-2: Perspectives in Salmonid Management.
Moderator:

A Holistic, Watershed Approach to Salmonid Habitat Management. David T. Hoopes, R. W. Beck and Associates, Redmond, Washington.

Fishery biologists concerned about adverse impacts to fish habitat and the influence such impacts have on fish populations will do well to extend their concerns beyond the riparian zone. Many do, and among them are those who recognize the importance of careful watershed management. What is not as widely accepted, however, is the fact that fishery biologists and managers simply have to become more actively involved in watershed or basin management if stream habitat is to be protected or restored. Our working definition of habitat is often too restricted to include many of the most influential factors governing fish populations; namely, those land uses and developments that affect water quality and quantity, both before and after water reaches our streams and rivers. Many institutional constraints are perceived as effectively deterring fishery biologists from actively participating in watershed management. The most influential of all, however, may stem from the conservatism within our own profession. Participation in watershed management may be accomplished in ways that can be effective while not jeopardizing professional standing. But stepping up on the stream bank, and beyond, means walking into a somewhat foreign environmental filled with economic, social and political considerations heretofore usually avoided if at all possible. Entering these areas, however, can provide new and effective opportunities to work successfully for resource protection and management.

Management and Protection of Baja California, Mexico, Trout. Carlos Yruretagoyena, Direccion de Pesca, Ensenada, B.C., Mexico.

The trout of Baja California are unique forms indigenous to the mountains of the Baja peninsula. Carlos is very active in studies on these trout and trying to improve management. His paper will discuss the distribution and habitat of the trout, and some of the problems and opportunities for maintaining existing populations.

My Life with Salmon. Anthony Netboy, author, Gauges, British Columbia.

Anthony Netboy is a noted author who has published five books on salmon. He first became interested in salmon in 1952 when he was hired by the Bonneville Power Administration to study the problems of developing the Columbia River's hydroelectric potential. Since then he has continued his research, travelling throughout the world where salmon are found. He will discuss highlights of his experience in studying salmon throughout the world.

Session B-2: Contributed Papers.

Moderator:

Monitoring Stream Riparian Vegetation Using Large Scale Color Infrared Aerial Photography. Michael R. Crouse and Jean Findley, Bureau of Land Management, Vale District Office, Vale, Oregon.

In semi-arid climates such as southeastern Oregon, streamside riparian vegetation plays a critical role in maintaining water quality and providing habitat for desert trout and many terrestrial wildlife species. Large scale color infrared aerial photography is being used by the Bureau of Land Management in Vale, Oregon, to monitor the effects of livestock grazing on stream riparian habitats. Approximately 150 miles of stream have been photographed at a scale of 1:2000 with repeat photos to be acquired on a five to ten-year cycle. Measurements are made to determine existing cover of woody and herbaceous vegetation in the riparian zone using a computerized mapping system. Changes in riparian vegetation composition and stream morphology detected by aerial photography will determine subsequent management actions.

Artificial Fish Habitat. Bob Sneitzer, Advanced Products Division, Spirit Lake, Iowa.

Heavy fishing pressure and tendencies toward fish overharvest in some waters, have emphasized the need to optimize fish habitat management and game fish production. Artificial habitat can increase niche utilization, concentrate game fish, and increase the carrying capacity of certain waters. A new tool for fisheries habitat improvement projects is to use discrete habitat modules placed in quantity in specified areas. Habitat modules made from extruded polypropylene simulate aquatic plants, are easy to place and have the capability to increase niche utilization and underwater cover potential for a variety of game fishes. The modules rapidly colonize with periphyton and blend unobtrusively into the underwater environment. They have the potential to provide cover for baitfish and to attract game fish. Module construction allows standardized comparisons in varied environs to compare management efforts. Modules are easily handled and the length of filament may be adjusted, within limits, to allow suitable placement in a variety of depths and situations.

Summary of the WDAFS Draft Position Statement on Small Scale Hydro Development. Tom A. Wesche, Wyoming Water Research Center, University of Wyoming, Laramie, Wyoming and Dudley W. Reiser, Bechtel Group, Inc., San Francisco, California.

Since 1982, the Water Development and Streamflow Committee of the WDAFS, chaired by Mr. Wesche and Dr. Reiser, has been working to develop a position statement for the Division on small scale hydro development. The objective of this presentation will be to provide: 1) background information on the subject; 2) a brief summary of the position statement; and 3) a mechanism whereby the membership can begin to respond to the content of the statement.

PACIFIC SALMON ISSUES: A LONG-TERM APPROACH

Salmon issues: they never become simpler and never end; they seem to increase exponentially for, as we solve one, more appear and the one we thought we solved bobs up later. If only the resource were as prolific! But surely the proliferation of issues is to be expected with any resource or commodity that is in short supply and that people cherish. Our Pacific salmon have been a part of the lives of Pacific Northwest people as long as people have lived here and they are no longer abundant enough to satisfy everyone.

THE SCOPE OF SALMON ISSUES

Most people look at anadromous salmonid (let's include steelhead) issues as they have understood the issues from their experience and as they expect to be affected by changes. Some see their income or recreation declining. Some are concerned about loss of a natural resource, others are outraged at apparent loss of their rights or heritage. Still others, for whom water is important, oppose reservation of water for the fish. The issues span a gamut of emotional, economic, political, legal, ecological, biological, administrative, and financial problems. Most people are concerned with problems of the moment but most issues are dynamic, recurring yet changing year after year.

The increasing public debate about salmon issues in the United States has expanded to a new forum because of the administrative requirements of the Fishery Conservation and Management Act of 1976. This Act provided a national program for all marine and anadromous fisheries. It included establishment of Regional Councils with responsibility for preparing fishery management plans in accordance with national standards, with participation by all concerned agencies, and with mechanisms for receiving advice from all interested parties. The salmon issues have proven to be major concerns of the Pacific and North Pacific Councils.

But as professional fishery scientists, we have a special and more demanding role. Our employers expect us to identify fundamental problems and recommend solution of issues regardless of whether they are "scientific". This requires an understanding of the many kinds of problems in each issue, anticipation of future problems, and knowledge of how such value-studded issues are settled in our society.

THE IMMEDIATE ISSUES

Most attention is focussed on the recurring issues that preoccupy the agencies every year. These are about regulations that restrict participation in the fisheries, or allocate catches among participants, or set quotas on catches, or prescribe when and where and by what means fish may be pursued. The participation and allocation issues are usually at the forefront because they embody aspects of equity and touch the

ACKNOWLEDGEMENTS: I am indebted to Donald R. Johnson, Richard, B. Thompson, and Robert L. Wilbur for many comments on early drafts of this manuscript.

lives of all fishermen as catches are divided between Canada and the United States, Indians and non-Indians, commercial and recreational fishermen, and among the different kinds of gear. Added to these issues are questions about boundaries of fishing areas, mixed stock fishing, and "inside" versus "outside" fishing which always include a mixture of conservation and equity problems.

Such immediate issues are dealt with in public hearings, if not in the courts in time for each fishing season to commence. All too often, the cycle of management recommendations, public hearings, revisions of regulations, promulgation, enforcement, monitoring, and in-season adjustments is an annual exercise in crisis management, although we like to believe that it is better than just trial and error.

A superficial identification of immediate issues was made by The U. S. Congress in the Findings of Public Law 96-561, an Act of 1980 entitled "Conservation and Enhancement of Salmon and Steelhead Resources". After noting the economic and social importance of salmon the Act identified these problems:

- o depressed stocks due to loss of habitat, excessive use, and failure of management,
- o economic hardship due to excess fishing capacity,
- o inadequacy of management and enhancement planning, and
- o poor coordination among salmon and steelhead managers.

This Act applies to Columbia River and Washington Conservation Areas. It established a Salmon and Steelhead Advisory Commission (SSAC) which held hearings in the fall of 1983 on a plan to establish coordinated management of the stocks and recommend enhancement measures.

In its Public Review Draft of October 10, 1983 with respect to a new management structure the SSAC elaborated a set of basic issues as follows:

"Public Policies Affecting Salmon and Steelhead Management Are Diffuse, Inconsistent, and Inadequate:

- o Effective interjurisdictional coordination is lacking;
- o No process exists to develop comprehensive policies or resolve interjurisdictional disputes;
- o Change is resisted.

"The Common Property Status of Salmon and Steelhead Frustrates Full Protection and Rational Development and Utilization:

- o Producing entities do not have full control over harvest of fish they produce;
- o Managing entities are unable or unwilling to control the number of participants in the fisheries;
- o Economic inefficiencies result because public funds support the costs of producing the fish and managing the fisheries;

- o Unrestricted entry, the migratory nature of the fish and the intense competition for harvests are disincentives to self-policing by harvesters.

"Information Frequently is Not Available to Properly Manage the Fisheries:

- o Management information is inadequate;
- o Management information is not obtained in a coordinated and efficient manner;
- o Existing information is not equally available to all affected parties;
- o Available information is not fully utilized in a timely manner for planning and managing,

"Enforcement Often is Inconsistent, Uncoordinated and Ineffective:

- o Effective enforcement is impeded by unclear, diffuse and overlapping jurisdictions, by separation of management and enforcement responsibilities, and by lack of public, political and judicial support."

A somewhat different approach was followed by a Canadian Commission which faced similar problems but fewer agencies with jurisdiction. Its terms of reference in the Inquiry Act of March 1981 were much broader. It started with a comprehensive study of the conditions in the fisheries and produced a report in 1981 written by Peter H. Pearce, Commissioner, entitled "Conflict and Opportunity: Toward a New Policy for Canada's Pacific Fisheries". It examined all marine and anadromous fisheries of British Columbia of which the salmon are by far the largest and most important.

After a brief description of the resources in Part One the Commission identified the following issues and devoted a chapter to each:

Part Two--Commercial Fisheries

- Licensing and Regulating Fleet Development
- The Licensing System: Problem and Proposals
- Rationalizing the Salmon and Roe-Herring Fisheries
- Indians in the Commercial Fisheries

Part Three--Non-Commercial Fisheries

- The Indian Fishery
- The Sport Fishery

Part Four--Conservation and Development

- Habitat Management
- Resource Enhancement and Aquaculture

Part Five--Management and Administration

- Fisheries Management
- Administration, Consultation, Enforcement, and Research

The Commission continued with tentative observations about directions of reform for the future:

Habitat management: Reconcile conflicts between protecting the environmental requirements of fish and developing other resources that affect fish habitat.

Stock management and conservation: Get better information on sustainable yields and catches, and focus management on interrelationships among species and stocks.

Resource enhancement: Protect wild stocks, integrate habitat management with enhancement, and involve the public in enhancement.

Fleet management: Reduce excess capacity.

Management of fishing: Shift fishing toward individual stocks in their best condition.

Industrial structure: Provide appropriate legal framework.

Provisions for Indians: Provide legal framework for special arrangements.

Sportfishing: Balance the use of the resource with values generated.

Fiscal arrangement: Charge for privileges according to value of resources used and abolish subsidies that lack an urgent need.

Research and statistics: Expand and improve.

Administration and consultation: Support the above directions more effectively.

The Canadian Commission developed detailed recommendations that appeared in a Final Report in September 1982, "Turning the Tide: A New Policy for Canada's Pacific Fisheries". This report contains vigorous criticism of all of the instruments of policy and calls for a "host of changes" including radical revision of the Federal Fisheries Act. In particular, it identifies the great complexity of fishery policy and the need for flexibility to meet changing and unpredictable issues.

The Commission's recommendations got increased attention after the dismal season in 1983 when catches from many grounds were low and, worse yet, prices were also down from 1982. But an industry with many people already in financial difficulty cannot help but focus on the immediate problems of survival.

Both of these Commissions worked by direction on issues of the moment as perceived by their legislative and administrative authorities. I suggest that this is a manifestation of the crisis-to-crisis cycle that is controlled by

Listing of Past Officers

<u>Year</u>	<u>President</u>	<u>Vice-President President-Elect</u>	<u>Secretary- Treasurer</u>	<u>Meeting Location</u>
49-50	John Hart	J. C. Simpson	F. A. Thompson	Seattle, WA
50-51	J. C. Simpson	A. W. Yoder	F. A. Thompson	Portland, OR
51-52	A. W. Yoder	Clarence Pautzke	Fred Thompson	Phoenix, AZ
52-53	Clarence Pautzke	A. F. C. Greene	Lew Garlick	Glacier National Park, MT
53-54	A. F. C. Greene	Alex Calhoun	Lew Garlick	Long Beach, CA
54-55	Alex Calhoun	Walter Allen	Lew Garlick	Las Vegas, NV
55-56	John Rayner	Bill Sigler	Lew Garlick	Moran, WY
56-57	Walter Allen	Lew Garlick	H. R. Newcomb	Vancouver, BC
57-58	Lew Garlick	Roy Barker	Cliff Millenbach	Glenwood Springs, CO
58-59	Roy Barker	Robert McMynn	Cliff Millenbach	Sun Valley, ID
59-60	Robert McMynn	Forrest Hauck	Cliff Millenbach	Portland, OR
60-61	Forrest Hauck	Cliff Millenbach	Fred Locke	Salt Lake City, UT
61-62	Cliff Millenbach	Don Andriano	Fred Locke	Santa Fe, NM
62-63	Don Andriano	Wayne Seaman	Fred Locke	Seattle, WA
63-64	Wayne Seaman	Robert Meigs	Fred Locke	Tucson, AZ
64-65	Robert Meigs	Fred Locke	Paul Cuplin	San Francisco, CA
65-66	Fred Locke	Alex McRae	Paul Cuplin	Anchorage, AK
66-67	Alex McRae	Tom Trelease	Paul Cuplin	Butte, MT
67-68	Tom Trelease	Fred Eiserman	Paul Cuplin	Honolulu, HI
68-69	Fred Eiserman	Chuck Campbell	Paul Cuplin	Reno, NV
69-70	Chuck Campbell	Paul Cuplin	George Holton	Jackson Hole, WY
70-71	Paul Cuplin	Art Whitney	George Holton	Victoria, BC
71-72	Art Whitney	Ralph Larson	George Holton	Aspen, CO
72-73	Ralph Larson	Howard Bassett	George Holton	Portland, OR

Ultimate Resolution of Problems Created by Treaty Rights: Does the experience since the Boldt Decision support the assumption that the many stocks can each be reliably divided among escapement and the different user groups? How much does regulation cost and who pays? Do Indian fisheries benefit all Indians and all tribes or mostly a few purse seiners in certain tribes?

These and other complex long-term issues deserve scholarly study and debate because all are dynamic issues with complex impacts. Some should be examined with the objective of producing forecasts of the trends under the likely alternatives. None can be dealt with in sufficient depth and objectivity as part of recurring crisis-to-crisis management deliberations.

If sound information about the underlying issues can be publicized, people from both industry and government who are concerned about the annual decisions should be able to reduce the current level of acrimony in the debates.

William F. Royce
April, 1984

Public Confidence in Decisions: Is it rapidly declining? The confidence in fishery scientists and fishery science is based on the firm public conviction of the necessity to maintain the resources. Public confidence in our profession is also based on our ability to predict the consequences of alternative actions. But when we become or appear to be advocates of actions involving value judgements, we may lose credibility.

Demand for Salmon: Is there any way but up? It is a luxury product already in short supply. International trade in salmon is rapidly increasing. Recreational demand has been increasing and will increase further in the Pacific Northwest with the roughly 50 percent increase in population projected for the year 2,000 by the census bureaus. But how will the supply of other salmonids (trout and Atlantic salmon) influence the markets for Pacific salmon?

Allocation of Salmon Fishing: Is there any possible way of satisfying recreational demand except by reducing commercial catches? If so, is it cost effective? The demand for allocation will be strong because recreational fishermen greatly outnumber commercial fishermen.

Natural and Enhanced Production of Salmon: Is there any way but down? Perhaps only in Alaska will it increase because catch regulation has improved, more improvements are possible, and the trend in production has been upward for a decade. Elsewhere, the coming water crisis, the energy demands, the increased urbanization, and the difficulties of public enhancement all will require special efforts just to maintain the supply.

Private Production of Salmon: Is there any way but up? With the topping-out of total world-wide fish production a decade ago, the gap between overall demand and total supply is widening. Average fish prices relative to other foods are increasing, salmon is a luxury product, and the technology for private salmon production is available. The economics are favorable in many localities and improving in the rest.

Costs of Management: Is there any way but up? Better information, more research, more enhancement, better enforcement will be needed to meet public demands and will be costly. In addition, other water users will challenge reservation of the water for salmon and demand compromises which must be evaluated.

Distribution of Costs and Benefits: Inequities abound! Do fishermen who benefit pay the full cost of management in license fees? Do water users and hydropower rate payers pay the costs of salmon mitigation? Do users of irrigation water pay the full costs of their water? Is maintenance of upriver runs in the Columbia worth any cost--it may soon exceed \$1,000 per fish? Who should pay?

<u>Year</u>	<u>President</u>	<u>Vice-President President-Elect</u>	<u>Secretary- Treasurer</u>	<u>Meeting Location</u>
73-74	Howard Bassett	William S. Platts	Terry Holubetz	Salt Lake City, UT
74-75	William S. Platts	Ron Goede	Joseph Stone	Albuquerque, NM
75-76	Ron Goede	Gerald Bouck	Joseph Stone (resigned)	Seattle, WA
76-77	Gerald Bouck	Kirk Beiningen	Del Skeesick	Sun Valley, ID
77-78	Kirk Beiningen	John Skinner	Robert W. Wiley	Tucson, AZ
78-79	John Skinner (John Skinner died 12/18/78, in a fire; Kirk Beiningen finished term.)	Robert W. Wiley	Clare Carlson	San Diego, CA
79-80	Robert W. Wiley	Gordon Haugen	Bruce May	Anchorage, AK
80-81	Gordon Haugen	Robert White	Willis Evans	Honolulu, HI
81-82	Robert White	Don Duff	Patrick Graham	Kalispel, MT
82-83	Don Duff	Stan Moberly	Neil B. Armantrout	Las Vegas, NV
83-84	Stan Moberly	Neil B. Armantrout	James Fessler	Teton Village, WY
84-85	Neil B. Armantrout	Anthony Novotny	Ellen Gleason	Victoria, BC