



Toward Adaptive Management through Independent Scientific Review

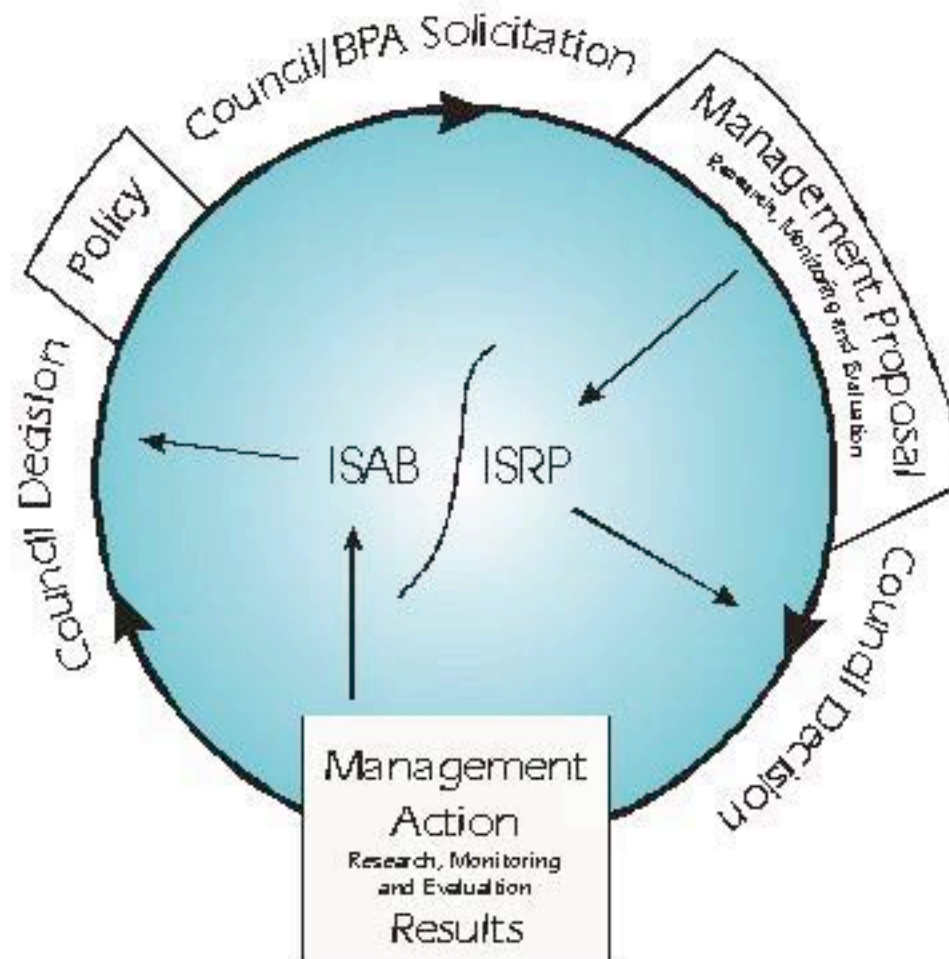
Erik Merrill

*Coordinator, Independent Scientific Review Panel
for the Northwest Power Planning Council*

and

*Independent Scientific Advisory Board,
for the Northwest Power Planning Council,
the National Marine Fisheries Service, and
the Columbia River Basin Indian Tribes*

Adaptive Management
The Role of Independent Scientific Review
In the Northwest Power Planning Council's Project Selection
and Program Development Process



Independent Scientific Advisory Board

Programmatic Review

1996 - Jointly Created by NOAA Fisheries and Council

- 1994 Fish and Wildlife Program and Bevan Report - Snake River Salmon Recovery Team. May 1994. Final Recommendations to the National Marine Fisheries Service.
- Precursors: Independent Scientific Group 1995-1996; Scientific Review Group 1989-1994; Technical Working Groups 1980s

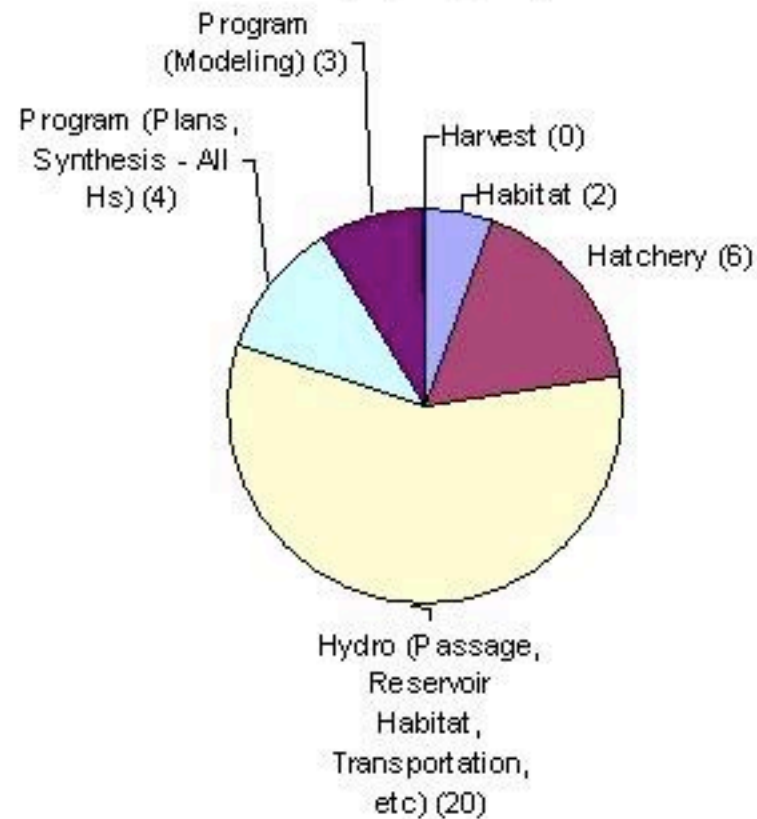
2002 - Columbia River Basin Indian Tribes added as sponsors

The ISAB's broad charge: foster a scientific approach to fish and wildlife recovery and the use of sound scientific methods in research related to the programs of the NMFS, the Council, and the Tribes.

- Review the scientific and technical issues associated with efforts to improve anadromous fish survival through all life stages, based on adaptive management approaches.
- Evaluate the Council's Fish and Wildlife Program
- Evaluate National Marine Fisheries Service recovery activities for Columbia River Basin stocks
- Evaluate the scientific merits of plans and measures proposed to ensure satisfaction of tribal treaty fishing rights in the Columbia River Basin and other tribal efforts to restore and manage fish and wildlife resources.

ISAB Reports 1997-2003

~ 35 (5 per year)



Independent Scientific Review Panel

Project Review

1996 Amendment to the NW Power Act

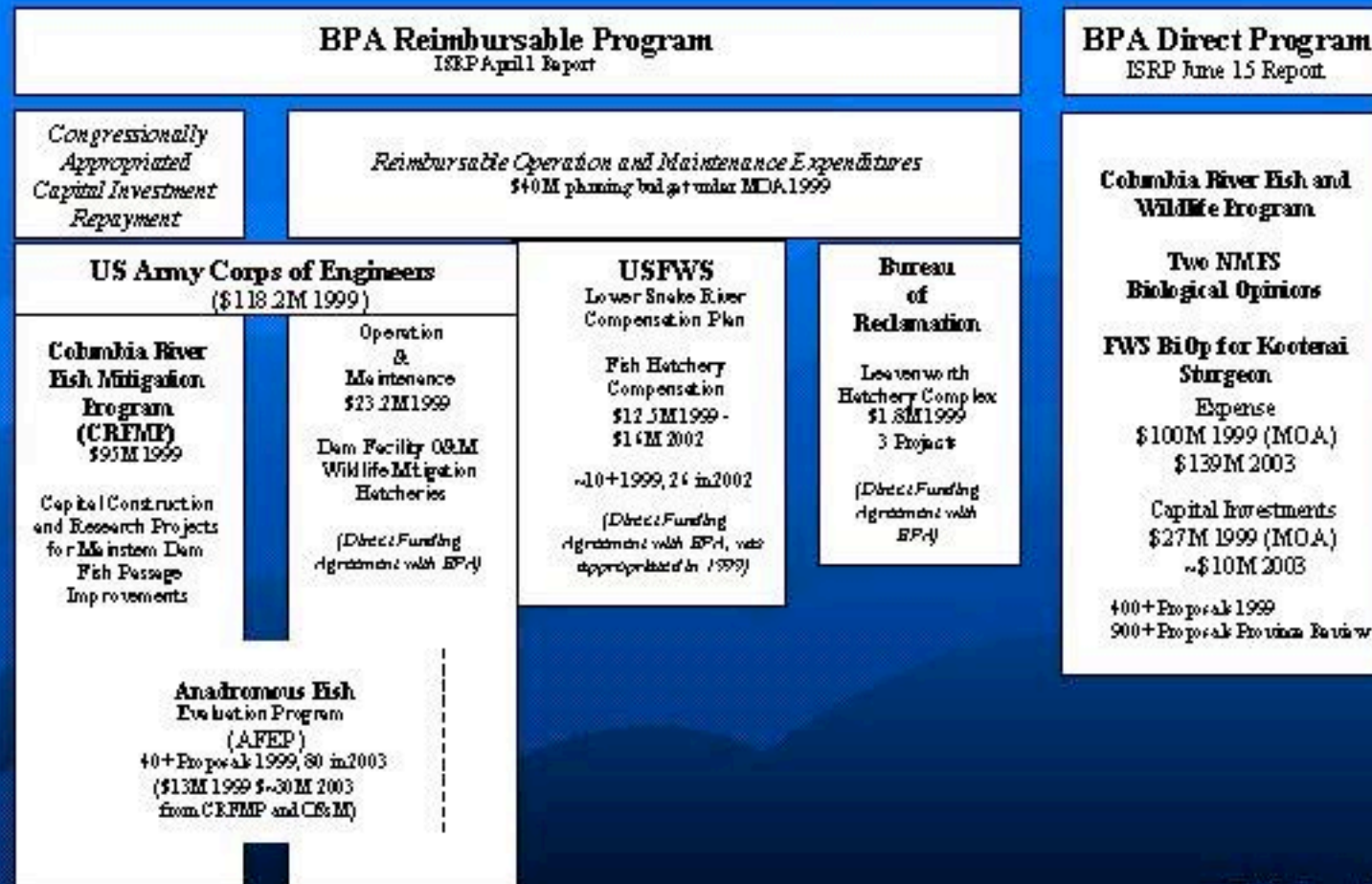
Review projects in the context of the Council's program and in regard to whether they:

- 1) are based on sound science principles;*
- 2) benefit fish and wildlife; and*
- 3) have a clearly defined objective and outcome*
- 4) with provisions for monitoring and evaluation of results*

Council must explain in writing when they diverge from ISRP Recommendations.

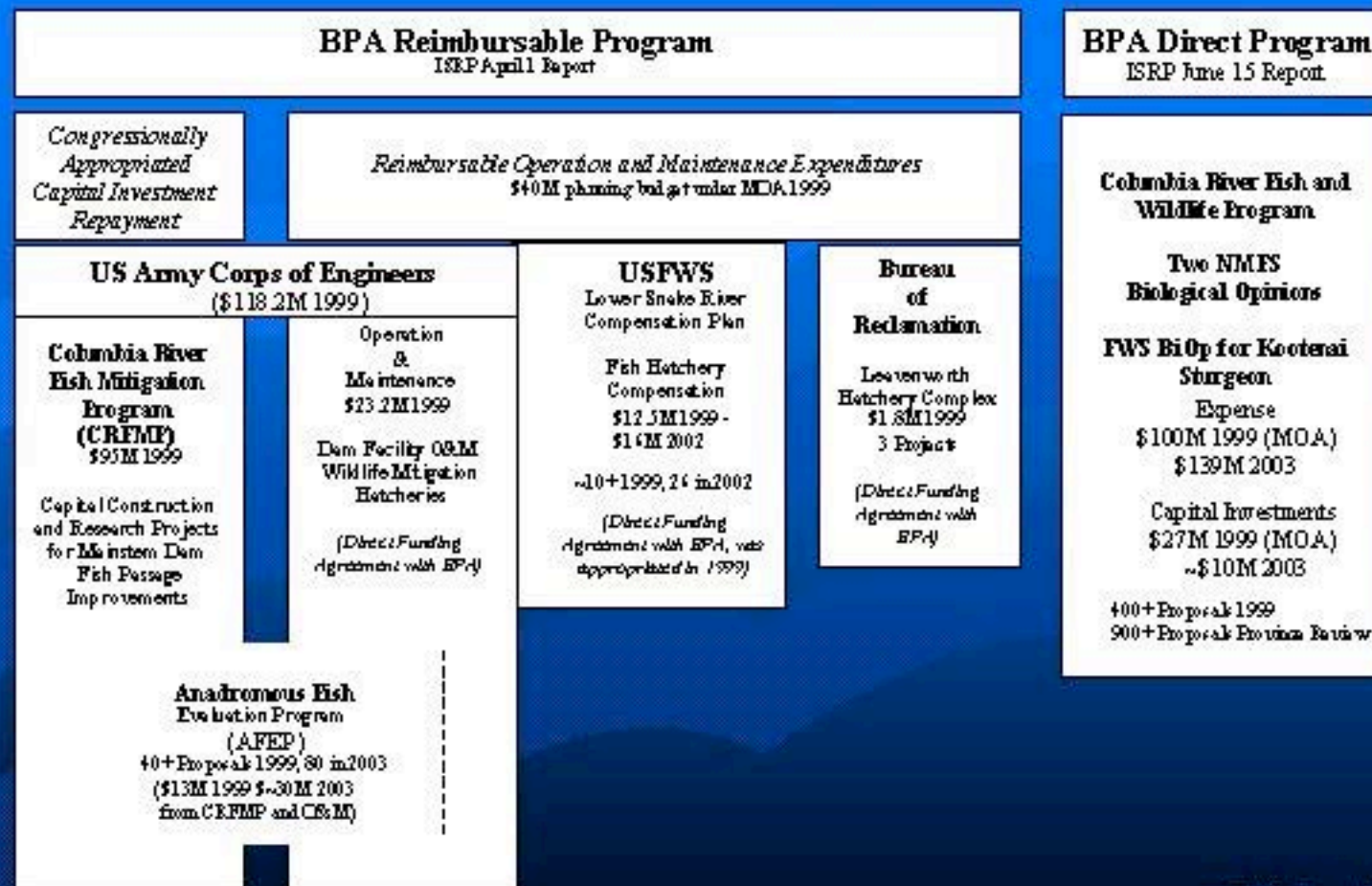
DRAFT -- ISRP Scope of Review -- "Reimbursable" and "Direct" Program

Budget figures: (EPA funding only) and number of projects (amenable to scientific review) included in the chart below are annual estimates based on FY1999 and FY2003 appropriations, ongoing EPA agreements, and project submittals. Actual budget and the number of funded projects vary from year to year.



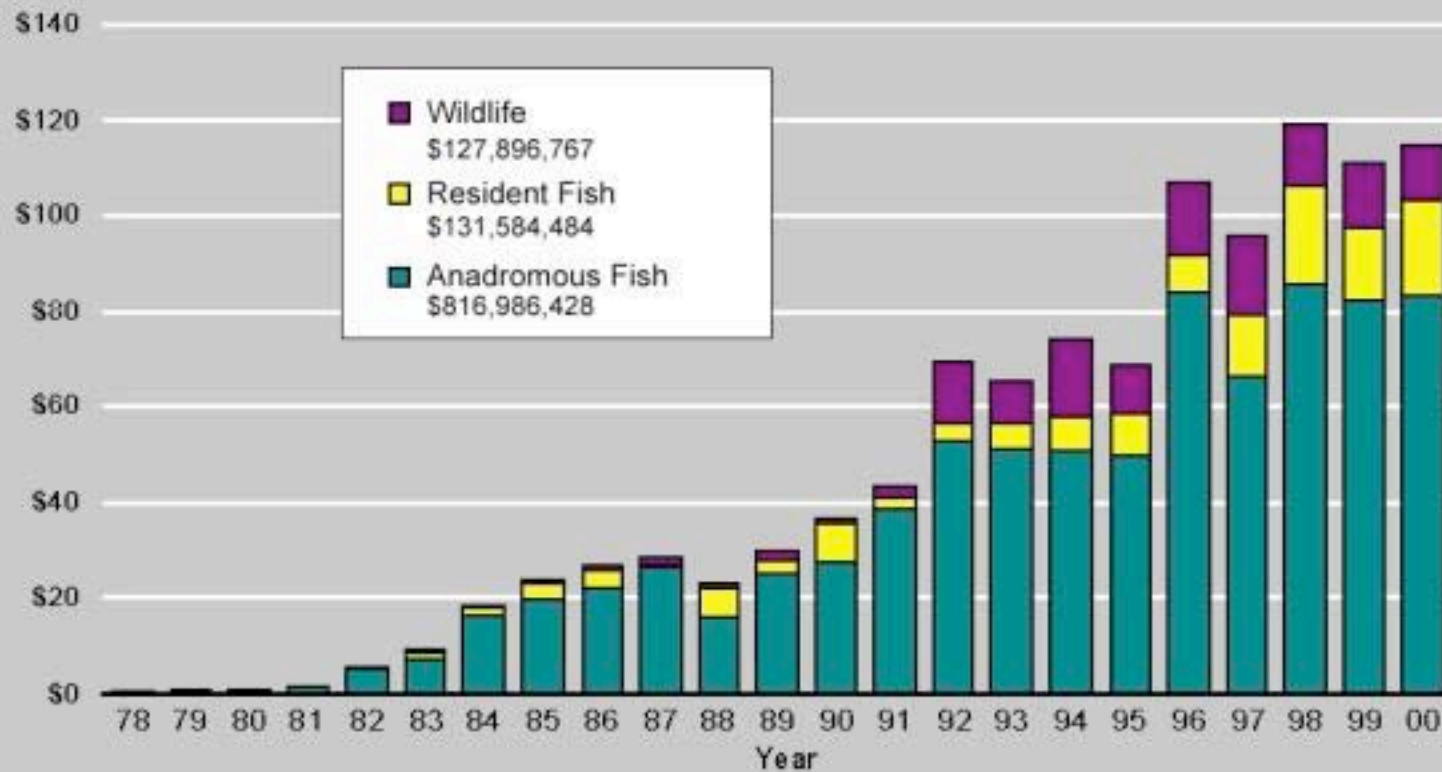
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BPA Direct Program Budget Obligations by Species 1978-2001

Dollars in millions



ISRP and ISAB

11 Members,

Eligible for two three-year terms

Appointment Procedures

1. Nominations from region, sponsors, ISRP, ISAB, Selection Panel
2. Screening by National Research Council Selection Panel
3. Appointment
 - ISRP – NW Power Planning Council
 - ISAB – Council, NOAA Fisheries, Tribes

ISAB and ISRP expertise:

- Columbia River anadromous and resident fish ecology,
- statistics,
- wildlife ecology,
- ocean and estuary ecology,
- fish husbandry,
- genetics,
- geomorphology,
- social and economic sciences, and
- other relevant disciplines.



Balance between Columbia River Basin and broader experience.

Susan Hanna, Ph.D., an expert in marine economics and fisheries management at Oregon State University.

Brian Riddell, Ph.D., an expert in international fisheries management at the Pacific Fisheries Resource Council, Nanaimo, British Columbia.

Richard R. Whitney, Ph.D., consulting fisheries scientist, Wenatchee, Washington, formerly a professor in the School of Fisheries, University of Washington.

the CAPTIVE BROOD



LIVE AT THE HATCHERY

CONTEXT AND HELP

**ISAB Ex Officios
Ad Hoc Members**



ISRP Peer Review Group Members

- Appointed by Council
- Pool of 122
- 29 members have participated in reviews (27 in FY00 review)

Robert Francis, Ph.D., University of Washington (ex-ISRP)

Dennis Lettenmaier, Ph.D., University of Washington (ex-ISAB, ISRP)

James A. Lichatowich, M.S., consulting fisheries scientist, Alder Creek Consulting (ex-ISAB, ISRP)

Philip Mundy, Ph.D., science Coordinator, Exxon Valdez Oil Spill Trustee Council (ex-ISAB)

INDEPENDENCE

- Conflict of Interest (financial, institutional)
- Bias?
- Assignments (self-generated tasks)
- Reporting (science/policy)



*Independent Scientific Advisory Board
for the Northwest Power Planning Council
and the National Marine Fisheries Service
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Finding Common Ground

Recent Significant Reports on Salmon Status

1995: National Marine Fisheries Service (NMFS)

"Proposed Recovery Plan for Snake River Salmon"

1995: Columbia River Inter-Tribal Fish Commission

"Wy-Kan-Ush-Mi Wa-Kish-Wit, Spirit of the Salmon"

1996: National Research Council (NRC) – "Upstream"

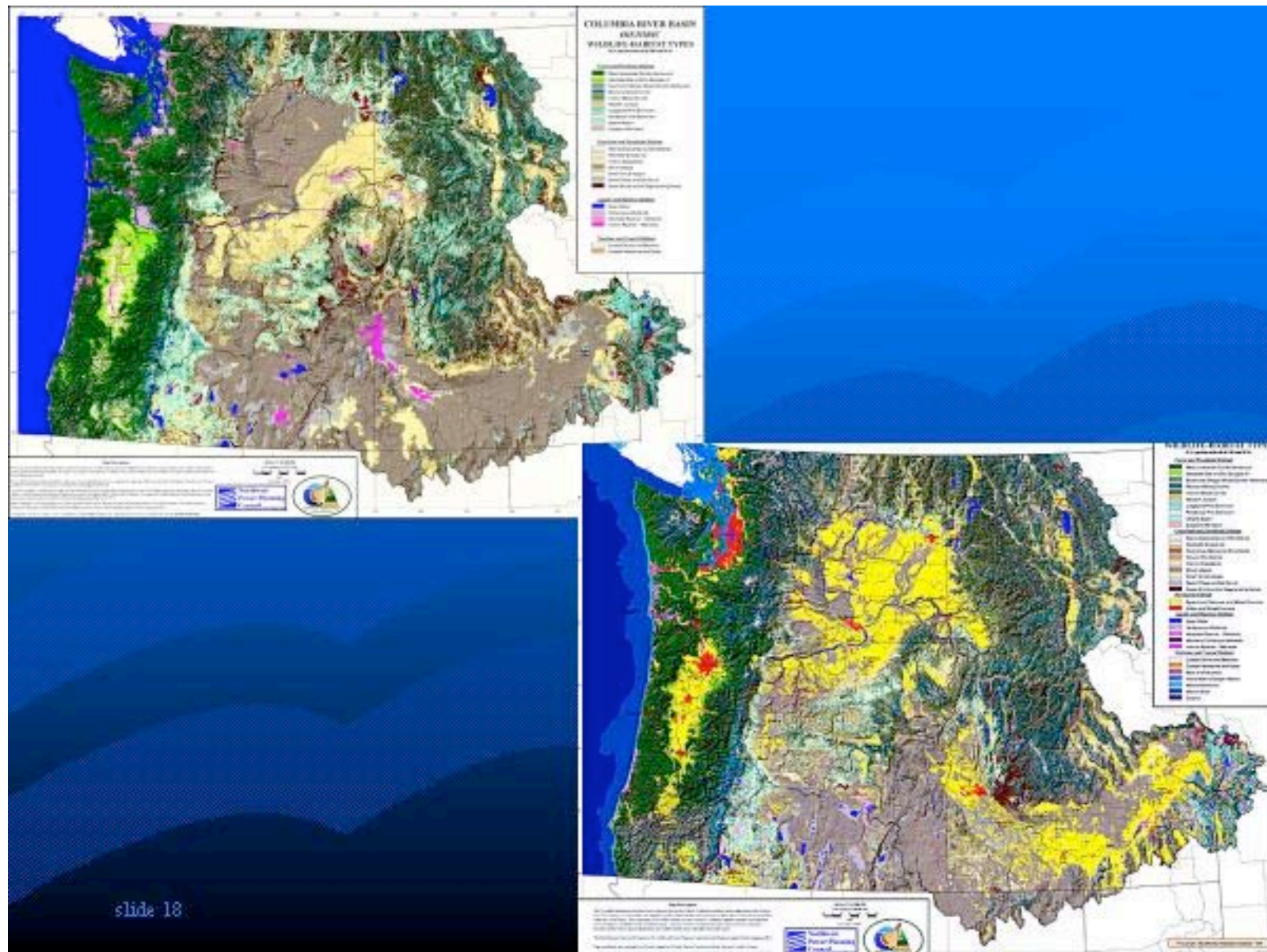
1996: Independent Scientific Group, "Return to the River"

1997: USFS / BLM Report (ICBEMP)

"An Assessment of Ecosystem Components in the Interior Columbia Basin and Draft Environmental Impact Statement"

Areas of Consensus

- substantial consensus in the areas of:
 - *conceptual foundation*
 - *natural environmental variability*
 - *habitat*
 - *harvest*
 - *monitoring and evaluation*
 - *need for institutional reform*
- maintenance and restoration of ecosystem processes and conditions will be necessary to achieve restoration goals



Areas of Disagreement

Lack of consensus was most evident in the areas of:

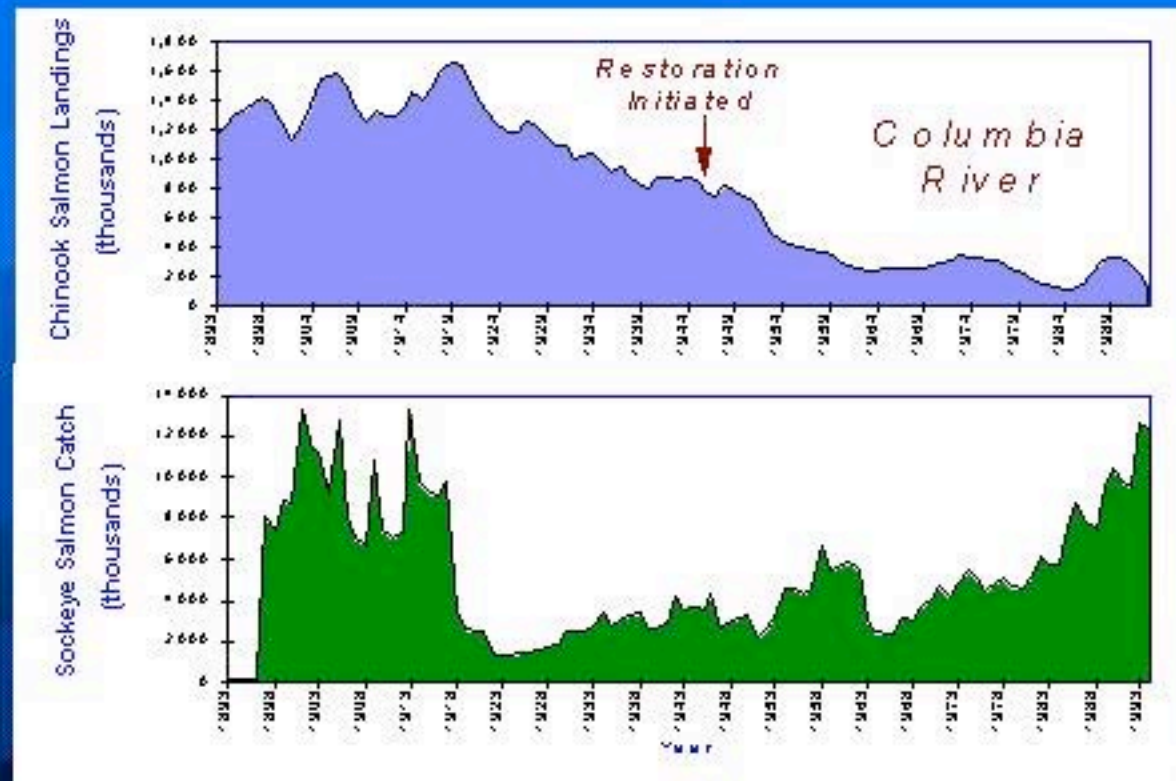
- **Artificial Production**

- supplementation and
- use as a tool for supporting harvest

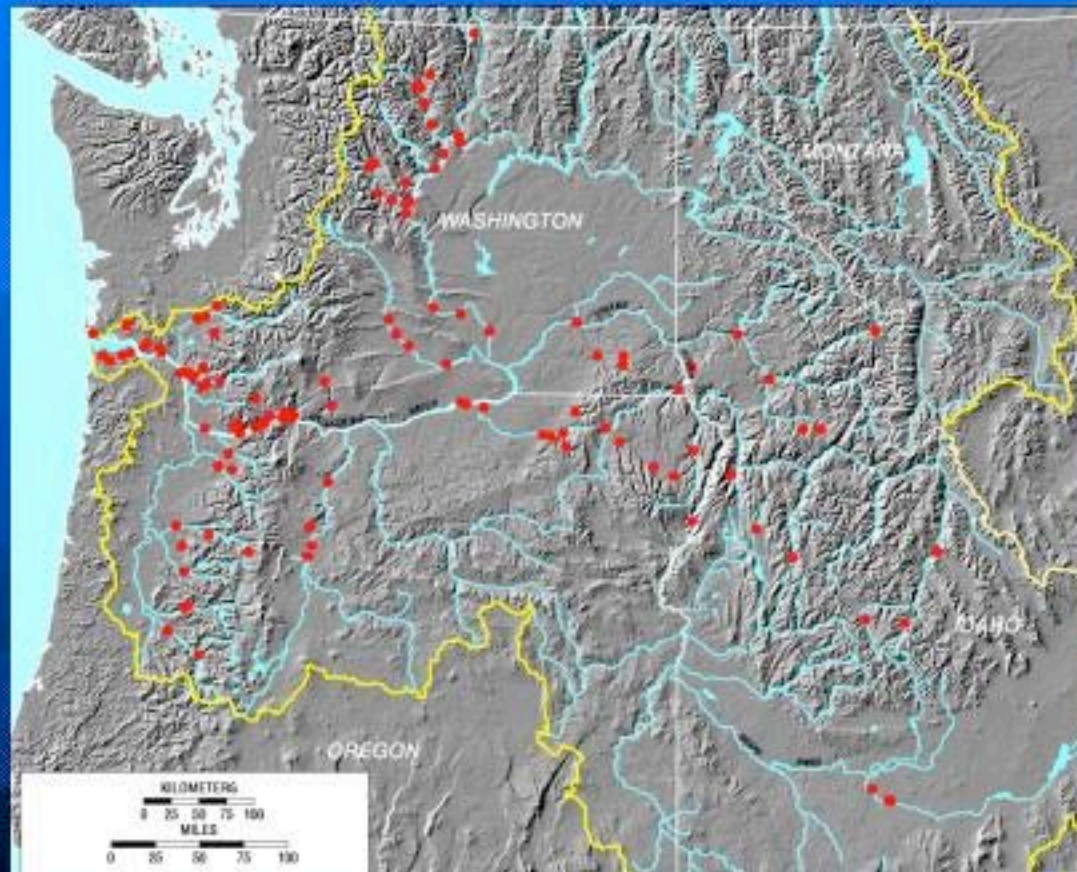
- **Hydropower Operations**

- *effects of flow augmentation*
- *drawdown of some mainstem dams*
- *transportation*

Harvest of Columbia River Chinook and Fraser River Sockeye for the Years 1893 to 1994



Anadromous Fish Propagation Facilities



Consensus and Technology

Level of Consensus

Technology

Agreement

Low

*Habitat
Harvest*

Disagreement

High

*Hatchery Operations
Hydroelectric Operations*

ISRP: Learning by Doing

- 1980s - 1995, BPA COTRs oversaw development and funding of projects.
- 1995 - 1996, CBFWA prioritized proposals and recommended projects for funding. BPA implemented.
- 1996, Amendment to NW Power Act. ISRP formed.
 - ISRP reviews project proposals
 - » *Scientific, technical, independent review*
 - CBFWA reviews proposals in parallel
 - » *Technical review from the management perspective*

1997 Review, the ISRP's 1st

Programmatic in nature, due to time constraints and the variable quality of the 225+ project proposals.

- *Many recommendations were made to improve the review process and proposal quality.*

Issues identified 97-99 included the need for:

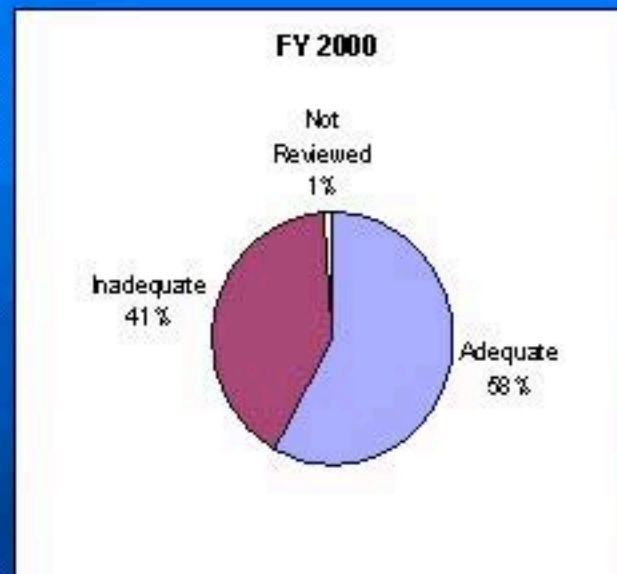
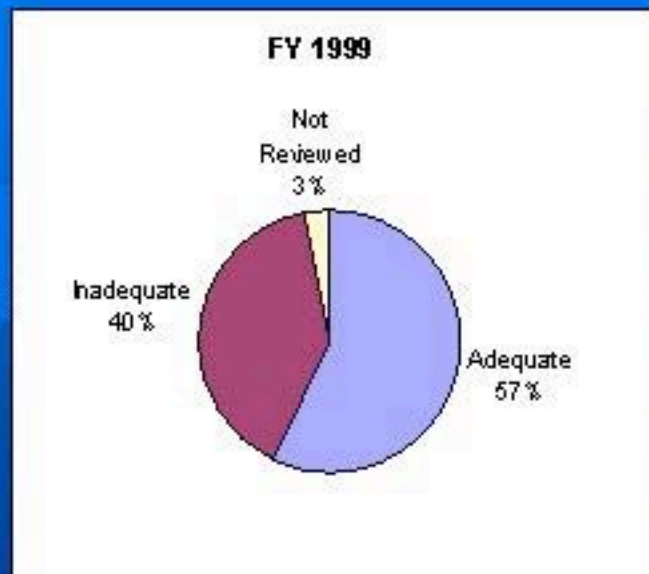
- **an integrated ecological framework for fish and wildlife,**
- **habitat restoration projects to be guided by a watershed assessment,**
- **reporting of progress towards the program's goals,**
- **a comprehensive review of artificial production, and**
- **inventories of remaining native resident fish populations.**

1998 and 1999 Reviews

- **1998:** The ISRP reviewed each of the 403 project proposals submitted for funding through the FWP.
- **1999:** The review involved the ISRP and 27 outside peer review group (PRG) members to review 397 proposals and provided substantial analysis of programmatic issues.

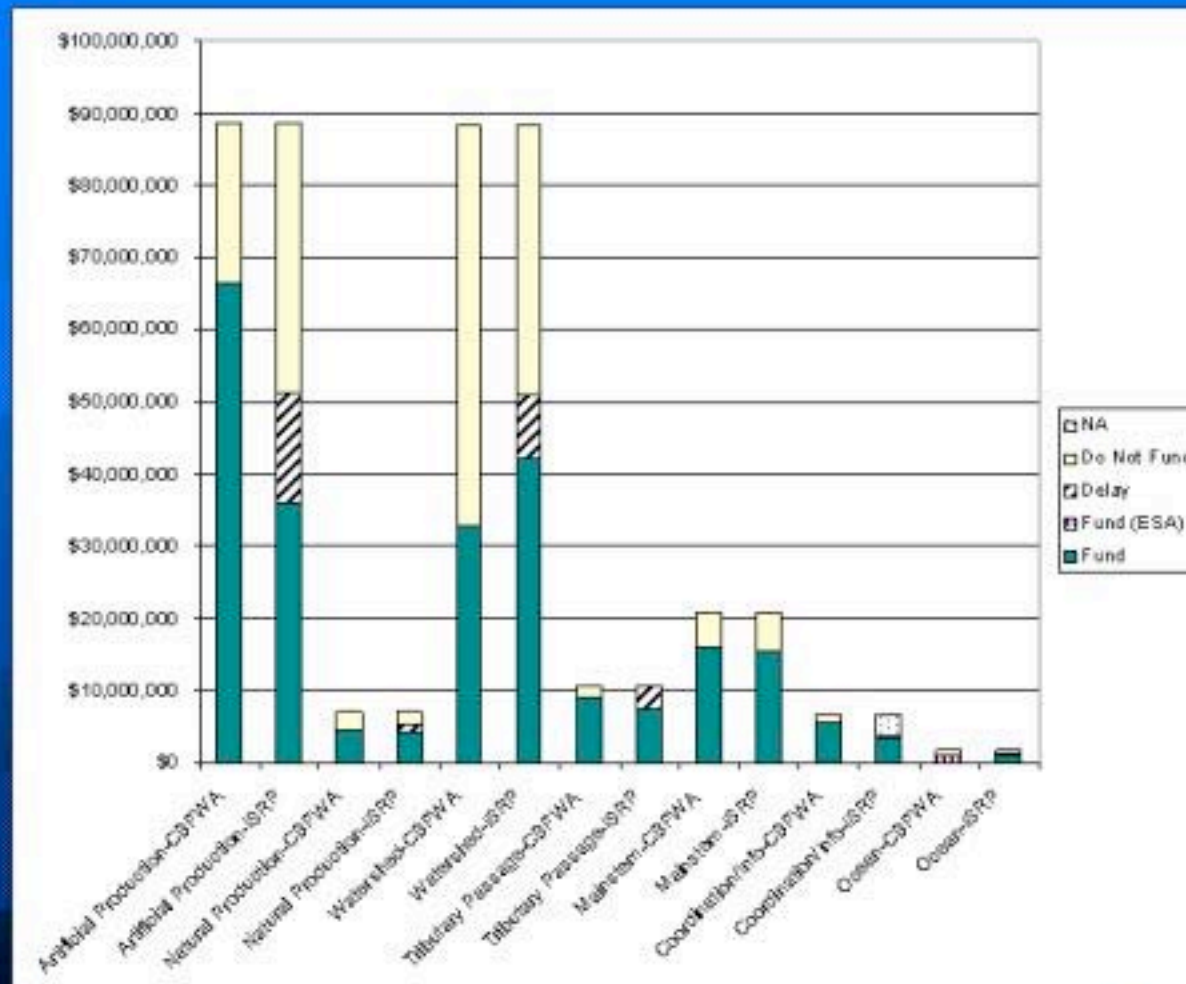


Comparison 1998 and 1999

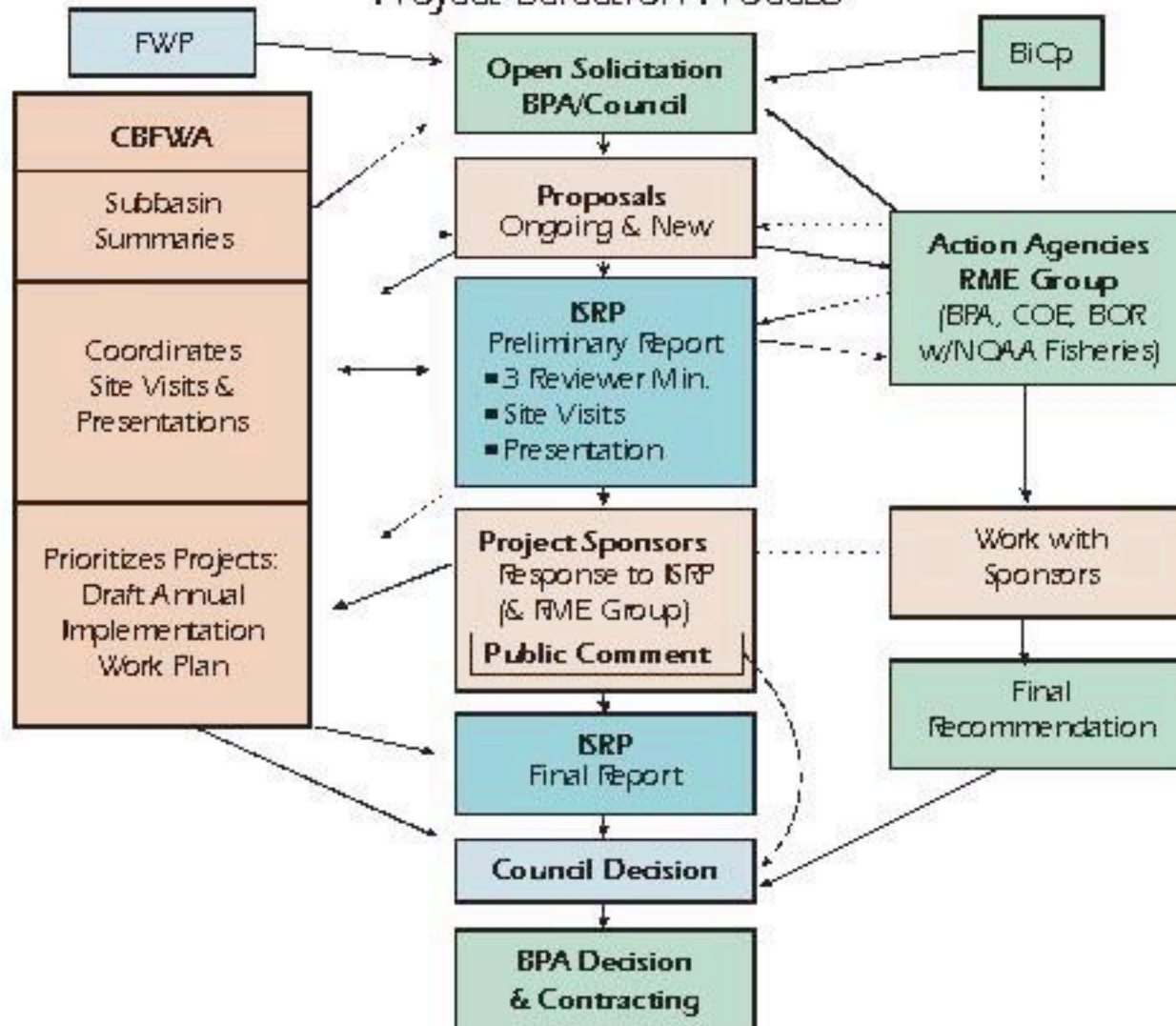


Fix-it-loop: 75 of 100
inadequate proposals were
judged adequate.

Comparison of ISRP and CBFWA Recommendations 1999



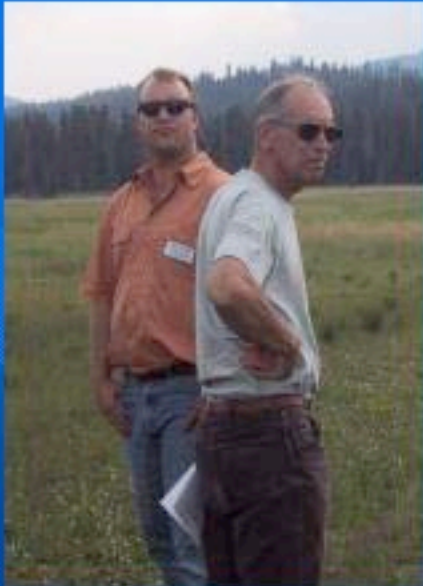
Columbia River Fish and Wildlife Program Project Selection Process



The Rolling Review's Ecological Provinces



Policy:
the Council



Management:
CBFWA

Science:
the ISRP

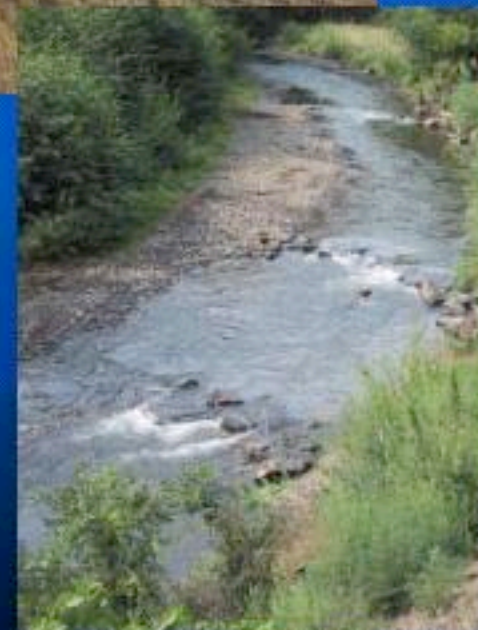


 Planning Council

Methods of Rehabilitation and Recovery



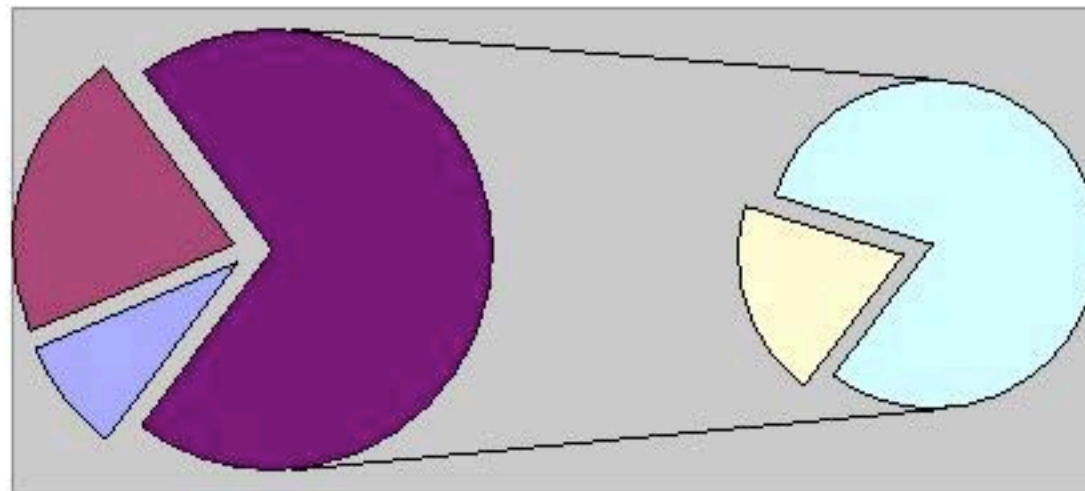
slide 31 *Supplementation as an Experiment*



Stream Rehabilitation Methods



Province Review – Response Loop Results

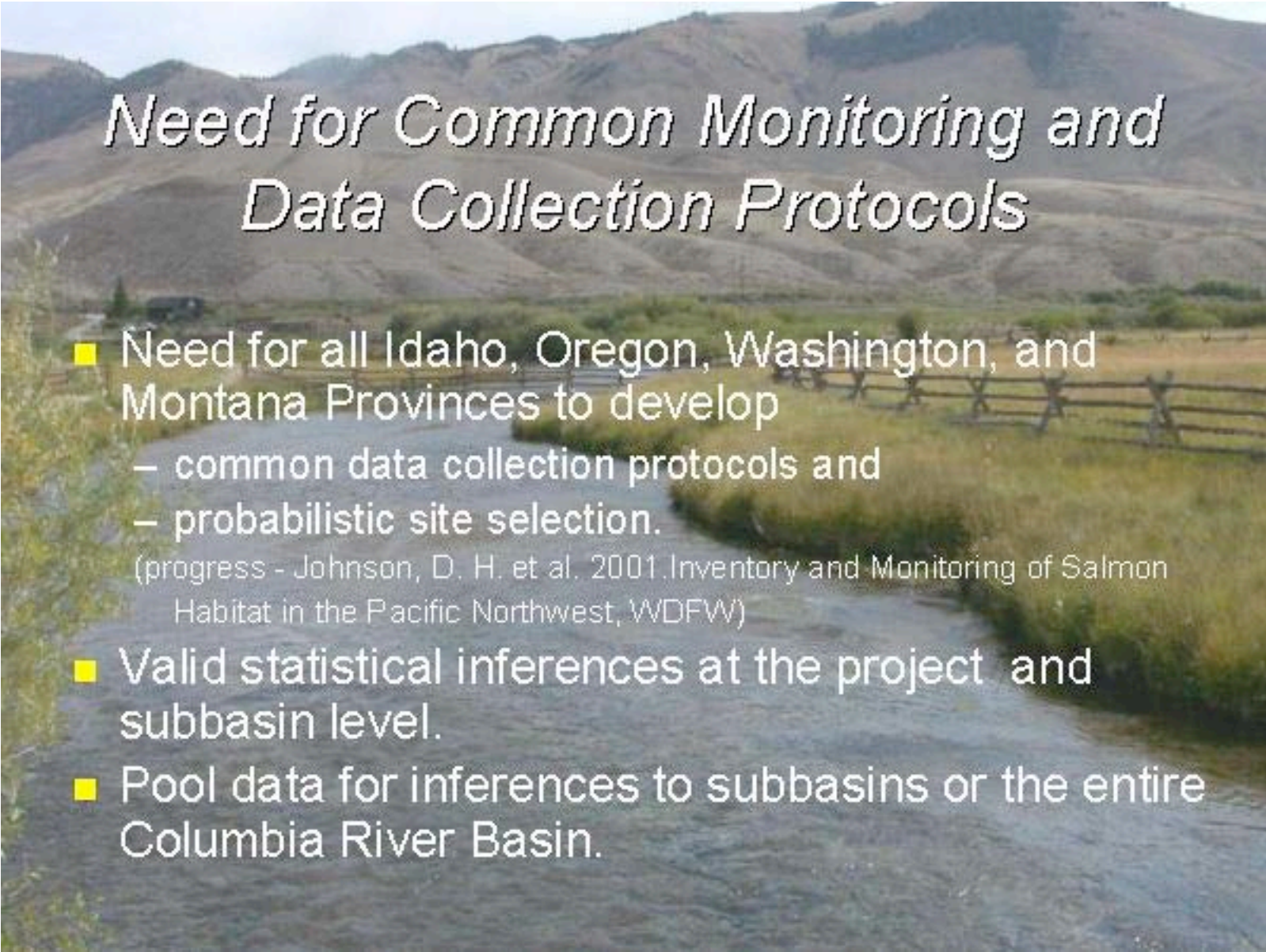


■ Do Not Fund ■ Fund □ Response needed - Do Not Fund □ Response needed - Fund

Monitoring and Evaluation

- M&E is the foundation for adaptive management. Sound monitoring and evaluation (M&E) is critical to measuring progress to FWP goals

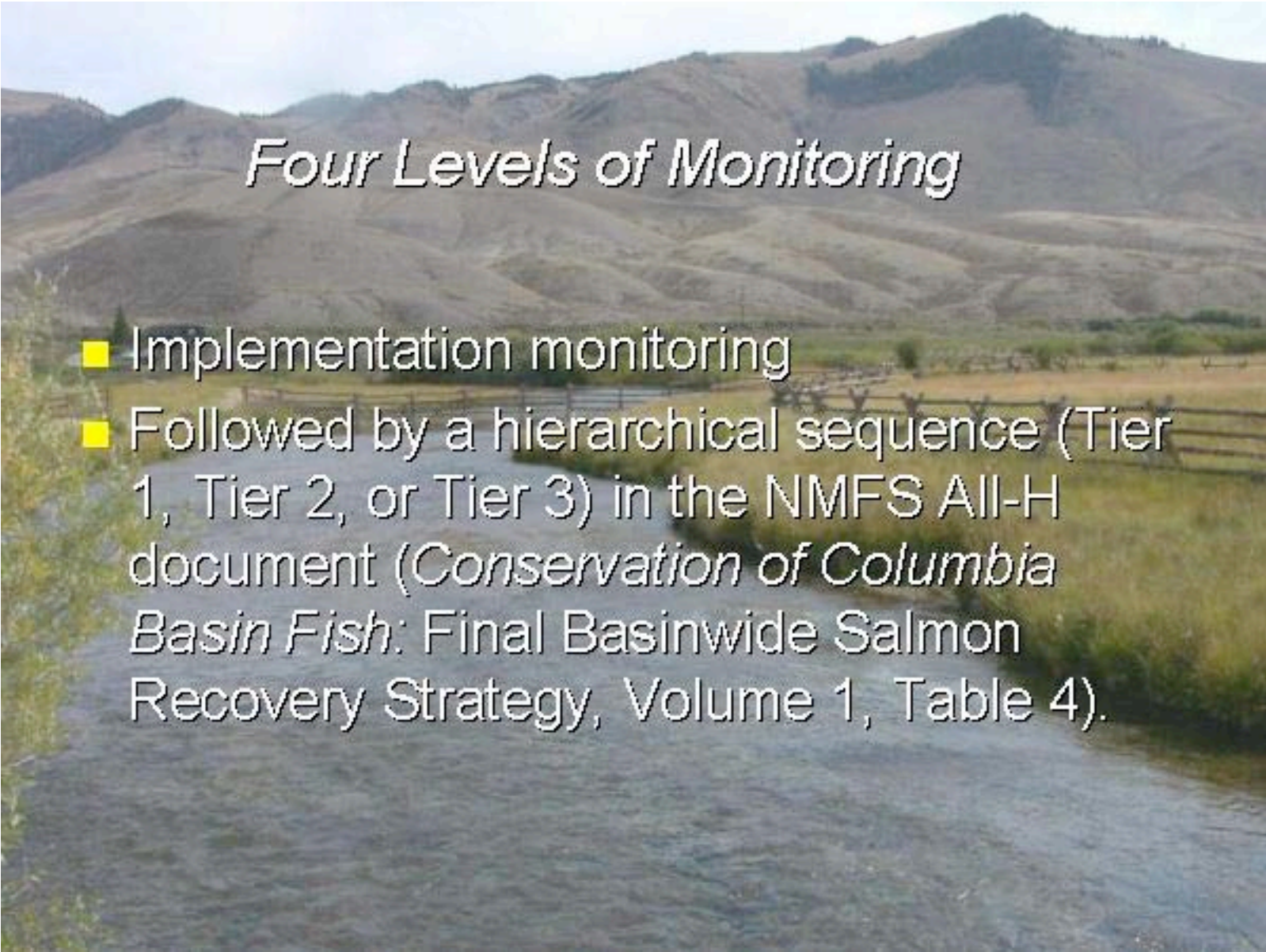
But no explicit program language describing needed project level M&E and no basin-wide monitoring strategy



Need for Common Monitoring and Data Collection Protocols


- Need for all Idaho, Oregon, Washington, and Montana Provinces to develop
 - common data collection protocols and
 - probabilistic site selection.

(progress - Johnson, D. H. et al. 2001. Inventory and Monitoring of Salmon Habitat in the Pacific Northwest, WDFW)
- Valid statistical inferences at the project and subbasin level.
- Pool data for inferences to subbasins or the entire Columbia River Basin.



Four Levels of Monitoring

- Implementation monitoring
- Followed by a hierarchical sequence (Tier 1, Tier 2, or Tier 3) in the NMFS All-H document (*Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy*, Volume 1, Table 4).



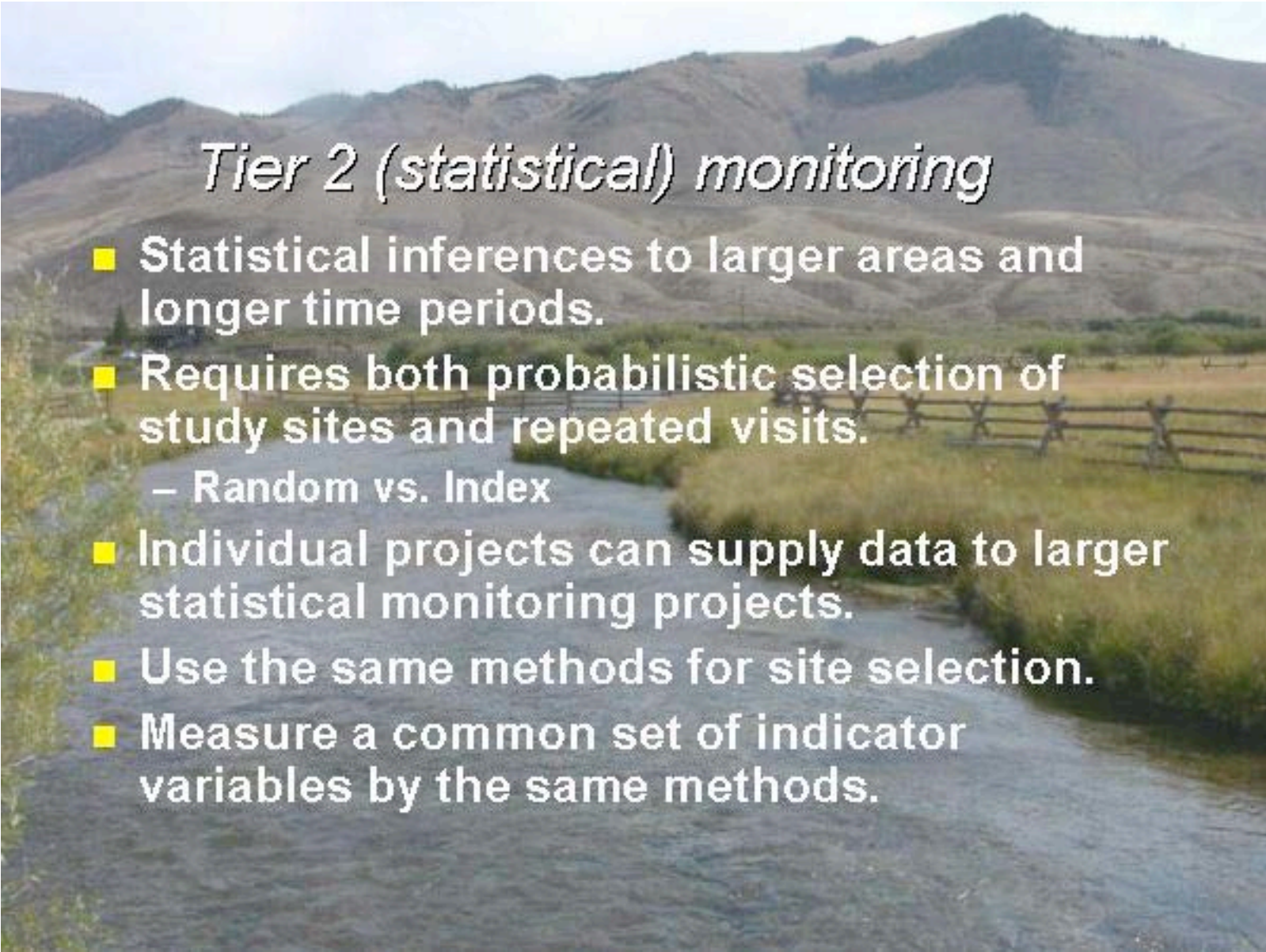
Implementation Monitoring

- Monitoring of task completion.
 - miles of stream fenced,
 - number of culverts removed,
 - completion of reports,
 - irrigation diversions maintained, etc.
- Implementation monitoring results must be presented.
 - project results must also be measured in terms of benefits to fish and wildlife.



Tier 1 (trend) monitoring of individual projects.

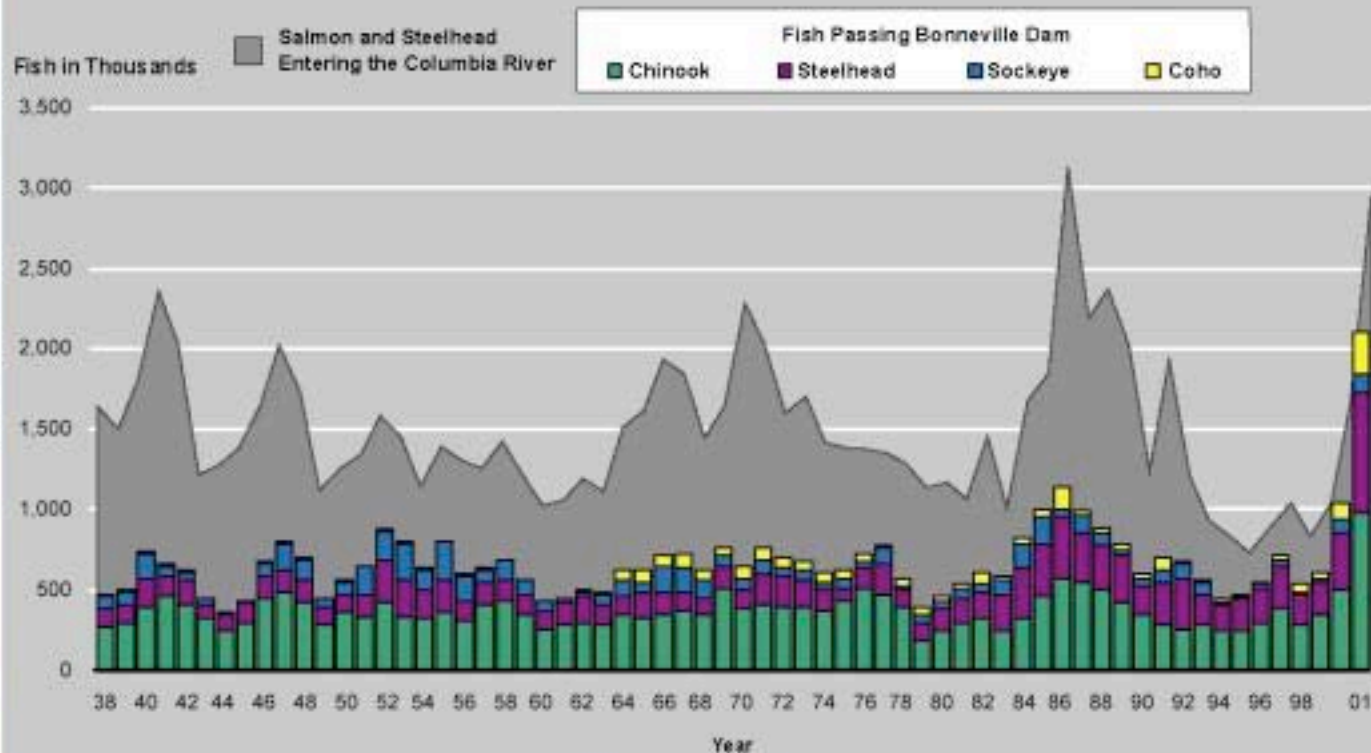
- Repeated measurements, usually representing a single, relatively small, spatial unit over a period of time.
 - Time series of temperatures of water entering and leaving the site.
 - Photopoints for cover.
 - Presence of target species.
 - Number of redds.
- Does not establish cause and effect relationships



Tier 2 (statistical) monitoring

- Statistical inferences to larger areas and longer time periods.
- Requires both probabilistic selection of study sites and repeated visits.
 - Random vs. Index
- Individual projects can supply data to larger statistical monitoring projects.
- Use the same methods for site selection.
- Measure a common set of indicator variables by the same methods.

Salmon and Steelhead Entering the Columbia River and Passing Bonneville Dam 1938-2001



Surprises Discovered During Tier 1 and 2 Monitoring – Ocean Regimes (PDO) and Significant Impacts on Salmon Survival

slide 40



Tier 3 Research Monitoring in Small Scale Individual Projects

- Establishment of mechanistic links between management actions and salmon or habitat responses.
- Experiments to establish cause and effect require controls and treatments randomly assigned.
- Typical research projects leading to publication in peer reviewed journals.

Fish Monitoring and Bypass Facility in Columbia River Dam





Surprise Discovered during Tier 3 In-River Survival Research -- 16,000 Terns - world's largest breeding Caspian tern colony, 67% of Pacific Coast population

Tern/Salmon Research and Management Actions – An Example of Adaptive Management in Practice in the Columbia River Basin.

Consumed 11.3% or 11.2 of 96.6M smolts that reached the estuary in 1998; 2001 5.9M ~ 50% of 1998

slide 43

Tensions: Implementation vs. Monitoring, Evaluation, and Research

Observational vs. Experimental



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air
FISHING COUNCIL

A scenic landscape photograph showing a wide river flowing through a valley. The river is in the foreground, with its surface reflecting the sky. The banks are covered in green grass and some shrubs. In the background, there are rolling hills and mountains under a clear sky. The text is overlaid on the upper part of the image.

Research Monitoring on Subbasin or Larger Scale

- Extremely difficult or impossible.
- Example: Idaho Supplementation Study

Idaho Supplementation Studies (ISS)

■ ISS includes:

- Tribal, state, and federal participation
- 11 state and federal anadromous hatcheries
- 3 satellite rearing ponds
- Annual production capacity:
 - » 8.5 million spring chinook smolts,
 - » 2 million summer chinook smolts,
 - » 6.7 million A-run steelhead *O. mykiss* smolts, and
 - » 4 million B-run steelhead smolts.

■ Study Design (3 phases; each ~ 5 years duration)

- Phase 1 – broodstock development
- Phase 2 – treatments
- Phase 3 – terminate outplanting; monitor results

Original and current designation of ISS study streams.

| Stream | Original Study Design | Current Designation | Comments |
|-----------------------|-----------------------|---------------------|--|
| Salmon River Drainage | | | |
| State Cr. | Treatment | Control | |
| SF Salmon R. | Treatment | Treatment | |
| Lemhi R. | Treatment | Control | No treatments through BYD1 |
| Paisley R. | Treatment | Treatment | |
| EF Salmon R. | Treatment | Treatment | |
| Herd Cr. | Control | Control | |
| WVF Yankee Fork S.R. | Treatment | Treatment | |
| Upper Salmon R. | Treatment | Treatment | |
| Alturas Lake Cr. | Treatment | * | No treatments through BYD1 data included in Upper Salmon R. |
| NF Salmon R. | Control | Control | |
| Valley Cr. | Control | Control | |
| Marsh Cr. | Control | Control | |
| Bear Valley Cr. | Control | Control | |
| Camas Cr. | Control | * | Dropped due to logistical constraints |
| Lake Cr. | Control | Control | |
| Secon R. | * | Control | Added to original study design |
| Johnson Cr. | Control | Control | |
| Clearwater Drainage | | | |
| Red R. | Treatment | Treatment | |
| Newsome Cr. | Treatment | Treatment | |
| Crooked R. | Treatment | Treatment | |
| Lolo Cr. | Treatment | Treatment | |
| Crooked Fk. Cr. | Treatment | Control | One treatment in 1992 Changed to control stream 1993 |
| Clear Cr. | Treatment | Treatment | |
| American R. | Treatment | Treatment | One treatment through BY95 Changed to control stream 1995 |
| Colt Killed Cr. | Treatment | Treatment | |
| Big Flat Cr. | Treatment | Treatment | |
| Pete King Cr. | Treatment | Treatment | |
| Squaw Cr. | Treatment | Treatment | |
| Papoose Cr. | Treatment | Treatment | |
| Brushy Rk. Cr. | Control | Control | |
| Johns Cr. | Control | * | Dropped due to logistical constraints |
| Bear Cr. | Control | * | |
| Edorado Cr. | * | Control | Added to original study design |
| White Cap Cr. | * | Control | |

* Streams not included in the original study design.
 * Supplemental data started with broodyear 1996.

Changes in 1/3 of streams

Average proportion of non-ISS chinook salmon carcasses recovered in ISS study streams during carcass surveys. N = the number of years with covariate estimates out of a possible of seven. ND = no data.

| Subbasin | Study Stream | Category | N | Proportion Stray |
|------------------|--------------------|-----------|---|------------------|
| Clearwater River | American River | Treatment | 7 | 0.61 |
| | Big Flat Creek | Treatment | 7 | 0.63 |
| | Brushy Fork Creek | Control | 7 | 0.44 |
| | Clear Creek | Treatment | 7 | 0.31 |
| | Colt Killed Creek | Treatment | 6 | 0.64 |
| | Crooked Fork Creek | Control | 7 | 0.58 |
| | Crooked River | Treatment | 7 | 0.30 |
| | Edorado Creek | Control | 3 | 0.22 |
| | Herd Creek | Treatment | 4 | 0.08 |
| | Lolo Creek | Treatment | 7 | 0.38 |
| | Newsome Creek | Treatment | 6 | 0.44 |
| | Papoose | Treatment | 7 | 0.41 |
| | Pete King Creek | Treatment | 1 | 0 |
| | Red River | Treatment | 7 | 0.43 |
| | Squaw Creek | Treatment | 3 | 0.33 |
| | White Cap Creek | Control | | ND |
| Salmon River | Bear Valley Creek | Control | 7 | 0 |
| | EF Salmon River | Treatment | 2 | 0 |
| | Johnson Creek | Control | 7 | 0.02 |
| | Lake Creek | Control | 7 | 0.05 |
| | Lemhi River | Treatment | 6 | 0 |
| | Marsh Creek | Control | 6 | 0.01 |
| | NF Salmon River | Treatment | 3 | 0 |
| | Pahsimeroi River | Treatment | 4 | 0.27 |
| | Secesh River | Control | 7 | 0.05 |
| | Slate Creek | Control | 3 | 0.21 |
| | SF Salmon River | Treatment | 7 | 0.67 |
| | Upper Salmon River | Treatment | 4 | 0 |
| | Valley Creek | Treatment | 6 | 0 |
| | WF Yankee Fork | Treatment | 2 | 0 |

Lake Creek/Secesh River: Control Streams



ISRP Recommendations

- A written protocol for complete statistical analysis, certified by an independent statistician team should be presented to Council during the contracting period
- The protocol for statistical analysis must indicate how straying of hatchery fish into “control streams” and “partial treatments” will be analyzed
- Development of a specific stream-by-stream protocol and timetable for implementation of Phase III of the ISS

More information on the Independent Scientific Advisory Board and Independent Scientific Review Panel and reports from the groups are available on the Northwest Power Planning Council's website at:

www.nwccouncil.org/fw/science.htm

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