Assessment Methods for Fish:
Invitees

All Meetings

Rick Soren, CALFED
Sharon Gross, CALFED
Dick Daniel, CALFED
Jim Starr, DFG
Pete Chadwick, DFG
Frank Wernette, DFG
Jim White, DFG
Jim Arthur, USBR
Jean Elder, USFWS
Mike Thabault, USFWS
Bruce Herbold, EPA
Leo Winternitz, DWR
Ken Lentz, USBR

Striped bass, shad, sturgeon

Dave Kolhorst, DFG

Smelt and Splittail

Dale Sweetnam, DFG
Randy Baxter, DFG

Salmon and Steelhead

Bill Snyder, DFG
Terry Mills, DFG
Roger Guinee, USFWS
Mike Fris, USFWS
Marty Kjelson, USFWS
Pat Brandes, USFWS
Mike Aceituno, USFWS
Chris Mobley, NMFS

Working Meeting Agenda

The Resources Building, 1416 Ninth Street, Room 1147C, Sacramento

Striped Bass, Shad, Sturgeon, Smelt, and Splittail

August 22, 1996

9:00 - 9:10	Introductions and Goals for the Working Meeting (Wendy Halverson Martin)
9:10 - 9:20	Review comments from the June 21, 1996, Focused Work Sessions (Wendy Halverson Martin)
9:20 - 9:30	Discuss integration with other CALFED processes and Establish procedures for communication with agency experts (Wendy Halverson Martin)
9:30 - 9:50	Review list of Key Species (Phil Dunn)
9:50 - 10:20	Review and determine appropriate Life Stages and Assessment Variables for Striped Bass, American Shad, White Sturgeon, Delta Smelt, Longfin Smelt, and Sacramento Splittail [see enclosed lists]* (Phil Dunn)
10:20 - 10:30	BREAK
10:30 - 11:45	Discuss quantitative and qualitative assessment methods and linking relationships (Phil Dunn and Warren Shaul)
11:45 - 12:00	Schedule ongoing discussions and work sessions - Assignments and Next Steps (Wendy Halverson Martin)

*Note: We realize that not all species will be covered in detail in the given time, but would like to begin these discussions now.

Working Meeting Agenda

The Resources Building, 1416 Ninth Street, Room 1147C, Sacramento

Chinook Salmon and Steelhead Trout

August 27, 1996

9:00 - 9:10	Introductions and Goals for the Working Meeting (Wendy Halverson Martin)
9:10 - 9:20	Review comments from the June 21, 1996, Focused Work Sessions and from the August 22, 1996, meeting on Striped Bass and Other Species (Wendy Halverson Martin)
9:20 - 9:30	Discuss integration with other CALFED processes and Establish procedures for communication with agency experts (Wendy Halverson Martin)
9:30 - 9:50	Review list of Key Species (Phil Dunn)
9:50 - 10:20	Review and determine appropriate Life Stages and Assessment Variables for Chinook Salmon and Steelhead Trout [see enclosed lists]* (Phil Dunn)
10:20 - 10:30	BREAK
10:30 - 11:45	Discuss quantitative and qualitative assessment methods and linking relationships (Phil Dunn and Warren Shaul)
11:45 - 12:00	Schedule ongoing discussions and work sessions - Assignments and Next Steps (Wendy Halverson Martin)

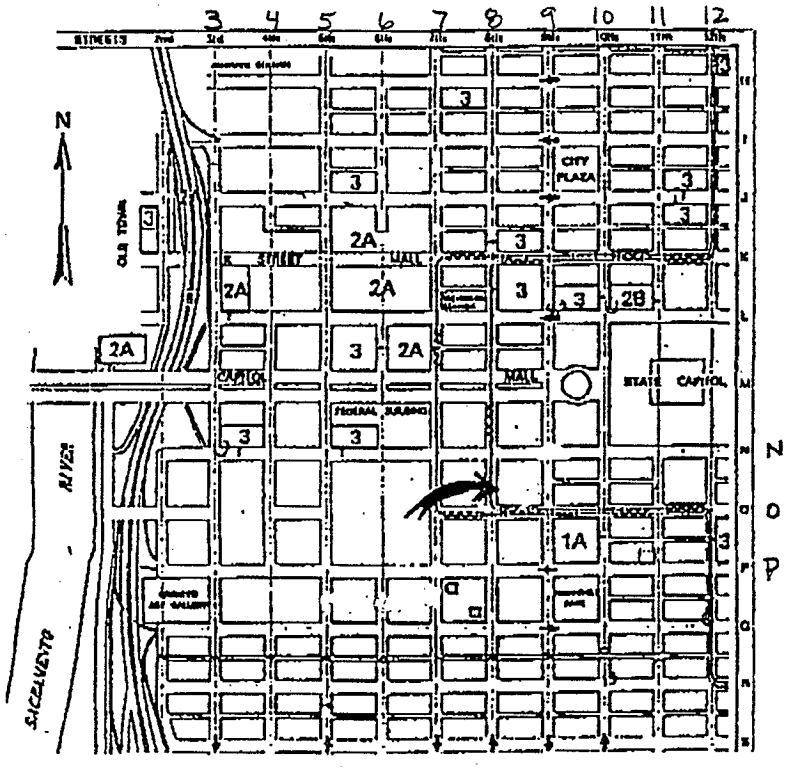
*Note: *We realize that not all species or runs will be covered in detail in the given time, but would like to begin these discussions now.

Meeting Location and Directions

Both meetings will be held in the CALFED Offices located in the Resources Building

1416 Ninth Street, Room 1147-C
Sacramento

The Resources Biuilding is located on
Ninth Street between N and O Streets.



The numbered blocks indicate parking lots.

List of Key Species

1. Sacramento River fall-run chinook salmon
2. San Joaquin River fall-run chinook salmon
3. Late fall-run chinook salmon
4. Winter-run chinook salmon
5. Spring-run chinook salmon
6. Steelhead trout
7. American shad
8. Green and white sturgeon
9. Striped bass
10. Sacramento Splittail
11. Delta smelt
12. Longfin smelt

What additional species would you include (e.g., largemouth bass, invertebrates)? Why?

What species would you delete? Why?

Fisheries Assessment Variables by Life Stage:
Sacramento River Fall-Run Chinook Salmon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
San Joaquin River Fall-Run Chinook Salmon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Late Fall-Run Chinook Salmon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Winter-Run Chinook Salmon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Spring-Run Chinook Salmon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Steelhead Trout

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

Fisheries Assessment Variables by Life Stage:
Steelhead Trout

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Salmon
   - B. Temperature Survival Relationship for Pre-Spawn Eggs
   - C. Flow Survival Relationship for Adult Migration
   - D. Barrier Survival Relationship for Adult Migration
   - E. Flow Habitat Relationship for Spawning Success
   - F. Spawning Gravel Availability
   - G. Spawning Dispersal
   - H. Pollutant Mortality Relationships
   - I. Sport Fishing Mortality
   - J. Effects of Hatchery Fish Competition for Spawning Habitat
   - K. Stock Recruitment Relationships

II. Incubation and Emergence (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., scour, redd dewatering, water circulation)
   - C. Spawning Gravel Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Pollutant Mortality Relationships
   - E. Predation and Disease Mortality Relationships

III. Fry and Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships
   - K. Effects of Hatchery Fish Competition for Rearing Habitat

IV. Fry and Juvenile Rearing and Migration (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Out-Migration Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition for Rearing Habitat

V. Juvenile and Adult Rearing (Ocean Habitat)
- A. Natural Mortality Rate (based on water temperature, ocean upwelling)
- B. Commercial Fishing Mortality
- C. Sport Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
American Shad

I. Adult Migration and Spawning (Riverine and Delta Habitat)
   - A. Temperature Survival Relationship for Spawning Success
   - B. Flow Survival Relationship for Adult Migration
   - C. Barrier Survival Relationship for Adult Migration
   - D. Flow Habitat Relationship for Spawning Success
   - E. Spawning Habitat Availability
   - F. Salinity Effects on Spawning Success
   - G. Pollutant Mortality Relationship
   - H. Sport Fishing Mortality
   - I. Stock Recruitment Relationships

II. Incubation (Riverine and Delta Habitat)
   - A. Temperature Survival Relationship
   - B. River Flow Survival Relationship
   - C. Delta Flow Survival Relationship
   - D. Diversion Mortality Relationship
   - E. Lower San Joaquin River TDS Survival Relationship
   - F. Pollutant Mortality Relationship
   - G. Predation and Disease Relationships to Survival

III. Larval and Juvenile (YOY) Rearing (Riverine and Delta Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Transport Relationship for Rearing Success
   - C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
   - D. Diversion Mortality Relationship
   - E. In-River Rearing Habitat Availability
   - F. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - G. Delta Rearing Habitat Availability
   - H. Predation, Competition, and Disease Relationships to Survival
   - I. Pollutant Mortality Relationships

V. Juvenile and Adult Rearing (Ocean Habitat)
   - A. Natural Mortality Rate (based on water temperature, ocean upwelling)

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Green and White Sturgeon

I. Adult Migration and Spawning (Riverine Habitat)
   - A. Temperature Survival Relationship for Adult Sturgeon
   - B. Flow Survival Relationship for Adult Migration
   - C. Barrier Survival Relationship for Adult Migration
   - D. Flow Habitat Relationship for Spawning Success
   - E. Spawning Habitat Availability
   - F. Pollutant Mortality Relationships
   - G. Sport Fishing Mortality
   - H. Stock Recruitment Relationships

II. Incubation, Emergence, and Larval Distribution (Riverine Habitat)
   - A. Temperature Survival Relationship for Eggs and Larvae
   - B. Flow Habitat Relationship for Incubation Success (e.g., water circulation)
   - C. Spawning Substrate Quality (e.g., effects on dissolved oxygen, emergence)
   - D. Flow Transport Relationship for Rearing Success
   - E. Diversion Mortality Relationship
   - F. Pollutant Mortality Relationships
   - G. Predation and Disease Mortality Relationships

III. Juvenile Rearing and Migration (Riverine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Habitat Relationship for Rearing Success (cover, food, stranding)
   - C. Flow Transport Relationship for Out-Migration Success
   - D. Diversion Mortality Relationship
   - E. Dam Passage Mortality Relationship
   - F. In-River Rearing Habitat Availability
   - G. Riparian and Shaded Riverine Aquatic (SRA) Habitat Availability
   - H. Flood Bypass Habitat Availability and Stranding Losses
   - I. Predation, Competition, and Disease Relationships to Survival
   - J. Pollutant Mortality Relationships

IV. Juvenile and Adult Rearing (Delta, Estuarine, and Ocean Habitat)
   - A. Diversion Mortality Relationship
   - B. Delta Rearing Habitat Availability
   - C. Suisun Bay Rearing Habitat Availability
   - D. Predation, Competition, and Disease Relationships to Survival
   - E. Pollutant Mortality Relationships
   - F. Fishing Mortality (Sport and Poaching)

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Striped Bass

I. Adult Migration and Spawning (Riverine and Delta Habitat)
- A. Temperature Survival Relationship for Spawning Success
- B. Flow Relationship for Adult Migration
- C. Flow Habitat Relationship for Spawning Success
- D. Spawning Habitat Availability
- E. Ocean Salinity Effects on Spawning Success
- F. San Joaquin River Salinity Effects on Spawning Success
- G. Pollutant Mortality Relationship
- H. Sport Fishing Mortality
- I. Stock Recruitment Relationships

II. Incubation (Riverine and Delta Habitats)
- A. Temperature Survival Relationship
- B. Sacramento River Flow Survival Relationship
- C. Lower San Joaquin River Flow Survival Relationship
- D. Diversion Mortality Relationship
- E. Lower San Joaquin River TDS Survival Relationship
- F. Pollutant Mortality Relationship
- G. Predation and Disease Relationships to Survival

III. Larval and Juvenile (YOY) Rearing (Delta Habitat)
- A. Temperature Survival Relationship
- B. Flow Transport Relationship for Rearing Success
- C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
- D. Diversion Mortality Relationship
- E. Delta Rearing Habitat Availability
- F. Suisun Bay Rearing Habitat Availability
- G. Predation, Competition, and Disease Relationships to Survival
- H. Pollutant Mortality Relationships
- I. Effects of Hatchery Fish Competition and Predation

IV. Juvenile (1 to 3 years old) and Adult Rearing (Delta, Estuarine, and Ocean Habitats)
- A. Diversion Mortality Relationship
- B. Delta Rearing Habitat Availability
- C. Suisun Bay Rearing Habitat Availability
- D. Predation, Competition, and Disease Relationships to Survival
- E. Pollutant Mortality Relationships
- F. Effects of Hatchery Fish Competition and Predation
- G. Fishing Mortality (Sport and Poaching)

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Sacramento Splittail

I. Adult Migration and Spawning (Riverine and Delta Habitat)
   - A. Temperature Survival Relationship for Spawning Success
   - B. Flow Relationship for Adult Migration
   - C. Flow Habitat Relationship for Spawning Success
   - D. Spawning Habitat Availability
   - E. Pollutant Mortality Relationship
   - F. Sport Fishing Mortality
   - G. Stock Recruitment Relationships

II. Incubation (Riverine and Delta Habitats)
   - A. Temperature Survival Relationship
   - B. Flow Survival Relationships (e.g., dewatering)
   - C. Pollutant Mortality Relationship
   - D. Predation and Disease Relationships to Survival

III. Larval and Juvenile (YOY) Rearing (Riverine and Delta Habitats)
   - A. Temperature Survival Relationship
   - B. Flow Transport Relationship for Rearing Success
   - C. Flow Survival Relationships (e.g., stranding)
   - D. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
   - E. Diversion Mortality Relationship
   - F. Rearing Habitat Availability
   - G. Predation, Competition, and Disease Relationships to Survival
   - H. Pollutant Mortality Relationships

IV. Juvenile (1 to 3 years old) and Adult Rearing (Delta and Estuarine Habitats)
   - A. Diversion Mortality Relationship
   - B. Delta Rearing Habitat Availability
   - C. Suisun Bay Rearing Habitat Availability
   - D. Predation, Competition, and Disease Relationships to Survival
   - E. Pollutant Mortality Relationships
   - G. Fishing Mortality

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Delta Smelt

I. Adult Migration and Spawning (Delta and Suisun Bay Habitat)
   - A. Temperature Survival Relationship for Spawning Success
   - B. Flow Relationship for Adult Migration
   - C. Flow Habitat Relationship for Spawning Success
   - D. Spawning Habitat Availability
   - E. Ocean Salinity Effects on Spawning Success
   - F. San Joaquin River Salinity Effects on Spawning Success
   - G. Pollutant Mortality Relationship
   - H. Stock Recruitment Relationships

II. Incubation (Delta and Suisun Bay Habitats)
   - A. Temperature Survival Relationship
   - B. Pollutant Mortality Relationship
   - C. Predation and Disease Relationships to Survival

III. Larval and Juvenile Rearing (Delta and Suisun Bay Habitats)
   - A. Temperature Survival Relationship
   - B. Flow Transport Relationship for Rearing Success
   - C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
   - D. Diversion Mortality Relationship
   - E. Delta Rearing Habitat Availability
   - F. Suisun Bay Rearing Habitat Availability
   - G. Predation, Competition, and Disease Relationships to Survival
   - H. Pollutant Mortality Relationships

IV. Juvenile and Adult Rearing (Delta and Suisun Bay Habitats)
   - A. Diversion Mortality Relationship
   - B. Delta Rearing Habitat Availability
   - C. Suisun Bay Rearing Habitat Availability
   - D. Predation, Competition, and Disease Relationships to Survival
   - E. Pollutant Mortality Relationships

What life stages would include or delete? Why?

Can you recommend any additional assessment variables for this species? If so, what are they?

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

Fisheries Assessment Variables by Life Stage:
Longfin Smelt

I. Adult Migration and Spawning (Delta and Suisun Bay Habitat)
   - A. Temperature Survival Relationship for Spawning Success
   - B. Flow Relationship for Adult Migration
   - C. Flow Habitat Relationship for Spawning Success
   - D. Spawning Habitat Availability
   - E. Ocean Salinity Effects on Spawning Success
   - F. San Joaquin River Salinity Effects on Spawning Success
   - G. Pollutant Mortality Relationship
   - H. Stock Recruitment Relationships

II. Incubation (Delta and Suisun Bay Habitats)
   - A. Temperature Survival Relationship
   - B. Pollutant Mortality Relationship
   - C. Predation and Disease Relationships to Survival

III. Larval and Juvenile Rearing (Estuarine Habitat)
   - A. Temperature Survival Relationship
   - B. Flow Transport Relationship for Rearing Success
   - C. Pathway and Barrier Survival Relationships (e.g., DCC and Old River)
   - D. Diversion Mortality Relationship
   - E. Rearing Habitat Availability
   - F. Predation, Competition, and Disease Relationships to Survival
   - G. Pollutant Mortality Relationships

IV. Juvenile and Adult Rearing (Estuarine Habitat)
   - A. Diversion Mortality Relationship
   - B. Rearing Habitat Availability
   - C. Predation, Competition, and Disease Relationships to Survival
   - D. Pollutant Mortality Relationships

What life stages would include or delete? Why?

_____

_____

_____

Can you recommend any additional assessment variables for this species? If so, what are they?

_____

_____

Are there any proposed assesment variables which you would recommend CALFED not use for this species? Why?

EXAMPLES OF ASSESSMENT METHODS

Species/Life Stage: Sacramento River Fall-Run Chinook Salmon / Fry and Juvenile Rearing and Migration (Delta Habitat)

Assessment Variable: Pathway and Barrier Survival Relationships (also includes Temperature Survival and Diversion Mortality Relationships)

Assessment Method: USFWS model for estimating mortality of fall-run chinook salmon smolts in the Sacramento-San Joaquin Delta.

Application to CALFED: CALFED actions may affect salmon smolt survival through changes to Sacramento River inflow and water temperature, the distribution of flow across the Delta, and Delta diversions. The mortality index could be used to compare mortality of salmon smolts among alternatives with variable flow and diversion patterns.

Description: The model uses analytical relationships developed by the USFWS from tag release-return studies conducted under variable inflow, export, and water temperature conditions. The analytical relationship developed from the tag-return data is depicted in the figure below. Mortality of salmon smolt that migrate through the Delta is a function of flow, Delta Cross Channel operations, export rate, and Sacramento River water temperature.

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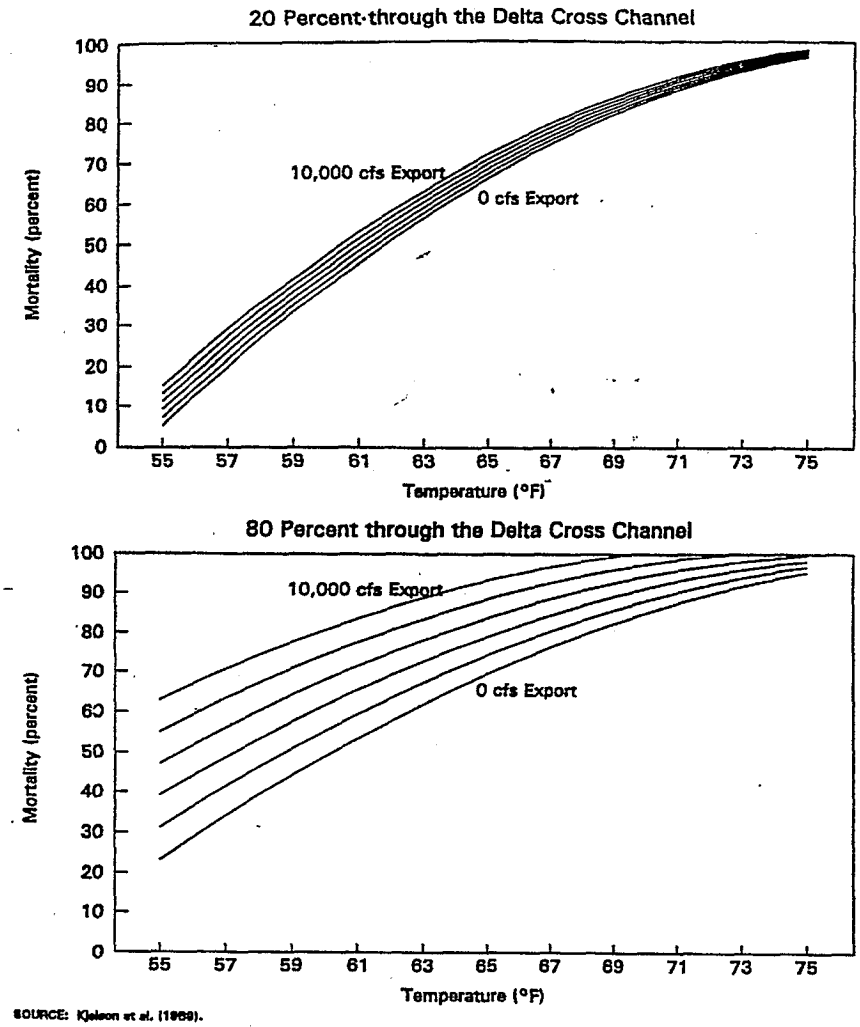


SOURCE: Kjelson et al. (1989).

PREDICTED SACRAMENTO RIVER CHINOOK SALMON SMOLT MORTALITY THROUGH THE DELTA VERSUS SACRAMENTO RIVER WATER TEMPERATURE AND DELTA EXPORT PUMPING RATES

Reference: Kjelson, M.A., S. Greene, and P. Brandes. 1989.

Input Data: Channel flow, water temperature, export rates, and Delta Cross Channel gate operations.

Modifications necessary for CALFED use: Although modifications to the model are not required with the existing Delta facilities and channel configuration, controversy regarding model validity should be clearly identified and, if possible, resolved. Potential changes to Delta channel barriers and diversion location under the CALFED alternatives may limit model usefulness.

Species/Life Stage: Fall-Run Chinook Salmon / Adult Migration and Spawning (Riverine Habitat)

Assessment Variable: Flow Habitat Relationship for Spawning Success (and Spawning Habitat Availability)

Assessment Method: Flow Habitat Relationship for Fall-Run Chinook Salmon in the Lower American River

Application to CALFED: CALFED actions may result in changes to the flow below Nimbus Dam on the American River that could affect depth, velocity, and spawning habitat availability for fall-run chinook salmon.

Description: The analytical relationship depicted in the figure below depicts the relationship of spawning habitat as a function of river flow based on IFIM studies. An index of spawning habitat can be calculated.

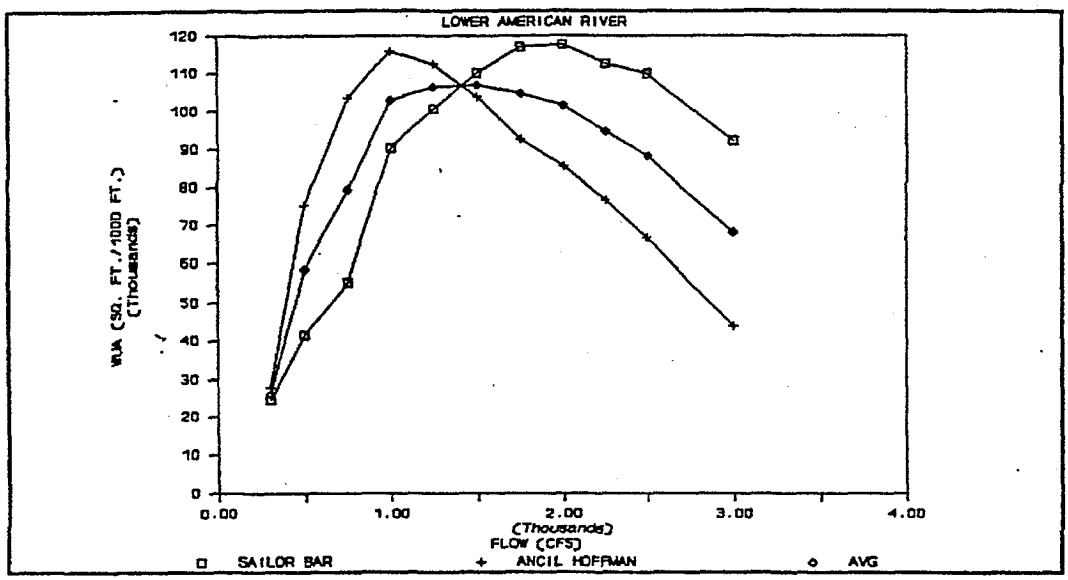


Figure 15. Relationships between flow and spawning habitat in Lower American River (from USFWS 1985).

Reference: BioSystems Analysis, Inc. 1989. Chinook salmon population model for the Sacramento River Basin - Version CPOP-2. Submitted to California Department of Fish and Game, Sacramento, California.

Input Data: River flow, flow-habitat relationship.

Modifications necessary for CALFED use: Although modifications to the model are not required with the existing river morphology, controversy regarding model validity should be clearly identified and, if possible, resolved. Potential changes spawning habitat (e.g., spawning gravel restoration) under the CALFED alternatives may alter model usefulness.

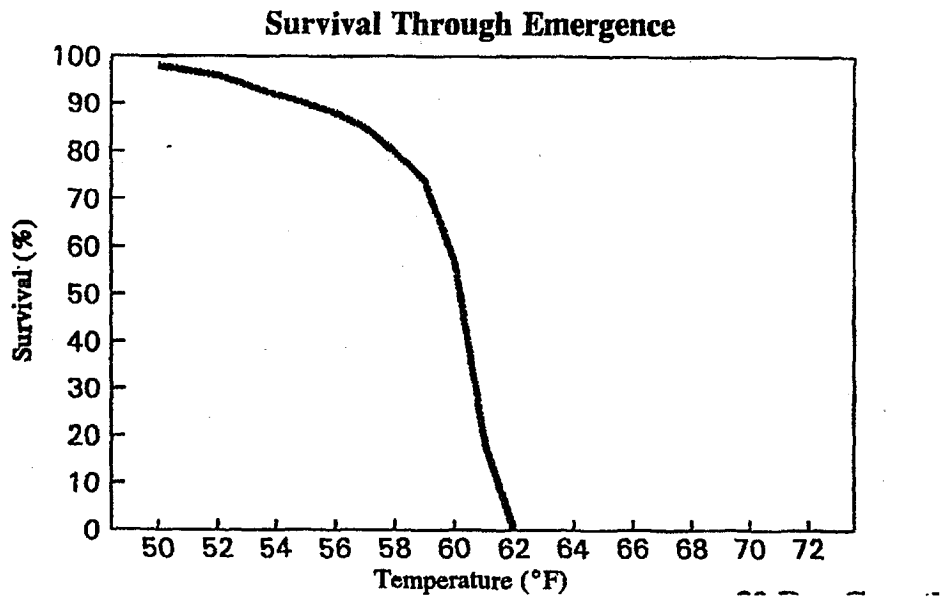
Species/Life Stage: Fall-Run Chinook Salmon / Incubation and Emergence (Riverine Habitat)

Assessment Variable: Temperature Survival Relationship for Eggs and Larvae

Assessment Method: Water Temperature Survival Relationship

Application to CALFED: CALFED actions may include changes to the flow below Keswick Dam in the upper Sacramento River, changes in Shasta Reservoir storage, and changes in operations of the water temperature control structure that could affect water temperature and the survival of eggs and larvae of fall-run chinook salmon.

Description: Survival is calculated using the relationship shown in the figure below that depicts survival through emergence as a function of water temperature. Incubation survival is based on simulated water temperatures in the river below Keswick Dam.



Reference: Brett, J. R., W. C. Clarke, and J. E. Shelbourn. 1982. Experiments on thermal requirements for growth and food conversion efficiency of juvenile salmon *Oncorhyncus tshawytscha.* (Canadian Technical Report of Fisheries and Aquatic Sciences No. 1027.) Department of Fisheries and Ocean, Fisheries Research Branch, Pacific Biological Station. Nanaimo, B.C., Canada.

Input Data: Simulated water temperature and temperature-survival relationship.

Modifications necessary for CALFED use: Modifications to the temperature survival model are not required. Changes in the existing river morphology (e.g., channel shape, riparian restoration), however, would require adjustments to the model used to simulate water temperature.

Assessment Methods for Fish:
Questions for Discussion

When reviewing the enclosed materials, consider the following questions and bring your thoughts, ideas, more questions, and issues to the work sessions.

1. *What advice do you have for CALFED about the general approach proposed to develop impact assessment methods?*

What are your recommendations to improve this approach within the required timeframe?

2. *Can you recommend specific assessment methods for each species?*

Questions for Discussion (Continued)

3. *How important is linkage of relationships? Why?*

Can it be done in the time frame for the CALFED Program?

4. *Should we integrate qualitative and quantitative analysis? How would this be accomplished?*

State of California

Memorandum

To : Ms. Wendy Halverson Martin
CALFED Bay-Delta Program

Date : July 11, 1996

From : Department of Fish and Game

Subject : Review of the CALFED Draft Fisheries Assessment Strategy Package

Thank you for the opportunity to review the CALFED Draft Fisheries Assessment Strategy Package. The attached comments are from the Bay-Delta Division staff and do not necessarily represent the views of the Department of Fish and Game (DFG). Mr. Terry Mills will be providing more specific comments regarding the salmon section of this document. I am concerned with the lack of DFG involvement in the fishery assessment tools selection to date, and feel our participation should not be limited to the last minute review of documents. My staff and I look forward to working with you and the CALFED consultants to develop fishery assessment tools and strategies.

If you have any questions please feel free to contact me or Mr. Jim Starr of my staff at 209-948-7800 or CALNET 8-423-7800.

Frank Wernette

Frank Wernette
Senior Biologist
Bay-Delta and Special Water
Projects Division

Attachment

cc: Bruce Herbold
U.S. Environmental Protection Agency
San Francisco, California

Chris Mobley
National Marine Fisheries Service
Santa Rosa, California

Tom Cannon
Jones and Stokes Associates
Sacramento, California

U.S. Fish and Wildlife Service
Sacramento, California
Mike Thabault
Jean Elder

Department of Fish and Game
Stockton, California
Dave Kohlhorst
Dale Sweetnam
Randy Baxter
Pete Chadwick (c/o)

Sacramento, California
Terry Mills
Bill Snider

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Bay-Delta Division Comments regarding the CALFED Draft Fisheries Assessment Strategy Package.

General Comments:

1) Your presentation of this material at the Assessment Process Workshop, in our opinion, should not be separated into two different "breakout sessions". Individuals interested in attending both groups will be unable to do so and it may result in the loss of productive information for either session. In addition, the interaction among individuals could trigger additional thoughts and ideas.

2) We would like to take on a larger and more productive role in this process, rather than just reviewing documents with a short turnaround time. You solicit further input after the July 10, 1996 deadline and we believe that this input should come in the form of face to face contact with agency biologist. This interaction would 1) involve agency biologist in the development of fishery assessment tools and 2) allow for proper review and consideration of assessment tools.

3) Please number all pages in the document so that easy reference can be made to correction or comment areas.

Specific Comments:

Overview of Fisheries Assessment Strategy; 2nd paragraph:

> The passage states that models do not exist that meet your qualifications, however the Department of Fish and Game has developed a striped bass model that, in our opinion, meets these qualifications.
>
> Also in this paragraph a fishery assessment strategy is described that will use a balanced array of simple variables and relationships without attempting to link these relationships together and predict absolute population mortality and survival rates and, ultimately, adult fish populations. This strategy for fishery or any assessment is unacceptable. These assessments should, to the extent possible, link relationships and equate impacts and actions to effects on adult populations.

Overview of Fisheries Assessment Strategy; that begins "Implement a balanced...":

balanced array of simple variables and relationships" will be used, while this paragraph states that qualitative, simple semi-quantitative, and complex quantitative (models) tools" will be employed. In addition, we do not believe that scientifically-based narrative descriptions should be compared to quantitative analyses, but narrative can be compared to other narratives and should be used in combination to demonstrate a point.

Overview of Fisheries Assessment Strategy; paragraph that begins"Rely extensively on...":

The CALFED process is working to develop long-term solutions for the Sacramento-San Joaquin Estuary and with that in mind, we should not rush forward or shy away from developing effective and appropriate analytical tools to determine potential impacts of CALFED alternatives.

Overview of Fisheries Assessment Strategy; paragraph that begins "the proposed analytical..":

Striped bass should be removed from the list of other species to be evaluated.

Black bass should not be dismissed so quickly and should be considered as an evaluation species for the Delta for potential impacts associated with CALFED alternatives. DFG collects information regarding black bass populations and densities throughout the Delta; over 40 fishing tournaments are held in the Delta yearly.

Overview of Fisheries Assessment Strategy; bullet list; second to last bullet:

The fishery agencies should be involved in defining what is a significance threshold and how these thresholds will be established.

Overview of Fisheries Assessment Strategy; bullet list; last bullet:

This bullet should be reworded to read:
analyze impacts using the assessment tools and present results

Table 1. Summary of Analytical Tools for Fish Species Assessment Variables: Fall-run Chinook Salmon:

In the spawning, incubation, and emergence section a tool name should be added that examines the Spawning Dispersal of salmon in spawning areas. The reason for this is that salmon have a tendency to clump together when spawning, which would negate any positive benefit of increasing numbers of fish and increasing spawning habitat. In addition, in the Fry and Juvenile in-

river rearing and migration section a tool name should be added which examines the Riverine and Aquatic Habitat in the lower rivers for shallow water habitats.

Under tool types it would be necessary to include tools that examine hydrodynamic information in the key channels, rivers, and facilities of the Sacramento-San Joaquin Delta, such as: entrainment indices at state and federal facilities, and for other selected locations in the Delta minimum, maximum, and average channel velocities, QWEST, DWR's smolt loss model, and USFWS smolt loss model as well as others.

In the juvenile and adult ocean survival section inputs required from other tools should be ocean temperature and an up-welling component. Both of these factors will affect the survival of ocean salmon although excellent conditions exist in and on the spawning grounds.

Figure and write up that links growth and temperature:

The indicator as described in this write up is a "Temperature survival index" however, this graph looks at the association between growth and temperature. We do not understand how survival can be equated from this association.

Figure and write up that links flow at Vernalis and smolt survival:

Document source and graph source should be the same, not from different documents. The word "San Joaquin" should be added.

This association would no longer be valid with some of the CALFED alternatives if water is removed from an alternative location in the Sacramento River instead of in the south Delta. We advocate that appropriate modifications be made to this tool to allow it to be used for any of the alternatives.

Narrative Describing Fry and Juvenile In-River Rearing and Migration:

The paragraph describes the benefits of riparian vegetation but does not take into account the fact that predators are are associated with riparian habitats.

Narrative Describing Fry and Juvenile In-River Rearing and Migration
Indicator - Habitat Connectivity Description

What defines a "Long distance of poor quality edge habitat"? Is there any support for the statement that "Linear-connected riverine and riparian (edge) habitats through space and time are highly desirable ecological features for

increasing fisheries production"? If this can not be supported, then it is a weak hypothesis and should be rethought.

Narrative Describing Fry and Juvenile In-River Rearing and Migration
Indicator - Levee Development and Revetment Description
Last sentence in second paragraph:

Conveyance facilities will not improve fish habitat. What may improve fish habitat are the habitat development measures associated with these conveyance facilities. In addition, the write up should recognize that some non-native fish species do very well along developed and rip-rapped levees in the Delta.

Narrative Describing Fry and Juvenile In-River Rearing and Migration
Indicator - Shaded Riverine Aquatic (SRA) Habitat Description
First sentence in second paragraph:

SRA habitat in the Delta may moderate the temperature of water in the immediate vicinity but would be of little benefit to the bigger Delta-wide picture.

Narrative Describing Fry and Juvenile In-River Rearing and Migration
Indicator - Flow/Transport Description

This narrative should be combined with the U.S. Fish and Wildlife Smolt Survival Model to analyze the CALFED alternatives.

Table 1. Summary of Analytical Tools for Fish Species Assessment Variables: Striped Bass

Under tool types it would be necessary to include tools that examine hydrodynamic information in the key channels, rivers, and facilities of the Sacramento-San Joaquin Delta, such as: entrainment indices at state and federal facilities, and for other selected locations in the Delta minimum, maximum, and average channel velocities, QWEST, DWR's smolt loss model, and USFWS smolt loss model as well as others.

Narrative Describing Adult Migration: wording changes

The word "thought" should be replaced with "known" so that it reads "...temperature is known to be an important..."

The sentence that begins with "Short term..." should read as follows: "Short term decreases in water temperature associated with cooler weather could

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increase mortality of newly spawned striped bass eggs or already hatched larval striped bass".

The amount of flow is likely to be more important than the stability of flows over the spawning period.

Figure and write up that describes the Cross Delta Flow Parameter:

This write-up and figure would need to be clarified, and the time period in which it describes defined. It might be more appropriate to look at the cross Delta flow parameter during key time periods. It might also be helpful to examine other components of the Cross Delta Flow Parameter tool (e.g. lower San Joaquin).

Figure and write up that describes the X2 location and survival index: wording addition:

Add the words "of reasons" after the word "variety" so that it reads "...higher flows for a variety of reasons including better..."

Figure and write up that discusses loss rate of juvenile striped bass at export pumps:

Add the word "index" so that it reads: "Estimated losses of 21-150 mm juveniles are divided by the abundance index for juveniles as determined from survey data to determine a loss rate index".

Figure and write up that describes the association between young of the year index and egg production:

The word "adjusted" should be replaced with the word "reduced" and would read as follows"..estuary should be reduced if the number of ...".

There is not enough information presented to decide whether this is a non-linear or linear relationship. However, a linear representation is probably most appropriate based on the range of egg production presented in this figure.

Narrative Describing Larval and Early Juvenile Rearing Transport
Indicator - Shallow Water Habitat
First paragraph, last sentence: wording change

The word "seasonally" should be replaced with the word "historically" and would read as follows "...flooded terrestrial habitat that historically provided...".

Narrative Describing Larval and Early Juvenile Rearing Transport
Indicator - Food production and availability

Data on survival rates have suggested that these changes in the distribution and composition of striped bass food items is not important.

Narrative Describing Fry and Juvenile Delta Migration Survival
Indicator - Juvenile Abundance

This figure looks at the association between survival and temperature and does not give any indication as to the abundance of juvenile salmon as a result of temperature.

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Summary of Key Points from the CALFED Bay-Delta Program Analytical Tools Work Sessions

Fish Species: Delta Resident Fish - Chinook Salmon (June 21)

General Comments

- Use best available information/data/relationships/models.
- Use balanced approach using narrative, indices, and models.
- Use strong relationships that are well known.
- Do not link relationships to develop indices/models unless the links are well known.
- Goal is not number of fish. Ecosystem integrity is important. Goal of program is to improve natural ecosystem functions and integrity.
- Sensitivity analysis is desirable, and explain rationale for all analyses/assumptions.

Assessment Variables

- Modular and flexible approach is needed. May need daily analyses for flow fluctuations on a particular river. Average monthly flows may be appropriate for other affects. Need to assess specific CALFED components.
- Focus on broad ecological functions.

Modeling Tools

- Do not rely heavily on indices or population models. Do not combine/lump, or multiply indices.
- Need to establish more tools to evaluate habitat restoration actions, design restoration component, and differentiate between alternatives.

Unresolved Issues

- How will modeling outputs be characterized? There is great difficulty in comparing and understanding different types of output.

Attendees

Wendy Halverson Martin - CALFED
Alice Low - CH2M Hill
Tom Taylor - Trihey & Associates
Jim Buell - MWD Consultant
Rick Breitenbach - CALFED
Bruce Herbold - EPA
Phil Dunn - CALFED Consultant
Russ Brown - CALFED Consultant
Jordan Lang - CALFED Consultant
Tom Cannon - CALFED Consultant
Warren Shaul - CALFED Consultant
Frank Wernette - DFG
Pete Chadwick - DFG
Ken Lentz - USBR
Randy Bailey - MWD Consultant
Leo Winternitz - DWR
Liz Howard - USBR
Dick Daniel - CALFED
Phil Unger - Entrix
Steve Ford - DWR
Terry Mills - DFG
Jim White - DFG
Jordan Lang - CALFED Consultant
Rick Soehren - CALFED

Summary of Key Points from the CALFED Bay-Delta Program Analytical Tools Work Sessions

Fish Species: Riverine Fish - Striped Bass (June 21)

General Comments

- Supporting variables are likely more important variables than trying to get to adult fish abundance.
- Look at changing relationships based on science and sound judgment, but do not just throw out historic data.
- Federal/state agencies should be involved in helping CALFED team in developing tools/methods/relationships. A few selected individuals will provide input and keep group small so it can still work effectively.
- See "Summary of Key Points" for chinook salmon. All of these issues that were generic to the general CALFED approach were agreed to by the striped bass group, in general. There were no contradictions between the two groups in terms of approach.

Unresolved Issues

- How will the new facilities be modeled? Many of these facilities may fundamentally change the existing system so that historic relationships may not be valid.

Attendees

Wendy Halverson Martin - CALFED
Alice Low - CH2M Hill
Tom Taylor - Trihey & Associates
Jim Buell - MWD Consultant
Rick Breitenbach - CALFED
Phil Dunn - CALFED Consultant
Russ Brown - CALFED Consultant
Jordan Lang - CALFED Consultant
Tom Cannon - CALFED Consultant
Warren Shaul - CALFED Consultant
Frank Wernette - DFG
Dick Daniel - CALFED
Peter Baker - EA Engineering
Jack Rowell - USBR
Ted Sommer - DWR
Chris Mobley - NMFS
Jim White - DFG
Larry Puckett - DFG, USFWS
Bill Snyder - DFG