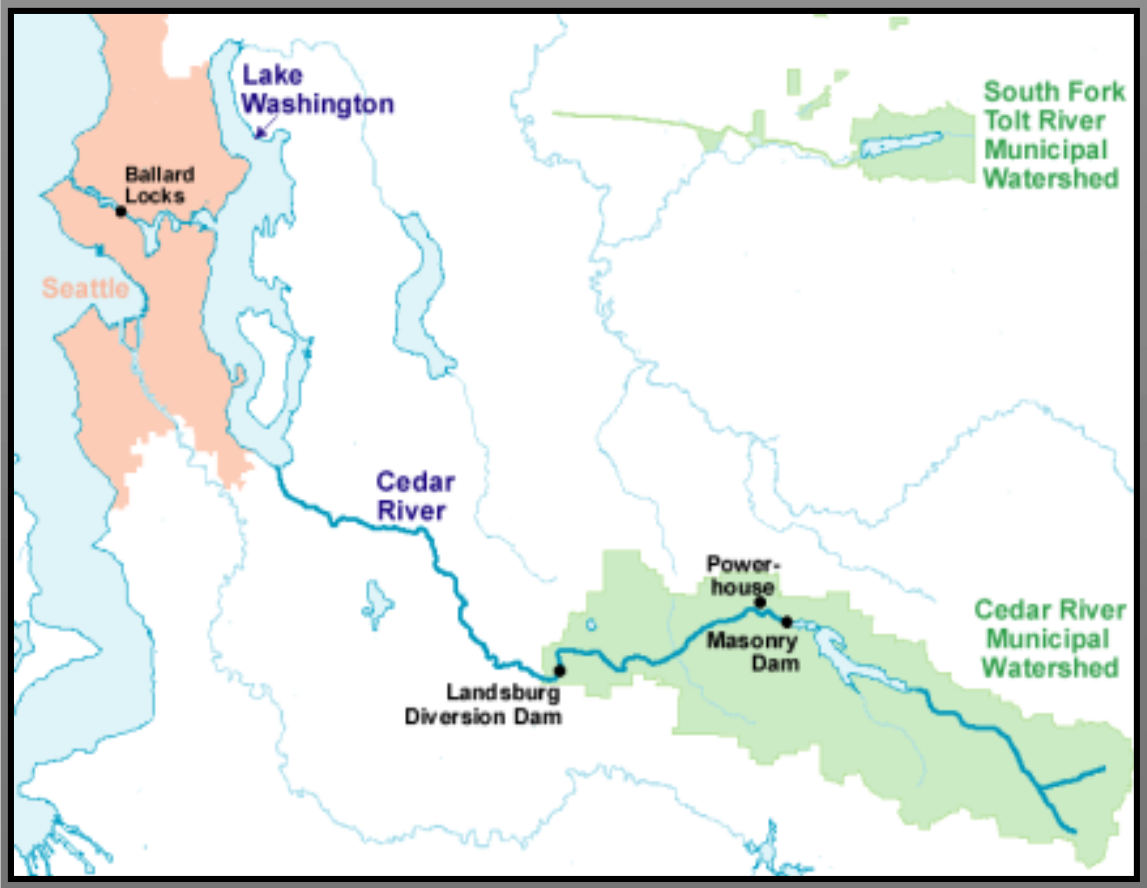
Cedar River
Instream Flow Management

Rand Little
Seattle Public Utilities

City of Seattle

Geographic Overview



- Storage reservoir receives run-off from the upper 43% of the basin
- Approx. 20% of average annual flow diverted at the Landsburg Diversion Dam

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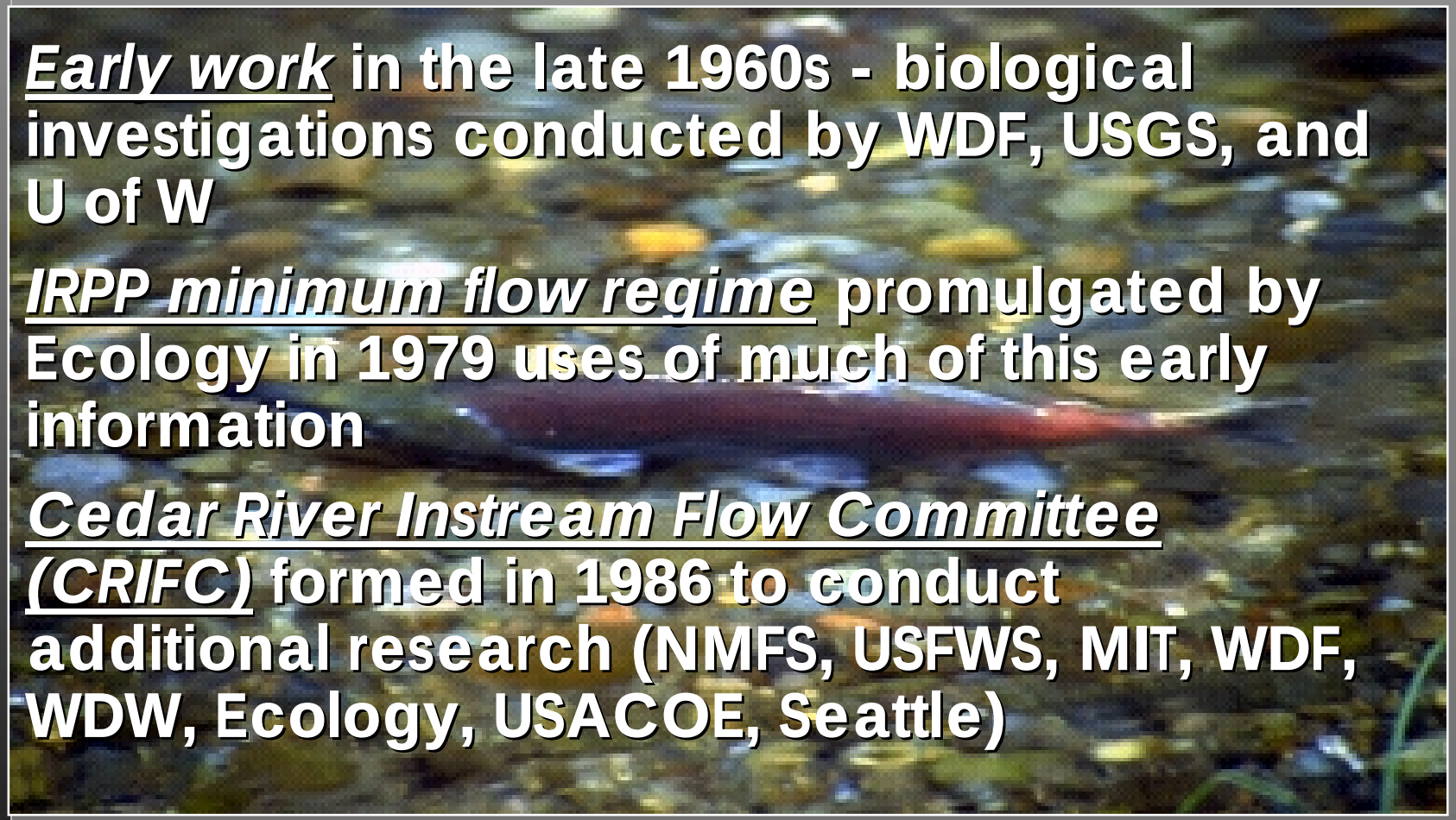
Historical Background



- ***Early work*** **in the late 1960s - biological investigations conducted by WDF, USGS, and U of W**
- ***IRPP minimum flow regime*** **promulgated by Ecology in 1979 uses of much of this early information**
- ***Cedar River Instream Flow Committee (CRIFC)*** **formed in 1986 to conduct additional research (NMFS, USFWS, MIT, WDF, WDW, Ecology, USACOE, Seattle)**

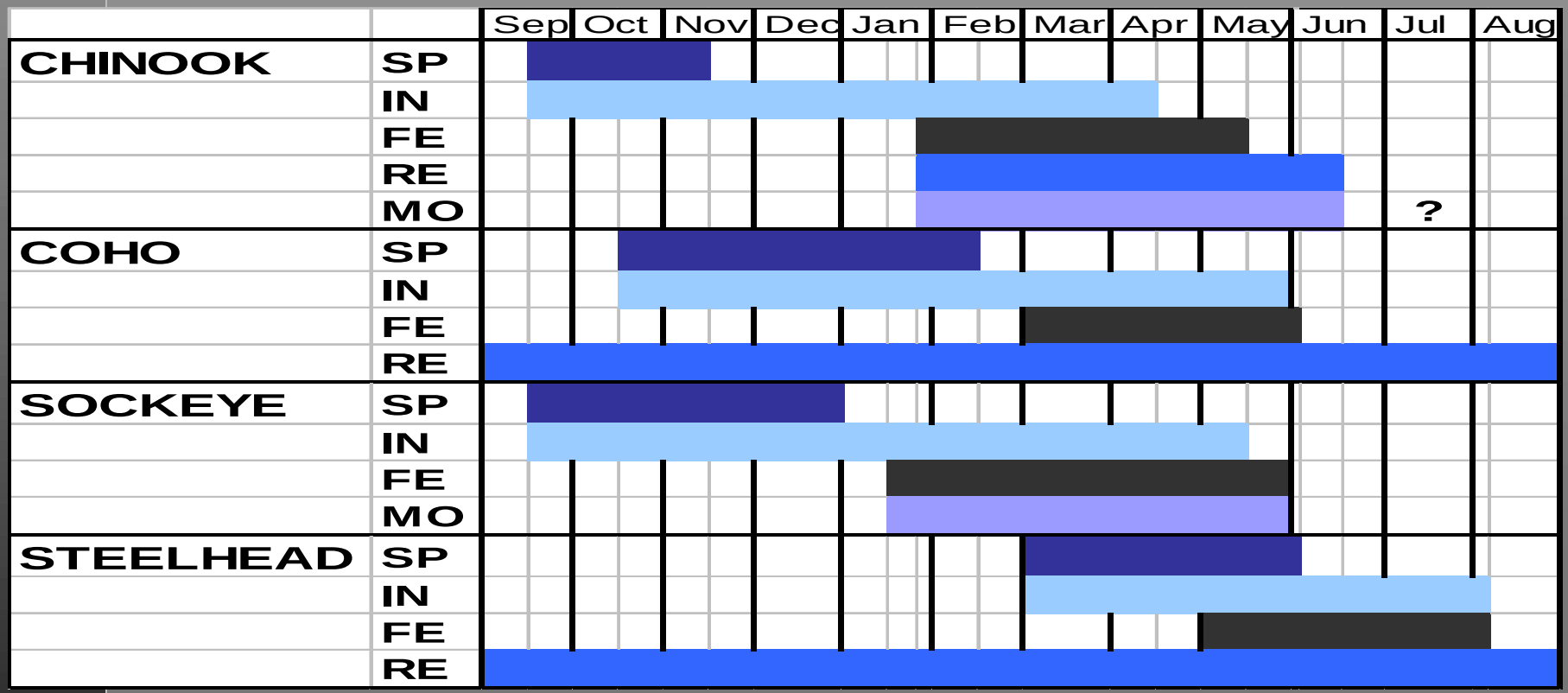
Historical Background

- ***1991:*** **CRIFC completes 5-year study program including PHABSIM analyses and companion studies**
- ***1993:*** **Using the results of studies, CRIFC begins development of a new instream flow management regime**
- ***1994-2000:*** **Instream flow is included in the development of the HCP. Additional study, analysis and discussion leads to HCP instream flow management program**

Guiding Principles

- Use best available scientific information
- Improve conditions in the Cedar for all salmonids
- Use the natural hydrograph to inform
- Provide flexibility and commitment to adapt & improve conditions for fish
- Preserve water supply capacity & flexibility
- Integrate flow management with flood control needs, water mgmt. in Lake Washington & mgmt. of Chester Morse Reservoir

Complex Array of Objectives



SP: spawning
IN: incubation
FE: fry emergence
RE: juvenile rearing
MO: migration out of river

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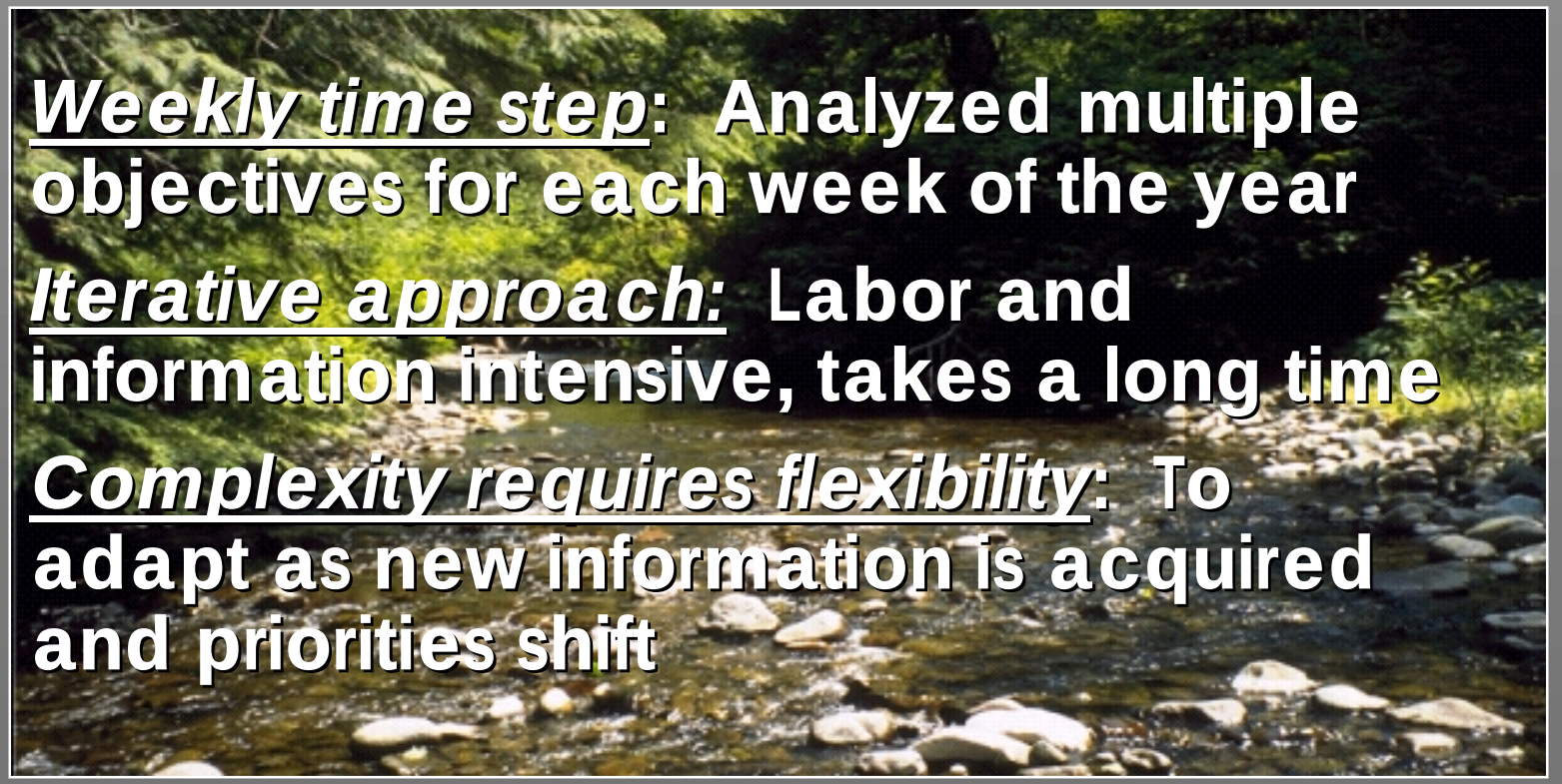
Addressing Multiple Objectives

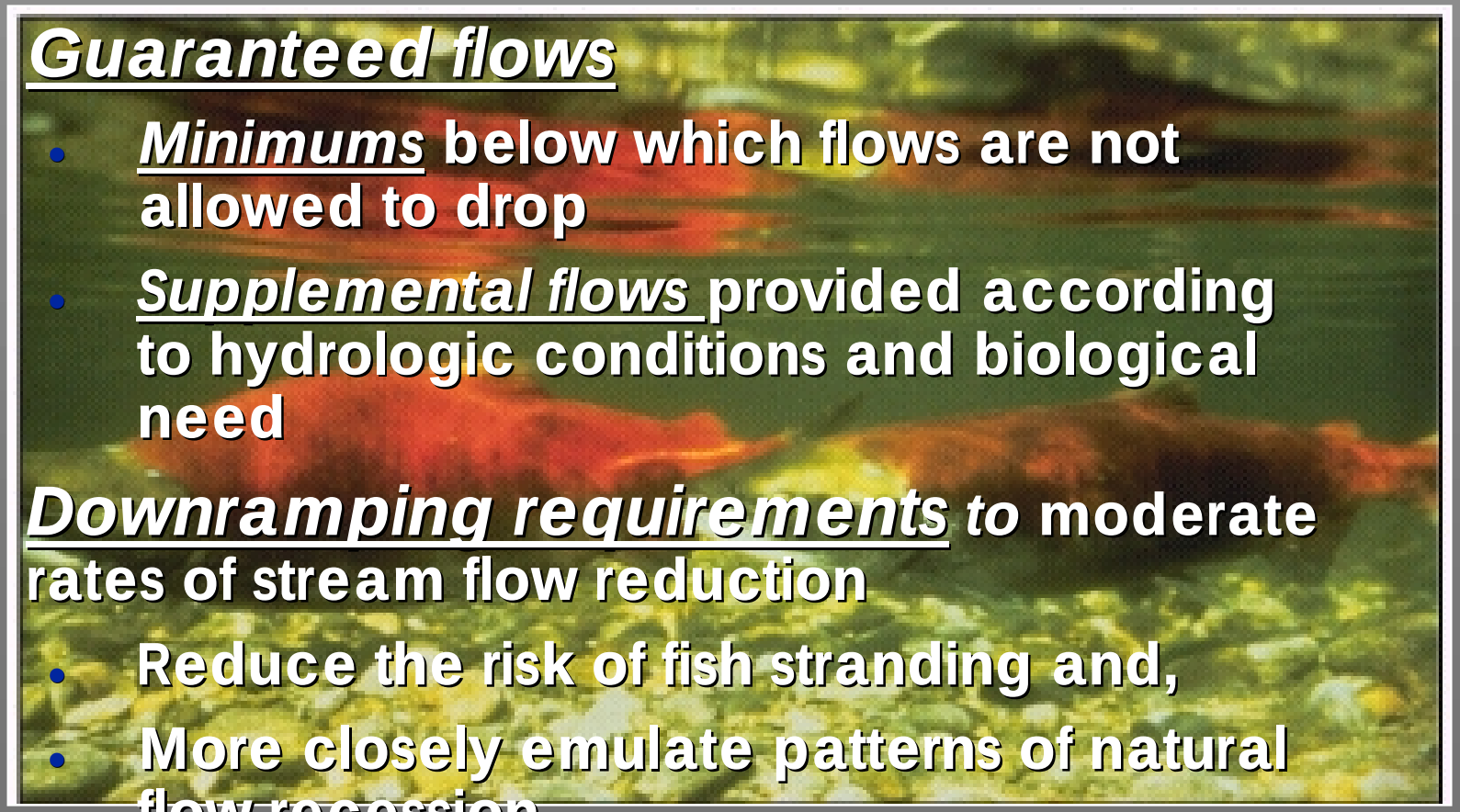


- ***Weekly time step***: Analyzed multiple objectives for each week of the year
- ***Iterative approach:*** Labor and information intensive, takes a long time
- ***Complexity requires flexibility***: To adapt as new information is acquired and priorities shift

Balancing Certainty and Flexibility

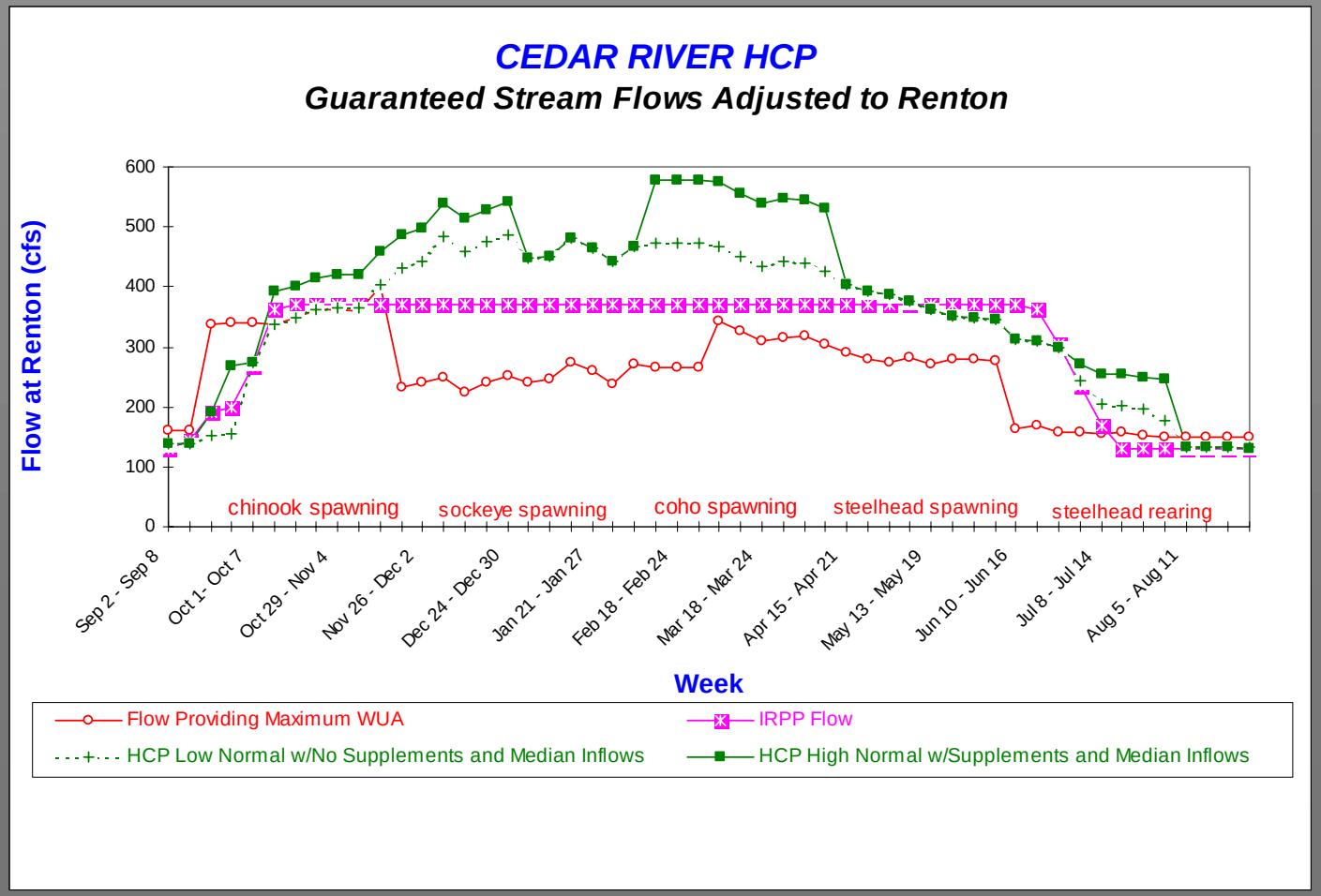
- ***Detailed mngmt. prescriptions*** **that protect the river and maintain municipal water supply capacity**
- ***Facility improvements*** **to help protect fish**
- ***Limitations on diversions*** **ensure flexibility to adapt and improve flow management**
- **Continued *monitoring and research***
- **Collaborative *oversight***

Detailed Prescriptions for Real Time Flow Management



- ***Guaranteed flows***
  - ***Minimums*** **below which flows are not allowed to drop**
  - ***Supplemental flows*** **provided according to hydrologic conditions and biological need**
- ***Downramping requirements*** ***to*** **moderate rates of stream flow reduction**
  - **Reduce the risk of fish stranding and,**
  - **More closely emulate patterns of natural flow recession**

Guaranteed Flows



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Facility Improvements

- Over $1.2 million for improvements to SCL's Cedar Falls hydropower facilities to protect fish and flows
- $ 2.1 million for fish passage and water efficiency improvements at the Chittenden Locks

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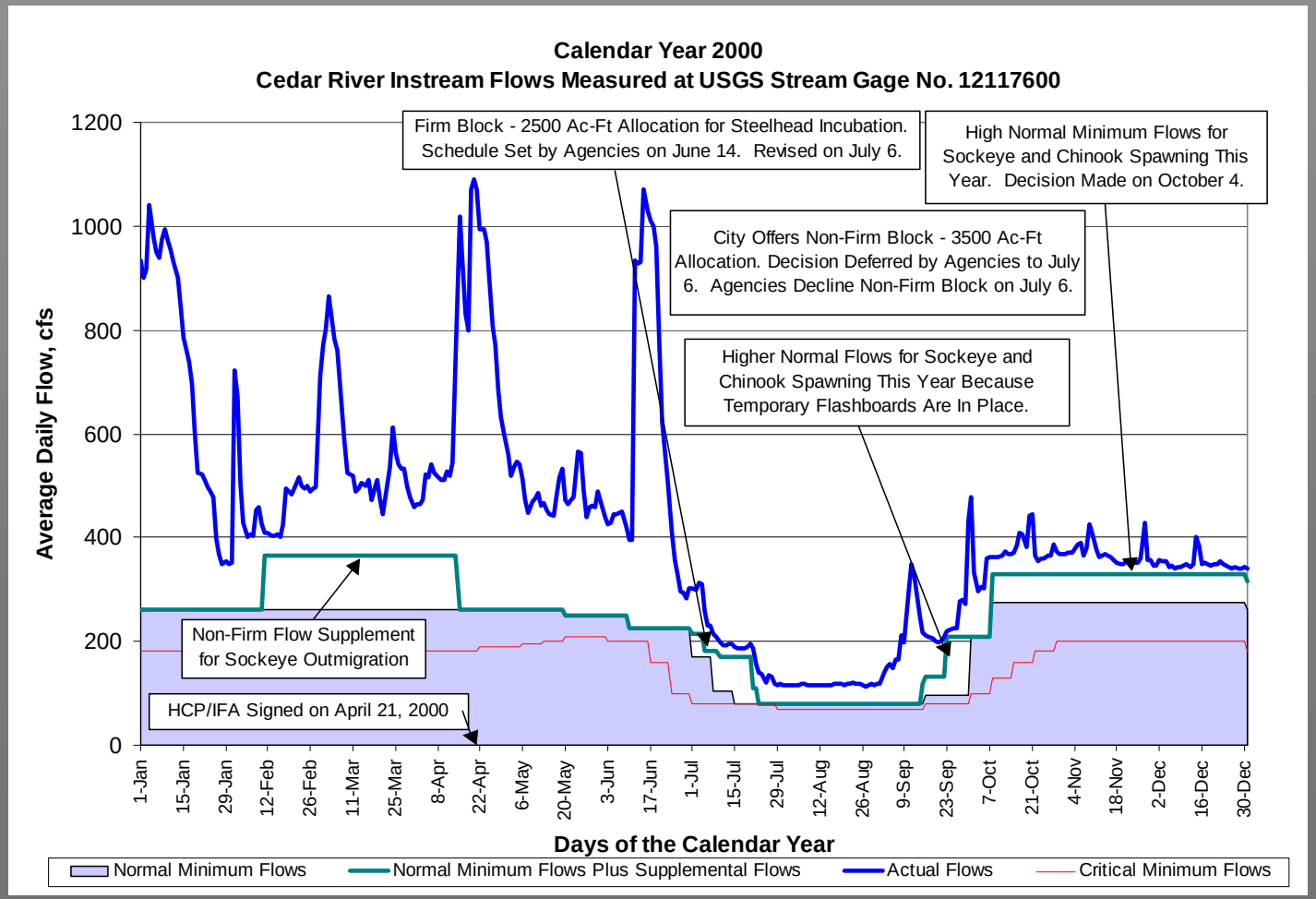
2000 Compliance Graph



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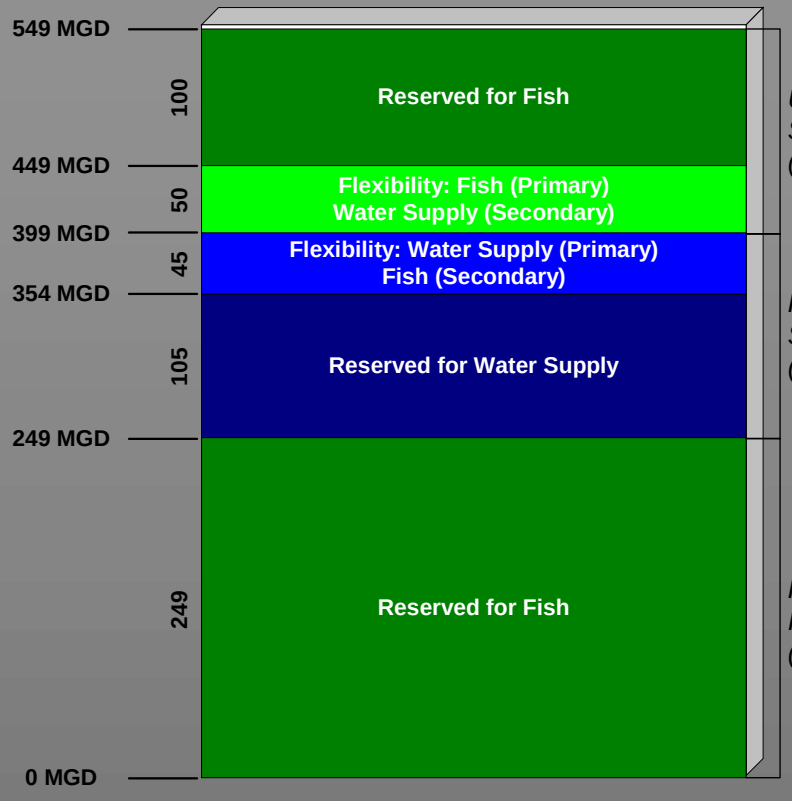
Preserving Flexibility

- Dedication of additional 100 MGD of Seattle's 300 MGD claim to the river
- Commitment to manage system to maintain annual diversions at present levels for next 10 years

Distribution and Hierarchy of Cedar River Flows

(Average Annual Flows in MGD)

Cedar River Hierarchy of Flows



Summary:

Reserved for Fish	64%
Reserved for Water Supply	19%
Flexibility: Fish Primary	9%
Flexibility: Water Supply Primary	8%

blocks.vsd 5/14/99 jmk

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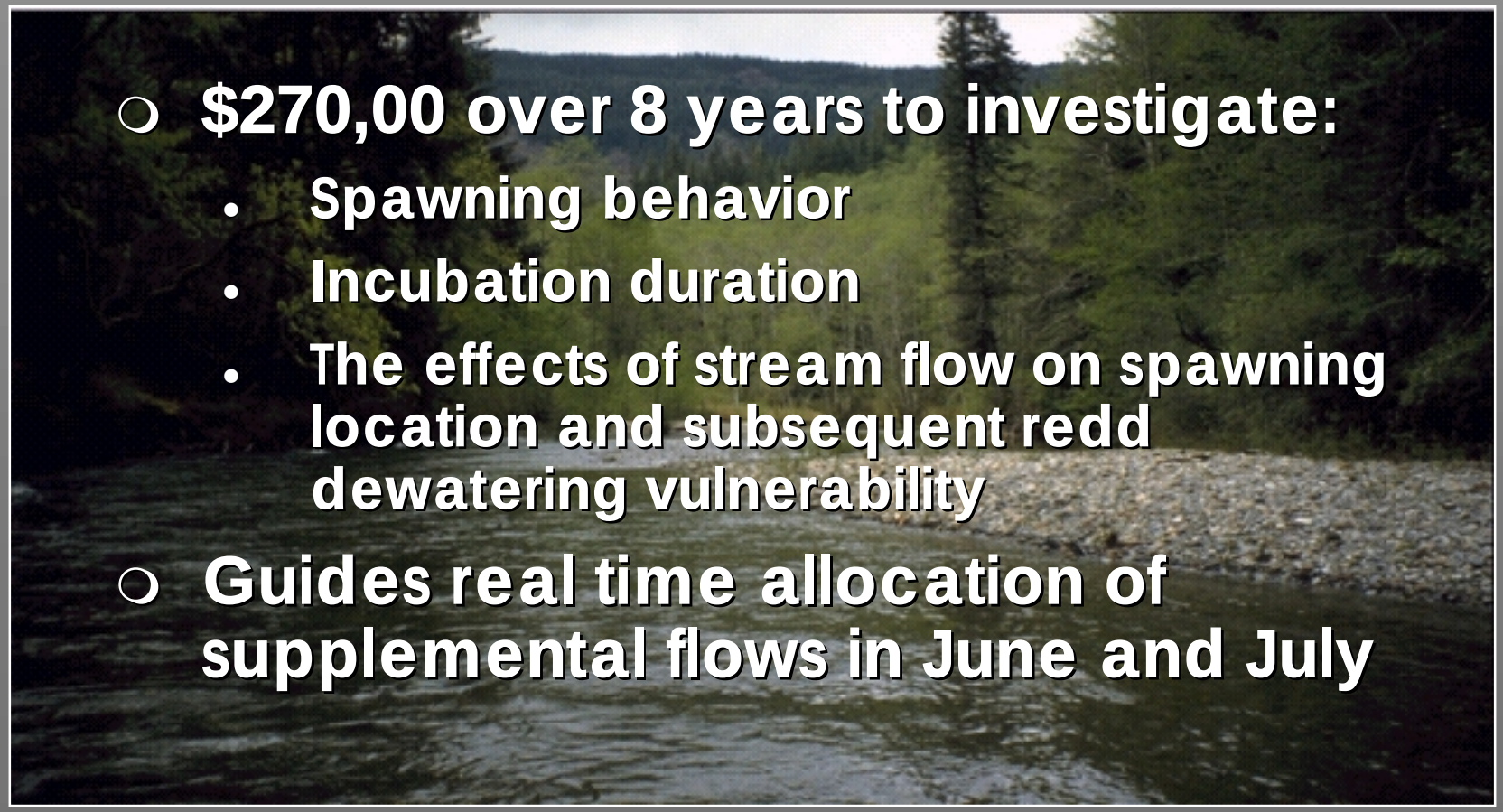
Research and Monitoring Objectives

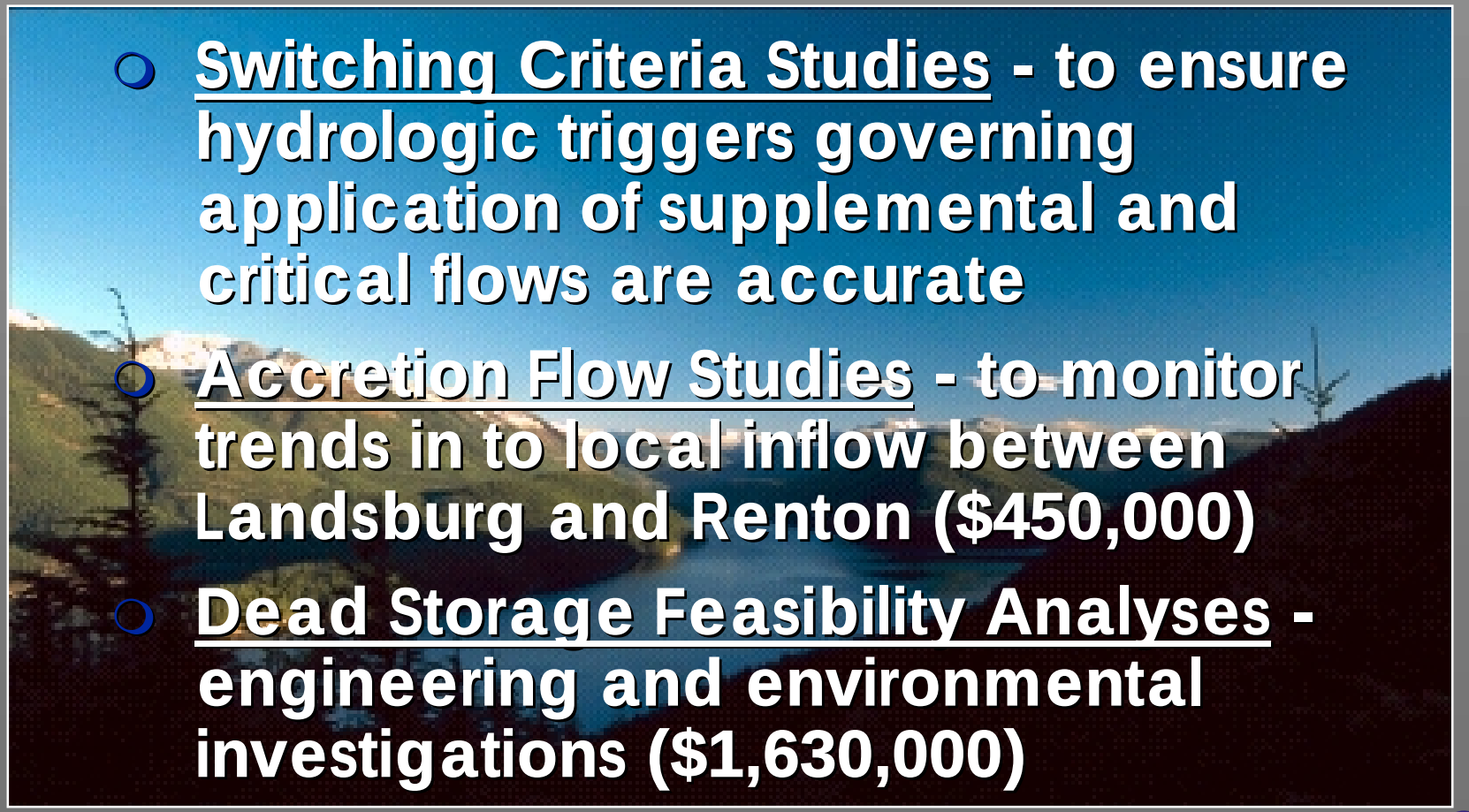
- Continue to improve our understanding of the relationships between stream flow and habitat, with an emphasis on chinook & other wild salmonids
- Support effective allocation of the supplemental blocks of summer water
- Help guide the allocation of water above guaranteed levels
- Address several new emerging technical issues

Steelhead Spawning and Incubation



- $270,00 over 8 years to investigate:
  - Spawning behavior
  - Incubation duration
  - The effects of stream flow on spawning location and subsequent redd dewatering vulnerability
- Guides real time allocation of supplemental flows in June and July

Hydrologic Studies



- Switching Criteria Studies - to ensure hydrologic triggers governing application of supplemental and critical flows are accurate
- Accretion Flow Studies - to monitor trends in to local inflow between Landsburg and Renton ($450,000)
- Dead Storage Feasibility Analyses - engineering and environmental investigations ($1,630,000)

Supplemental Biological Studies

- $1,100,000 to investigate up to 19 prioritized study questions addressing the effects of stream flow on:
  - Chinook and sockeye spawning and incubation
  - Chinook early life history
  - Water temperature
  - Natural ecological processes that shape and maintain riparian and in-channel habitat

Present status of studies

- Steelhead spawning and incubation ongoing since 1996 (annual reports)
- Chinook spawning 2000 (annual report), 2001
- Juvenile chinook in-river rearing projected to start with USFWS in 2002
- Effect of flow on juvenile chinook life history pattern presently being scoped with consultant
- Ecological processes -- plan to scope with WRIA8 flow sub-committee

Oversight

- ***Cedar River Instream Flow Commission***

  Representatives from:

  - National Marine Fisheries Service
  - U.S. Fish and Wildlife Service
  - Muckleshoot Indian Tribe
  - Washington Department of Fish & Wildlife
  - Washington Department of Ecology
  - King County
  - U.S. Army Corps of Engineers
  - Seattle City Light
  - Seattle Public Utilities

For additional information

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