Northwest Power and Conservation Council

August 4, 2003

MEMORANDUM

TO: Council Members

FROM: Bruce Suzumoto

SUBJECT: Ice Harbor Dam spill and juvenile survival studies

Brad Eppard from the Fish Ecology Division of the Northwest Fisheries Science Center (NOAA Fisheries) will present information regarding 2000 and 2002 survival studies at Ice Harbor Dam as well as update the Council on the status of the 2003 studies. NOAA Fisheries has conducted studies to estimate yearling and subyearling chinook survival at the project using passive integrated transponder (PIT) tag and radiotelemetry technology. NOAA Fisheries and the U.S. Army Corps of Engineers (USACE) have conducted spill and juvenile chinook survival studies at Ice Harbor since 1999. Attached is a historical overview of Ice Harbor spill studies provided by the USACE and a copy the PowerPoint presentation that Mr. Eppard will be making to the Council.

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Ice Harbor Spill Summary
(U.S. Army Corps of Engineers- Walla Walla)

Flow deflectors were added to Ice Harbor spillway in 1999, in hopes of allowing greater spill levels within the total dissolved gas standards (or waivers). The higher levels of spill was assumed to increase project survival on the assumption that spillway survival was 98% and turbine survival was 90%. The deflectors were expected to allow spills of around 50% of total river flow. However, they allowed 100%. Since the deflector installation the project operation was 45 kcfs during the daytime and spilling all but 10 kcfs (minimum powerhouse) at night.

These very high spill levels were a concern to many. Spillway survival studies were conducted in 2000, showing high survival in the spring but low in the summer. In 2002, survival was low in both spring and summer. No spill occurred in 2001 because of low river flows and power shortages.

In response to these low survivals, a two-treatment study was designed: the operation above vs. 50% spill 24 hours. Skimming flows off the deflectors and better tailrace egress conditions occur with 50% spill. In May, a direct (balloon tag) injury and survival study was conducted showing high survival with both treatments but higher injury rates at both treatments than seen at any other spillway. The concurrent radio tag survival study results will not be available until September.

As a result of the high injury rates seen in the May direct injury study, the summer study plan was changed. The spillway flow was concentrated (bulked) in 1 - 3 bays instead of being spread across all 10 bays. This operation was alternated with a no-spill treatment. Again a direct injury study was conducted as well as a more comprehensive Passive Integrated Transponder (PIT) tag study. The direct injury study again showed high injury rates with the spread out and bulked spills; however, injury rates were lower for the bulked spill. Results for the PIT tag study between the bulked spill and no spill are expected in early August.

The bulked spill is a concern for stilling basing integrity. Walla Walla district engineering needs to assess the operation before committing to any prolonged operation of this type. The first step of this evaluation is a hydrosurvey that will be conducted 22 and 23 July, with results available in early August. Physical modeling will follow.

Now that the fish survival studies are over, the region has agreed to operate with no spill 0800 to 2000 h, and bulked spill in the nighttime hours. Once the summer fish survival and hydrosurvey results are in, the operation will be revisited for the remainder of August when the fish spill season ends.

Further biological and engineering studies will be necessary over the next few years to increase fish survival thought this project. A special AFEP meeting as held on 15 July to map a strategy in response to these new study results.

Questions can be directed to Marvin Shutters 527-7249 or Mark Smith 527-7275

Spillway Survival at Ice Harbor Dam 2000, 2002, and 2003

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Funded by

U.S. Army Corps of Engineers
Walla Walla District

Background

- 1995 FCRPS Biological Opinion
  - To decrease travel time and mortality associated with passage through dams and reservoirs, maximize spill up to total dissolved gas (TDG) limits.
  - Investigate installation of spillway flow deflectors to reduce TDG levels at Ice Harbor Dam.
  - 24-hour spill at 25 kcfs (27% in the spring, 70% in the summer).

- 1997 Installation of spillway flow deflectors at Ice Harbor Dam
  - Allowed for higher spill levels while staying at or below TDG limits.

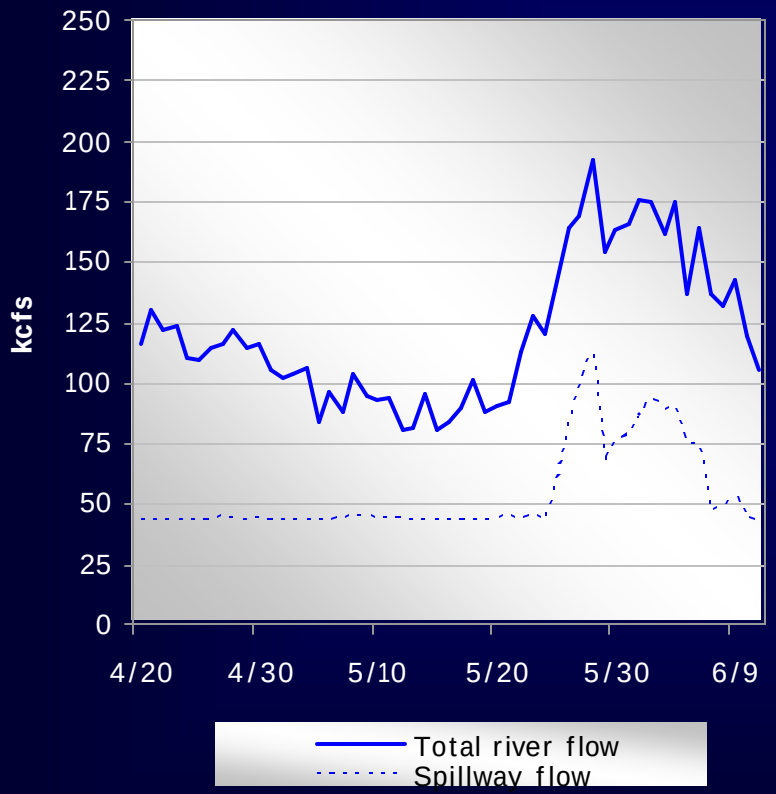
- 1998 FCRPS Supplemental Biological Opinion
  - Increase daytime (6:00 am to 6:00 pm) spill levels to 45 kcfs and nighttime (6:00 pm to 6:00 am) to an estimated 75 kcfs at night. TDG levels stay at or below limits.
  - Investigate effects of spill on fish passage (e.g., Fish Passage Efficiency).
  - For TDG reduction, spillway flow deflectors worked better than expected, able to spill up to 100 kcfs.

- 1999 Evaluation of the effects of spill on yearling spring chinook salmon fish passage efficiency at Ice Harbor Dam
  - Results led to spillway passage survival studies.

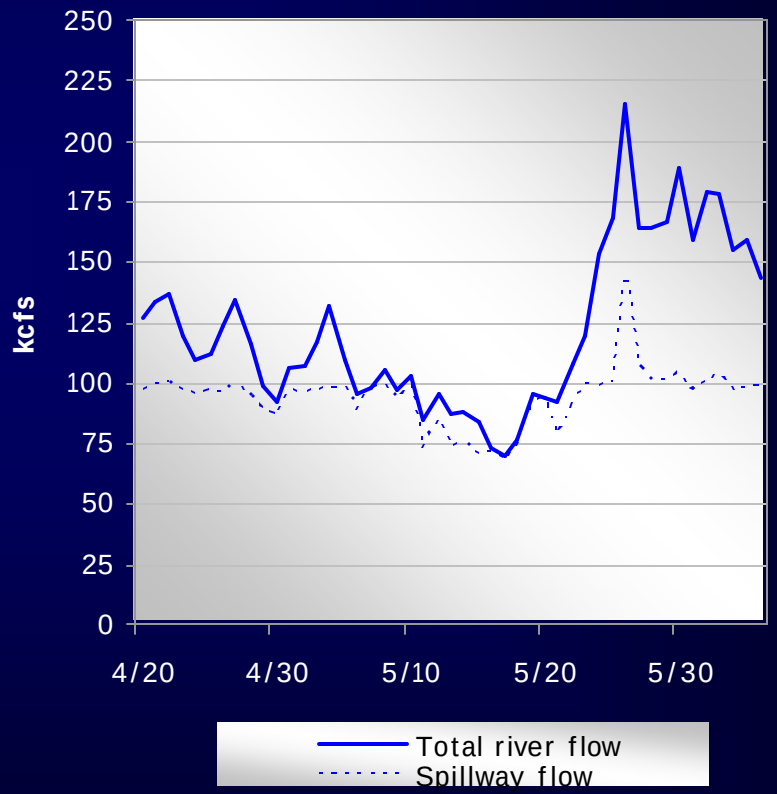
- 2000 FCRPS Biological Opinion
  - Higher performance of spillway flow deflectors to reduce TDG levels led to a nighttime spill limit increase to 100 kcfs. Daytime spill limits remain at 45 kcfs.

1999 Results: Spring operations

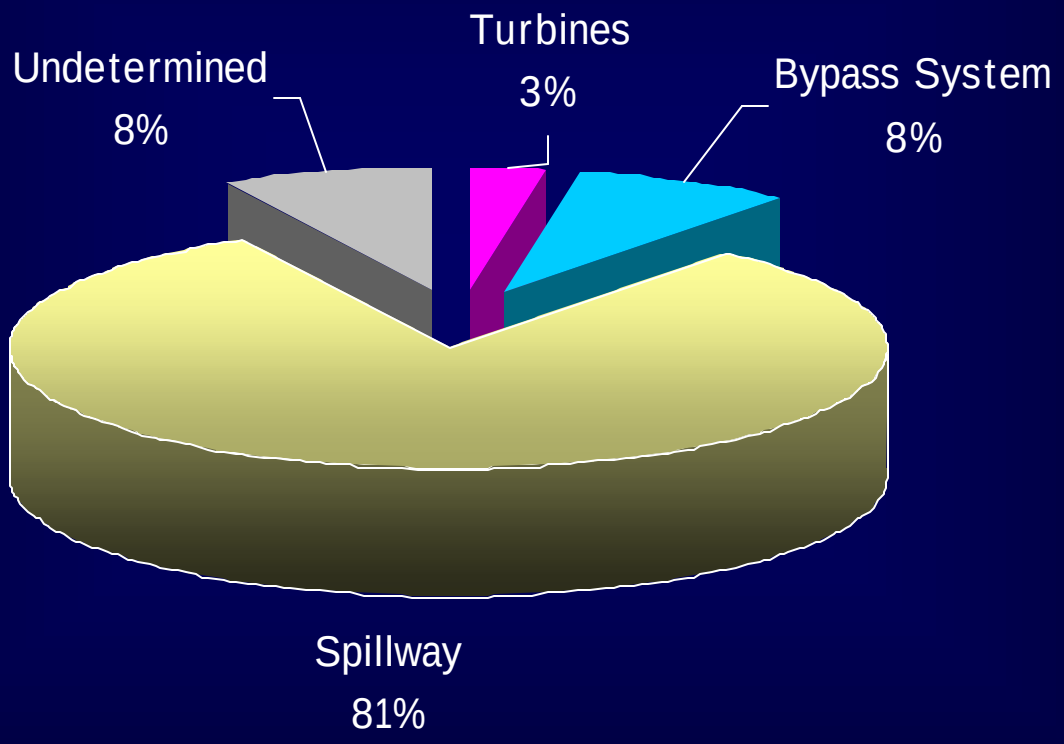
Daytime operations
(6:00 am - 6:00 pm)



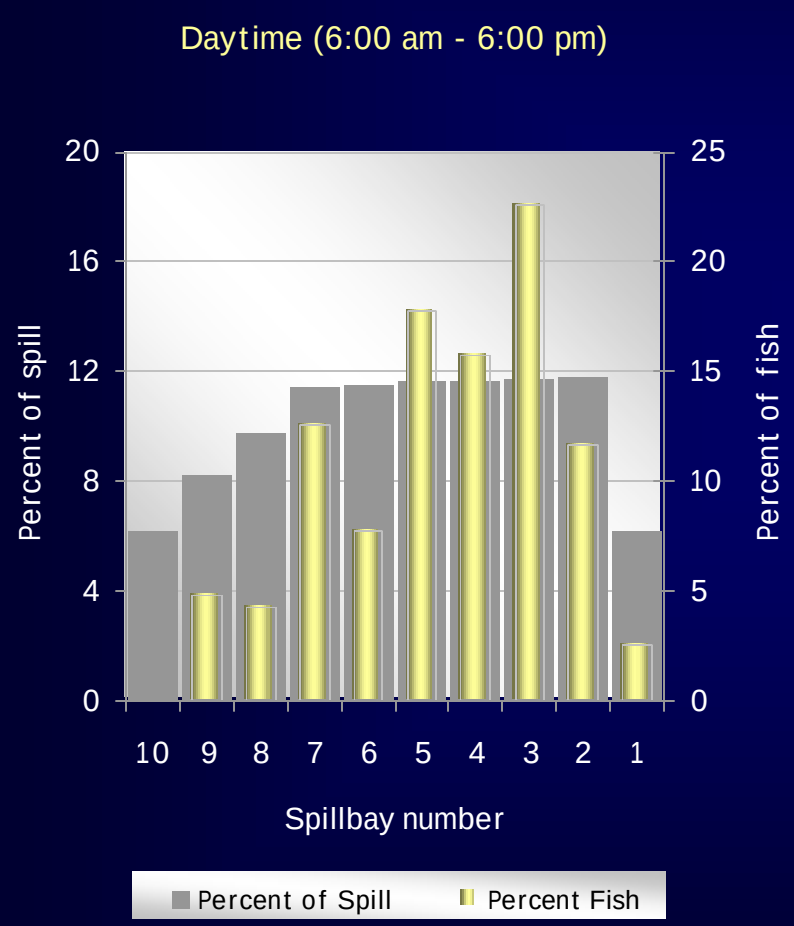
Nighttime operations
(6:00 pm - 6:00 am)

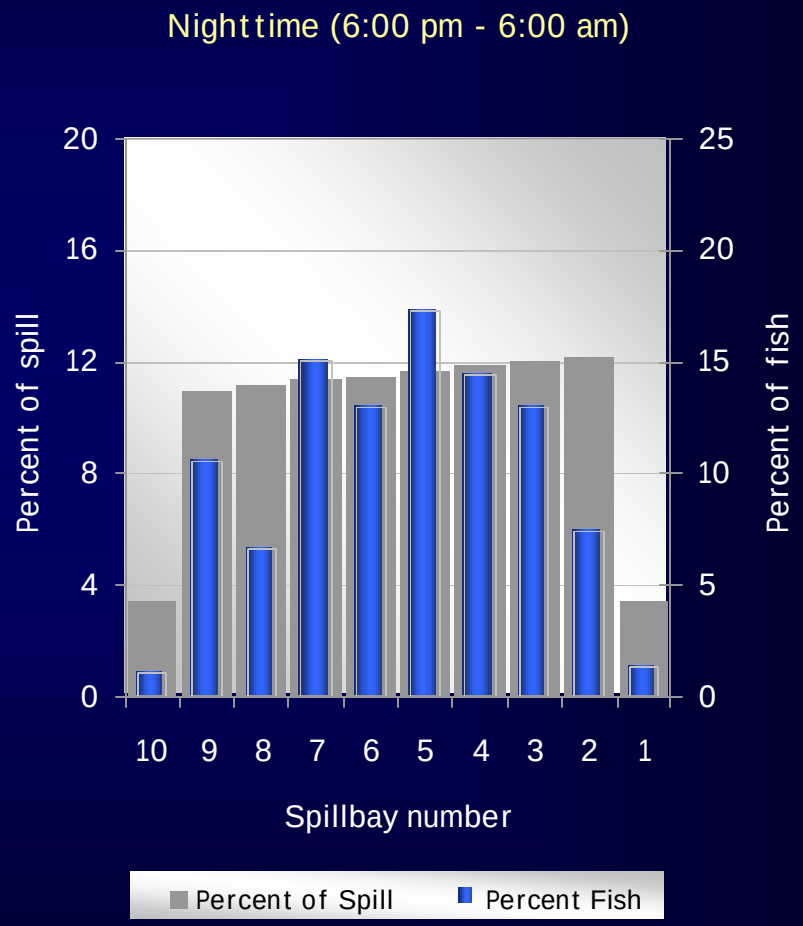


1999 Results: Passage distribution for radio-tagged yearling chinook

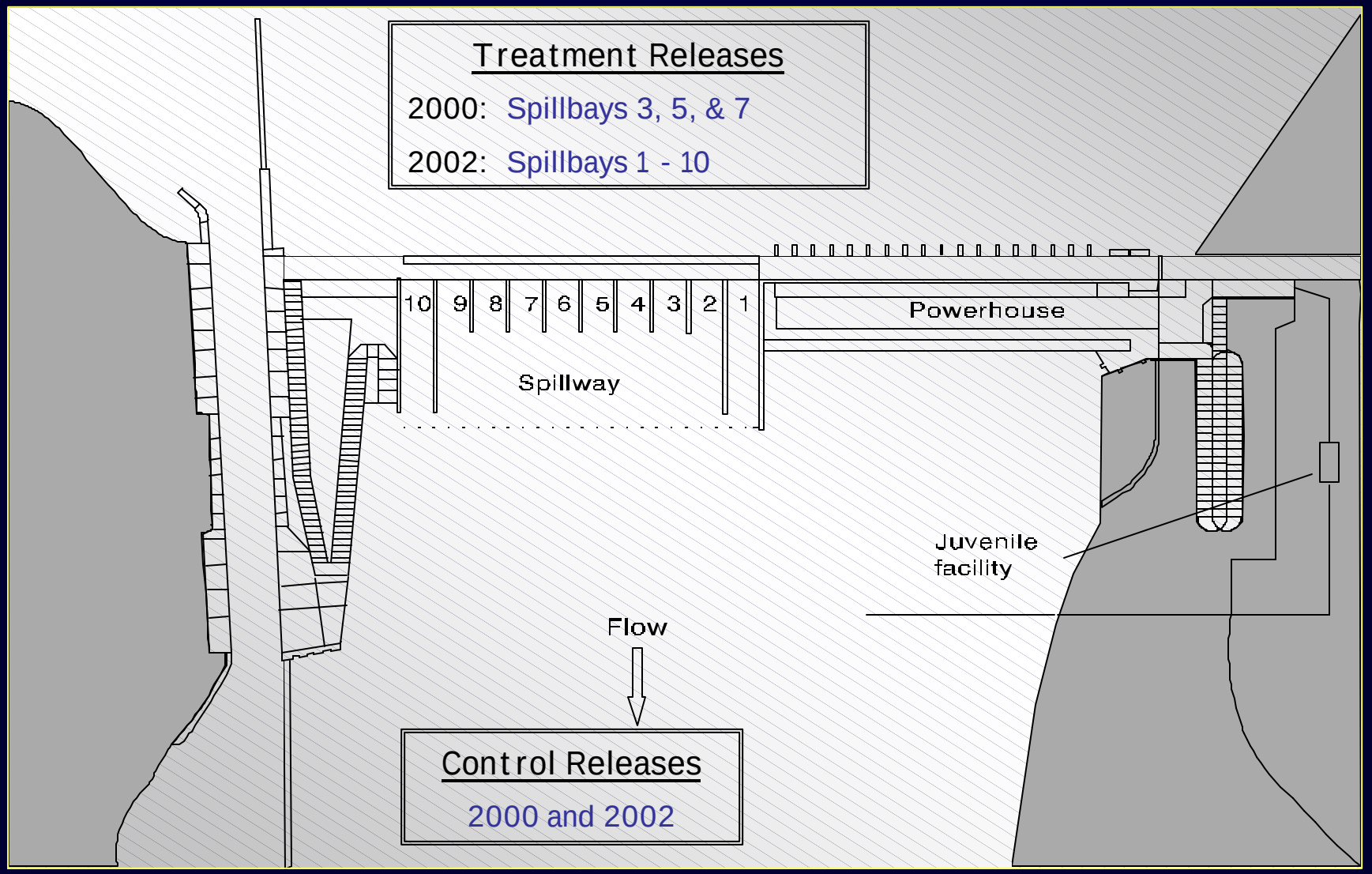


1999 Results: Spillway passage distribution





2000 and 2002: PIT-tagged fish release locations



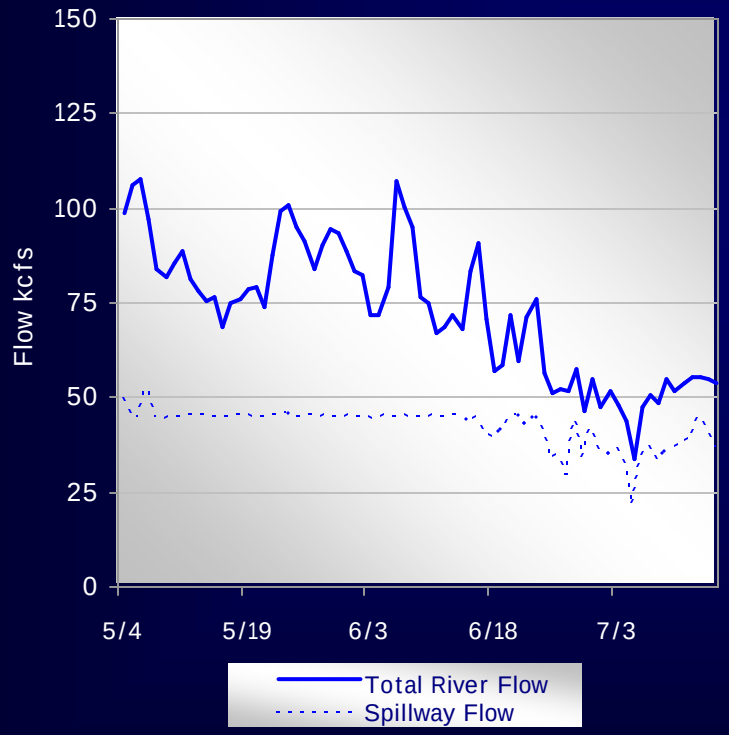
2000 and 2002: Test fish releases

Spillway Treatment Releases

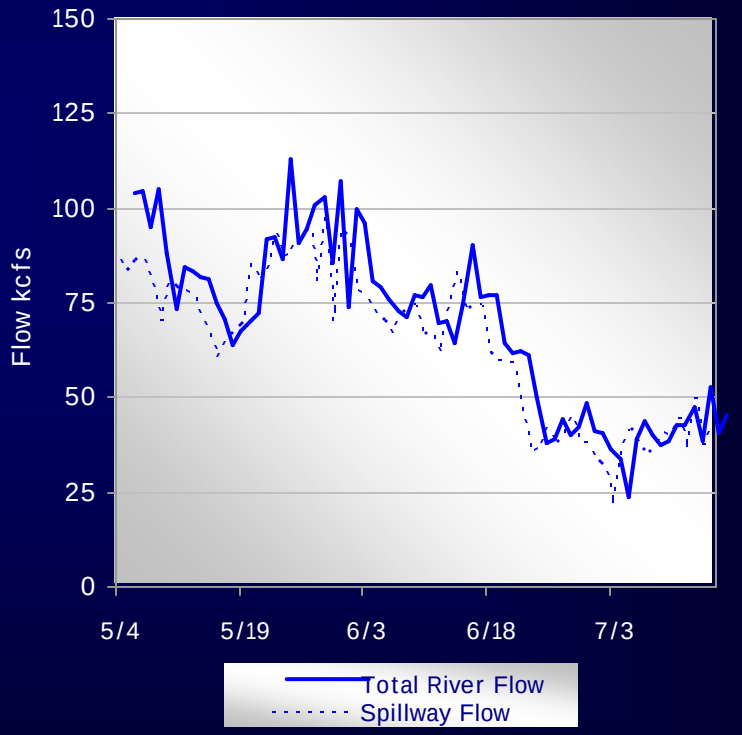
Tailrace Control Releases

2000 Results: Ice Harbor Dam operations

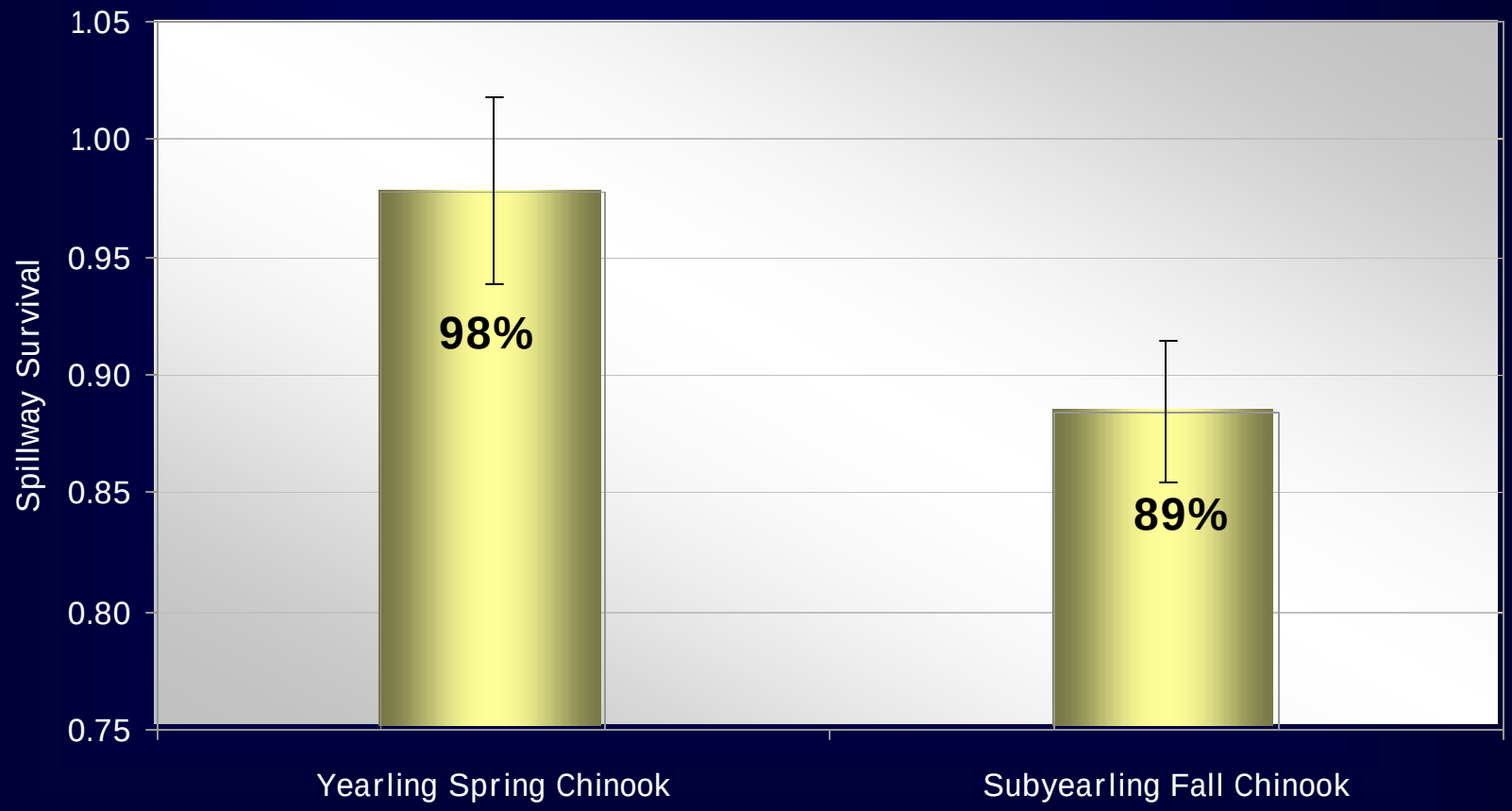
Daytime operations
(6:00 am - 6:00 pm)



Nighttime operations
(6:00 pm - 6:00 am)

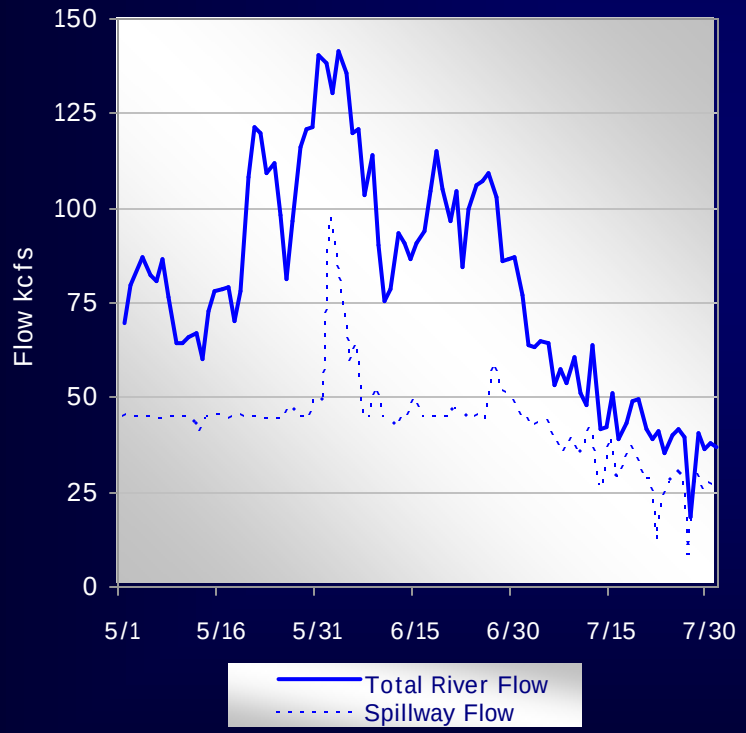


2000 Results: Spillway passage survival (nighttime only)

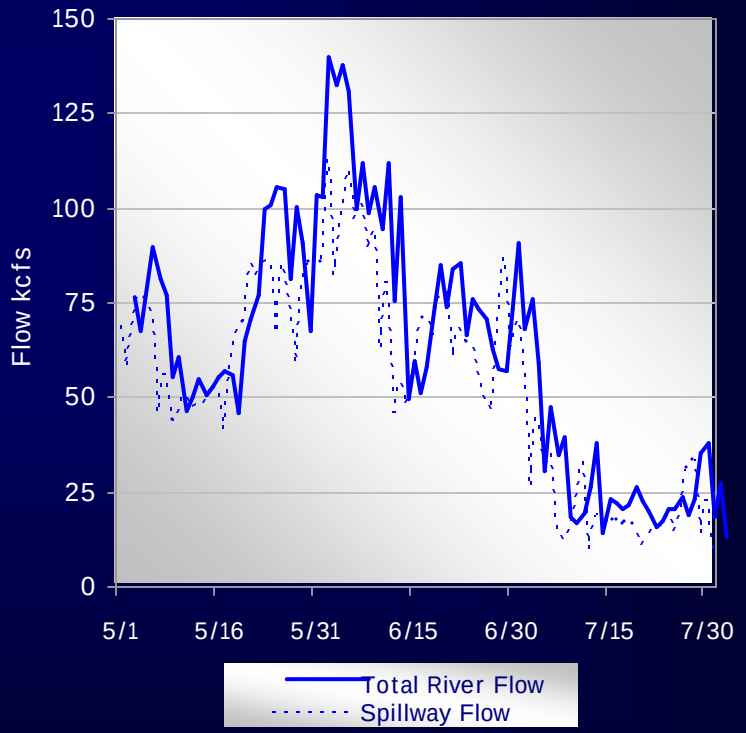


2002 Results: Ice Harbor Dam operations

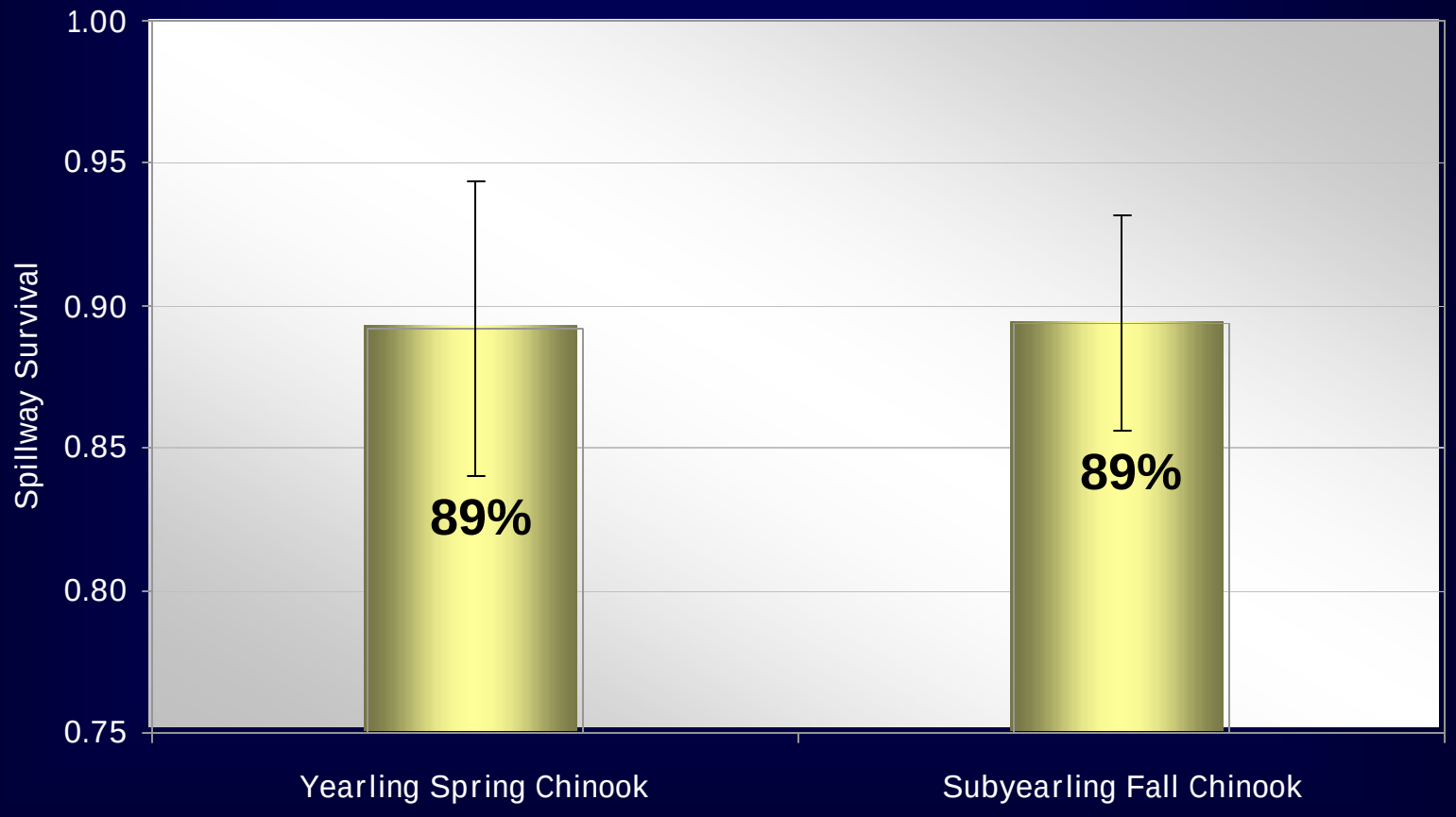
Daytime operations
(6:00 am - 6:00 pm)



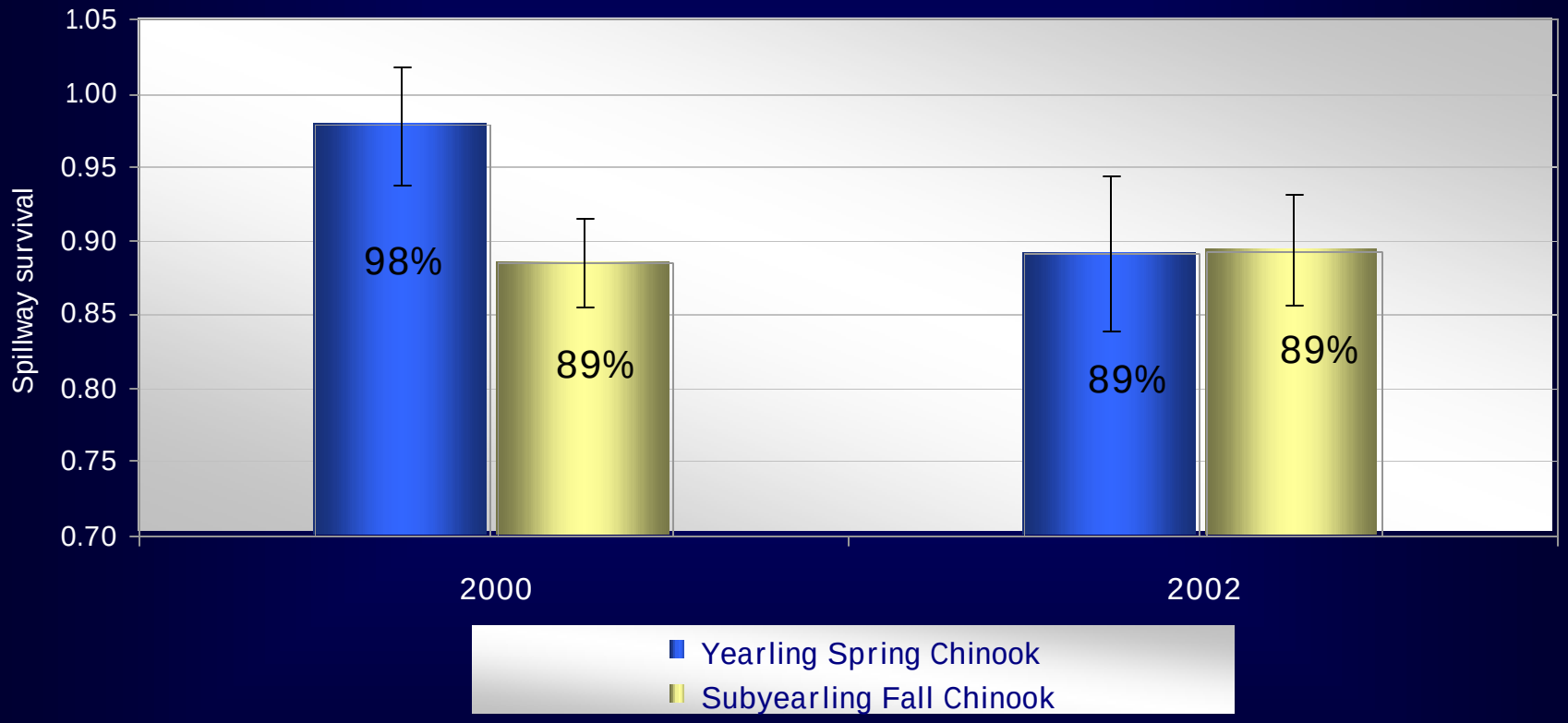
Nighttime operations
(6:00 pm - 6:00 am)



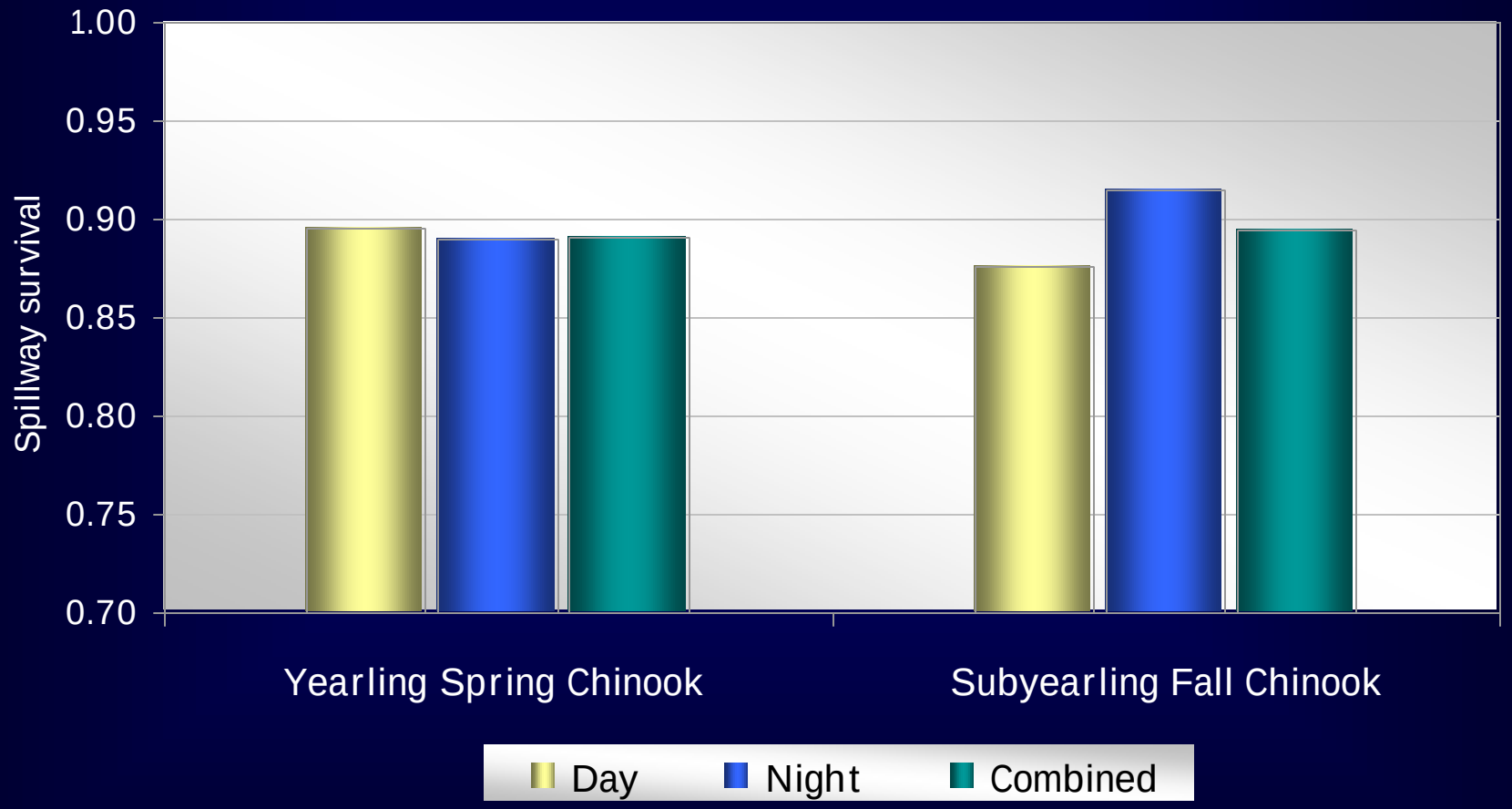
2002 Results: Spillway passage survival (day/night combined)



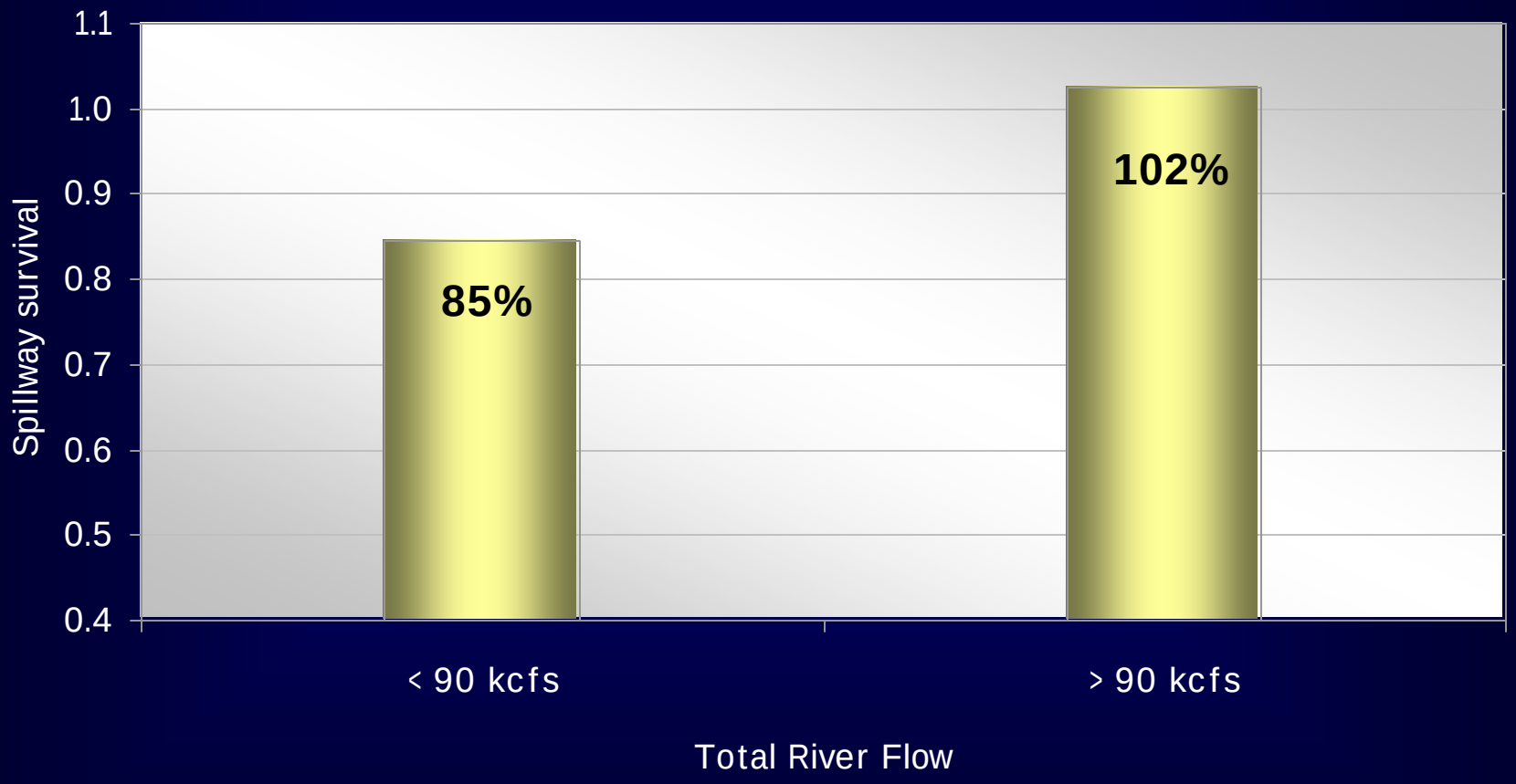
Summary: Spillway passage survival



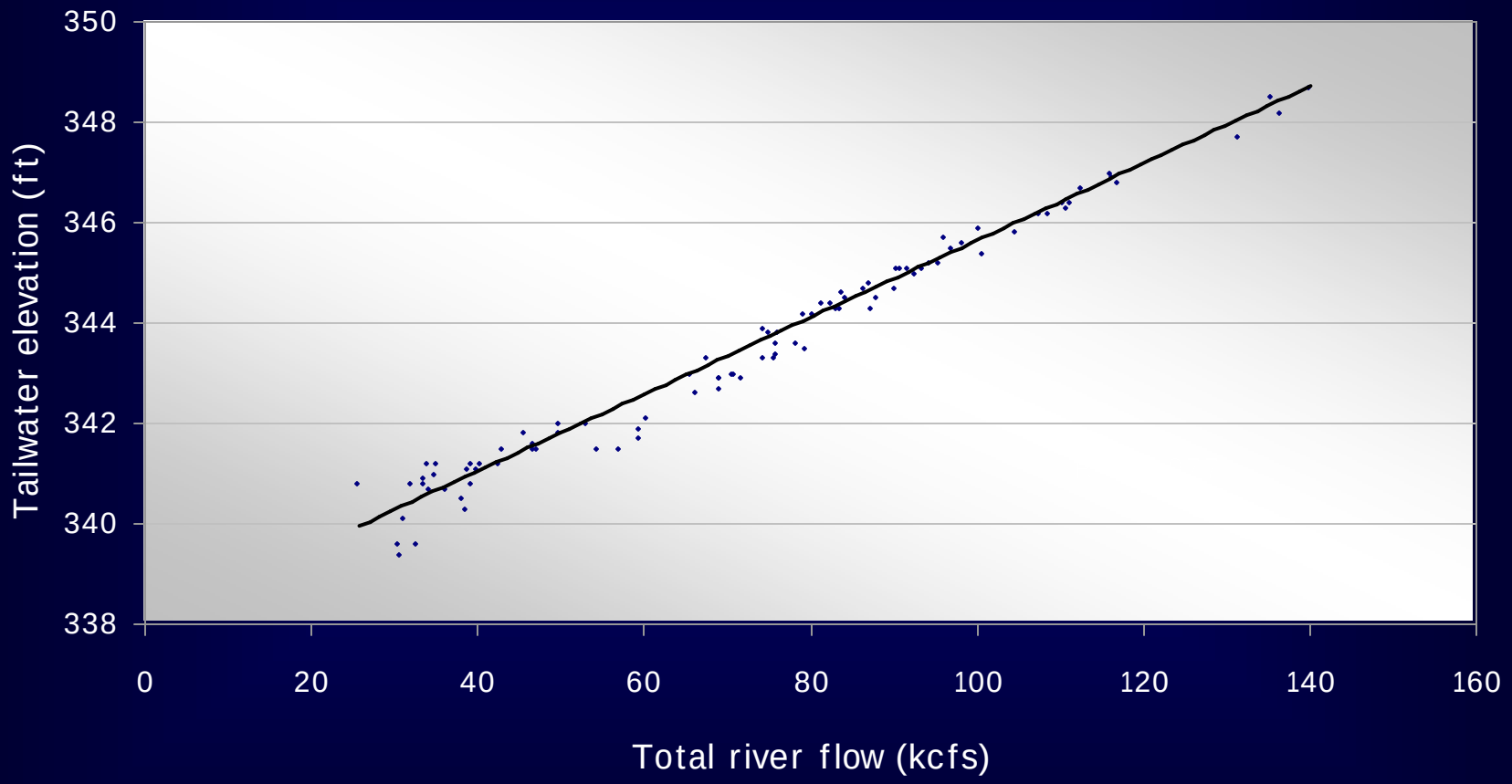
2002 Results: Day vs. night



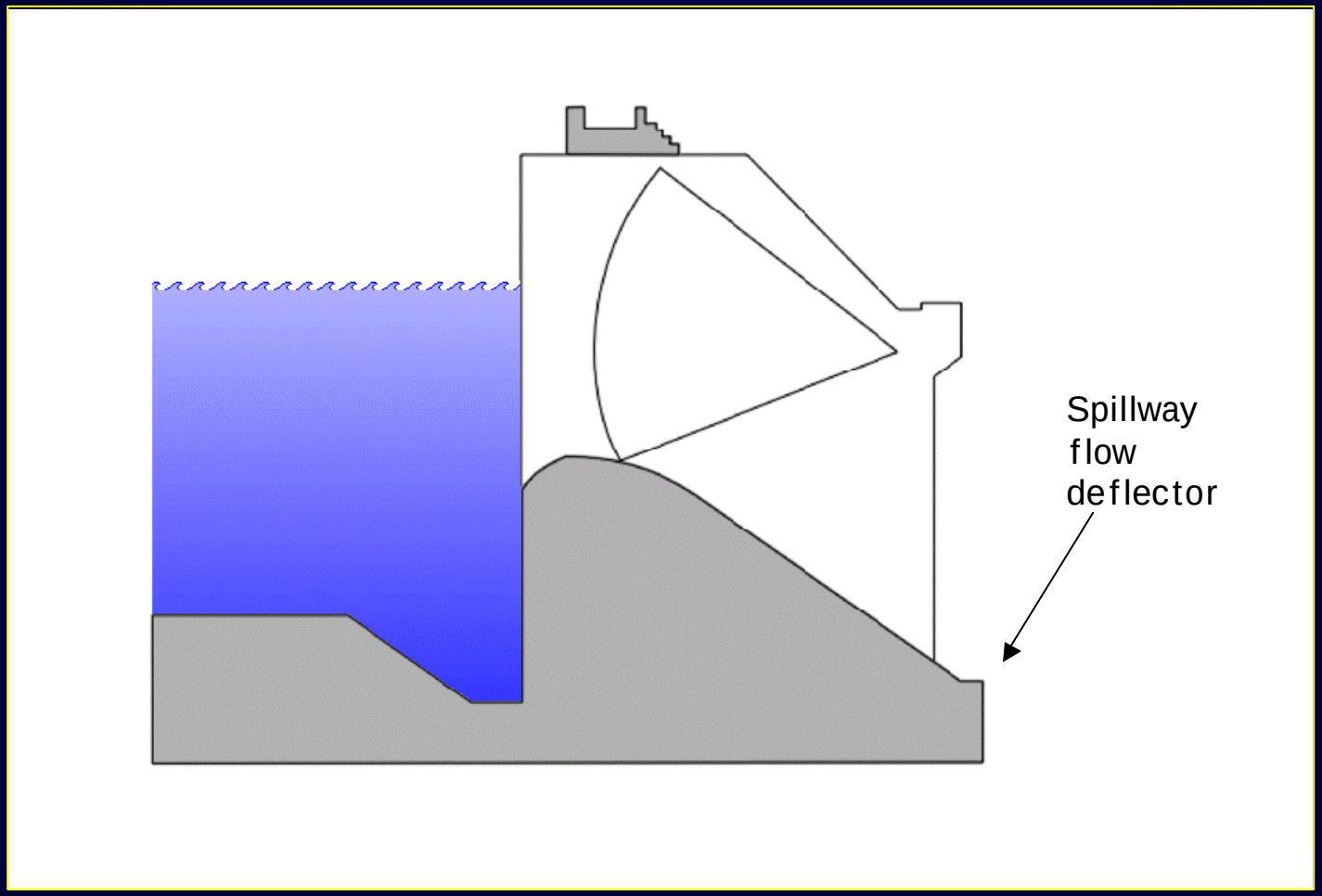
Summary: 2002 yearling chinook spillway survival vs. total river flow



Tailwater elevation vs. total river flow



Ice Harbor Dam spillway flow deflector



Ice Harbor Dam spillway flow deflector

2003 Research Focus: Spring

- Project Operations
  - Test hydraulic conditions under the 2000 Biological Opinion operation versus a 50% spill operation.
- Spillway survival
  - Release radio-tagged yearling spring chinook salmon above IHR.
  - Evaluate migration and passage behavior and survival as test fish pass IHR.
- Powerhouse survival
  - Release PIT-tagged yearling spring chinook salmon into Turbine Units 1 and 3 and the juvenile bypass system.

2003 Research Focus: Summer

- Project Operations
  - Test operations changed to a concentrated spill pattern (10 bays to 3) versus a no spill operation.

- Project Survival
  - Release PIT-tagged subyearling fall chinook salmon into the spillway, Turbine Unit 3, and the bypass system.

2003 Preliminary Results

- Yearling Spring Chinook Salmon
  - 80% spillway passage (radiotag)
  - Spillway survival (radio-tag analysis ongoing)
  - Turbine survival of 87% (PIT)
  - Bypass system outfall survival of 98% (PIT)

- Subyearling Fall Chinook Salmon
  - Preliminary data unavailable at this time