Design Considerations for Fish Passage Through Floodgates

2019 RCO Salmon Conference

Tom Slocum

Overview

1. Salmon recovery objectives- why do it?
2. Regulatory background
3. Typical site context
4. Design issues
5. Novel ideas?

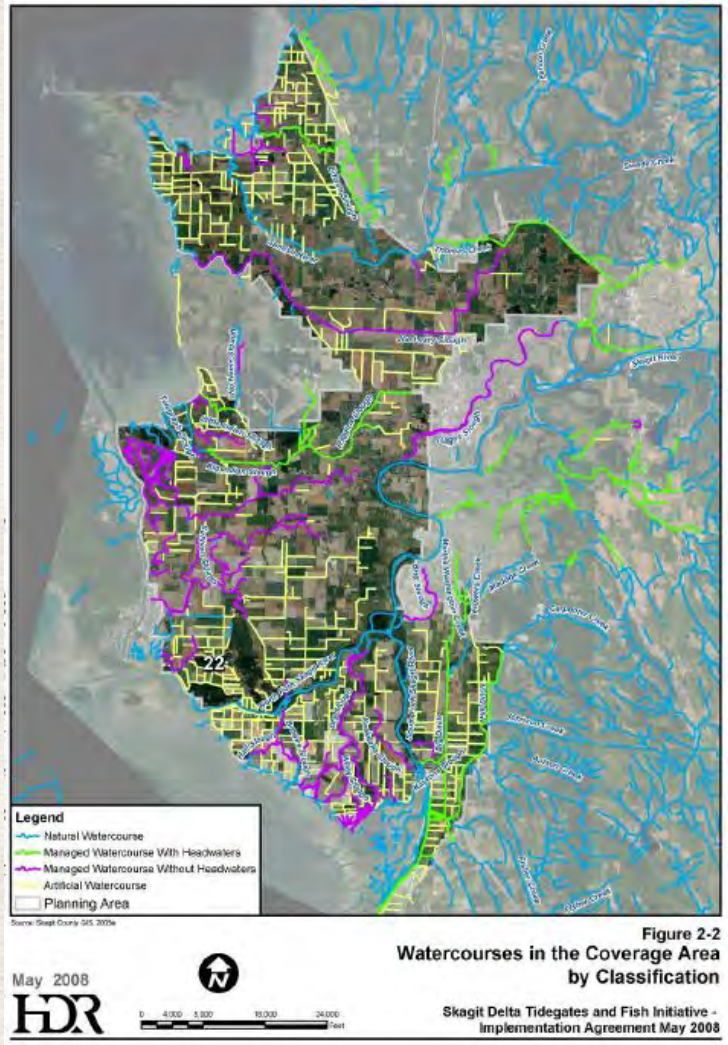
Salmon Recovery Objectives: Why Work on Floodgates?

- What are floodgates and why do we care?
- Where are they?
- Habitat objectives:

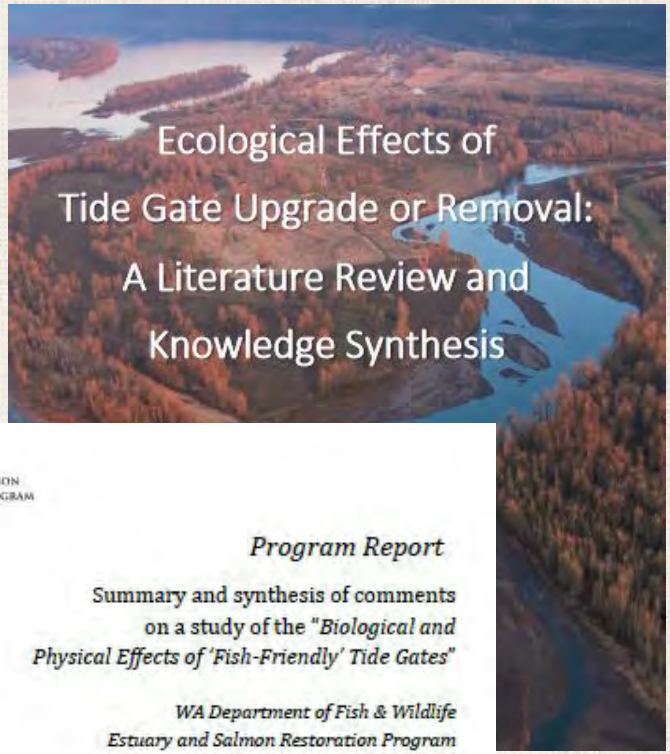
  Flood refuge?

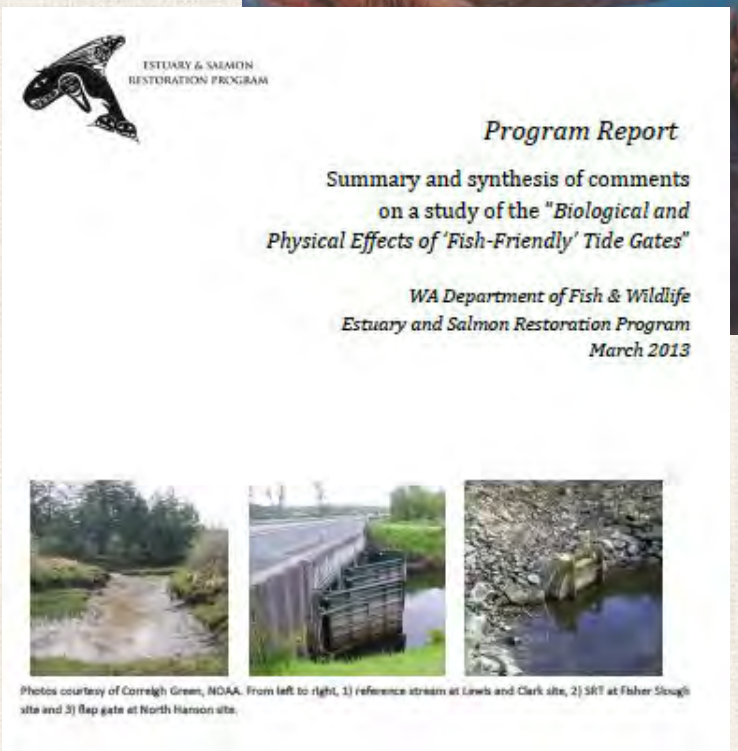
  Rearing?

  Spawning?



Salmon Recovery Objectives: Benefit?





ESTUARY & SALMON RESTORATION PROGRAM

Program Report

Summary and synthesis of comments on a study of the "*Biological and Physical Effects of 'Fish-Friendly' Tide Gates*"

WA Department of Fish & Wildlife
Estuary and Salmon Restoration Program
March 2013

Photos courtesy of Correigh Green, NOAA. From left to right, 1) reference stream at Lewis and Clark site, 2) SRT at Fisher Slough site and 3) flap gate at North Hanson site.

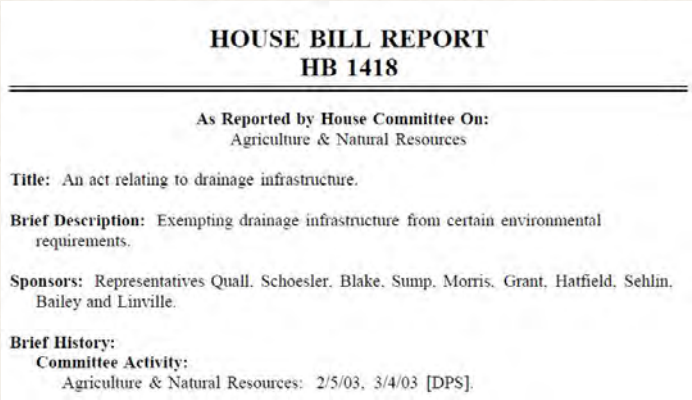
Monitoring studies show modest increase in utilization of upstream habitat by salmonids

Salmon Recovery Objectives: Balancing Interests

Removal, replacement or retrofit?

- Riverton Creek
- Appel Farm
- Fisher Slough

Regulatory Context



HOUSE BILL REPORT
HB 1418

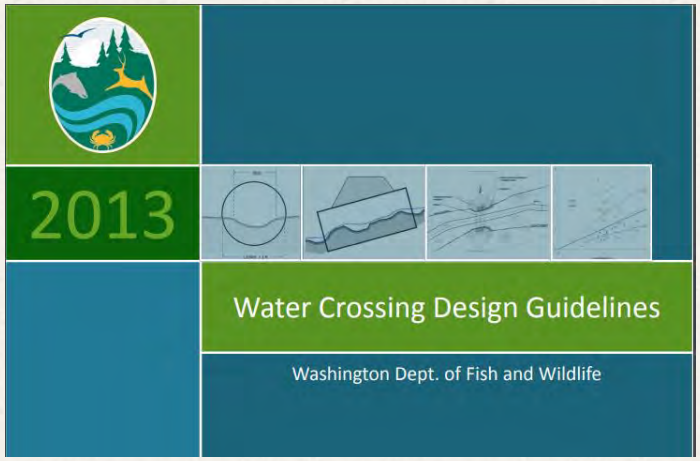
As Reported by House Committee On:
Agriculture & Natural Resources

Title: An act relating to drainage infrastructure.

Brief Description: Exempting drainage infrastructure from certain environmental requirements.

Sponsors: Representatives Quall, Schoesler, Blake, Sump, Morris, Grant, Hatfield, Sehlin, Bailey and Linville.

Brief History:
Committee Activity:
Agriculture & Natural Resources: 2/5/03, 3/4/03 [DPS].



- HB 1418 and Hydraulics Act
- WDFW Design Guidance
- NMFS Guidance/ESA
- County and drainage districts / PL 84-99

Typical Site Context

- Levees
- Timing for flood protection and salmon
- Non-synchronized hydrology
- Two-way flow

Typical Site Context (cont.)

- Deep, low slope ditches
- Poor WQ
- Outlet pool or drop to river
- Beavers

Design Parameters - Overview

1. Hydrology and flood risk management
2. Upstream habitat quality
3. Design flow for habitat objectives
4. Hydraulic design
5. O&M

Hydrology and Flood Risk Management

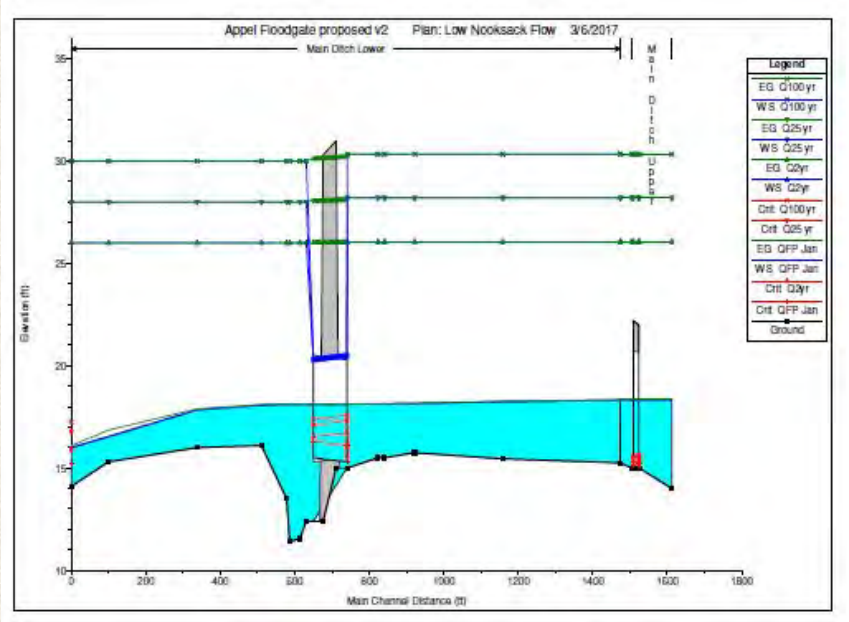
- U.S. and D.S flood elevations and hydrology
- Affected land uses and timing
- Existing flood infrastructure
- Remove, replace or retrofit the floodgate?

Upstream Habitat Quality

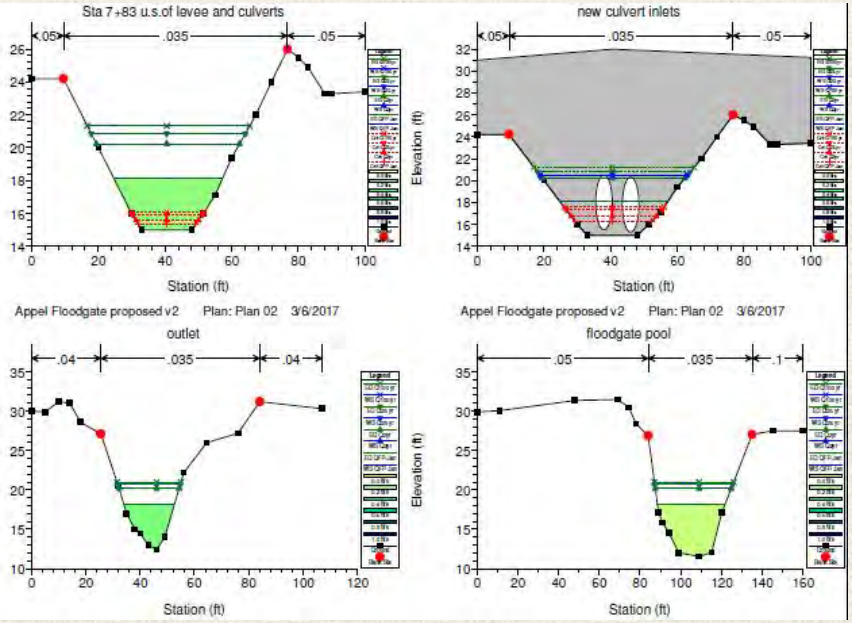
- Project objectives: headwater spawning or rearing?
- WQ: temperature, riparian cover, runoff
- Other passage barriers

Design Flows for Project Objectives

- Flood and hydraulic design: peak flows
- Fish passage flows: Q_{FP} and low flows
- Un-synchronized hydrology: model it as unsteady state or "snap shot" steady states?



Hydraulic Design Issues



- Limitations of HEC RAS for floodgates
- Velocity: Q_{FP} 2 to 3 fps
- Min. water depth 0.8’ for juveniles
- Gate open ≥ 90% of the time

Hydraulic Design (cont.)

- Pipe length and elev. wrt channel profile
- Pipe diameter choices
- Scour and energy dissipation

Operation and Maintenance Issues

- Floodgate closure levels and timing
- Maintenance and control
- M&AM

Ideas for improving fish passage

- More Light?
- Roughness?
- Others?

Comments and Questions?

- www./whatcomfamilyfarmers/videos/828939190775109/