

Columbia and Snake Rivers
Total Dissolved Gas
Total maximum daily Load
Overview



Paul J. Pickett, P.E.
Environmental Assessment Program
Washington State
Department of Ecology

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Columbia and Snake Rivers
Total Dissolved Gas TDML



- What's the problem?
 - Dam spills create dissolved gas (TDG)
 - TDG can cause gas bubble trauma (GBT)
 - Spills need to meet fish passage goals
 - Columbia and Lower Snake Rivers on 303d list



McNary Dam



Bonneville Dam

Columbia and Snake Rivers
Total Dissolved Gas TMDL

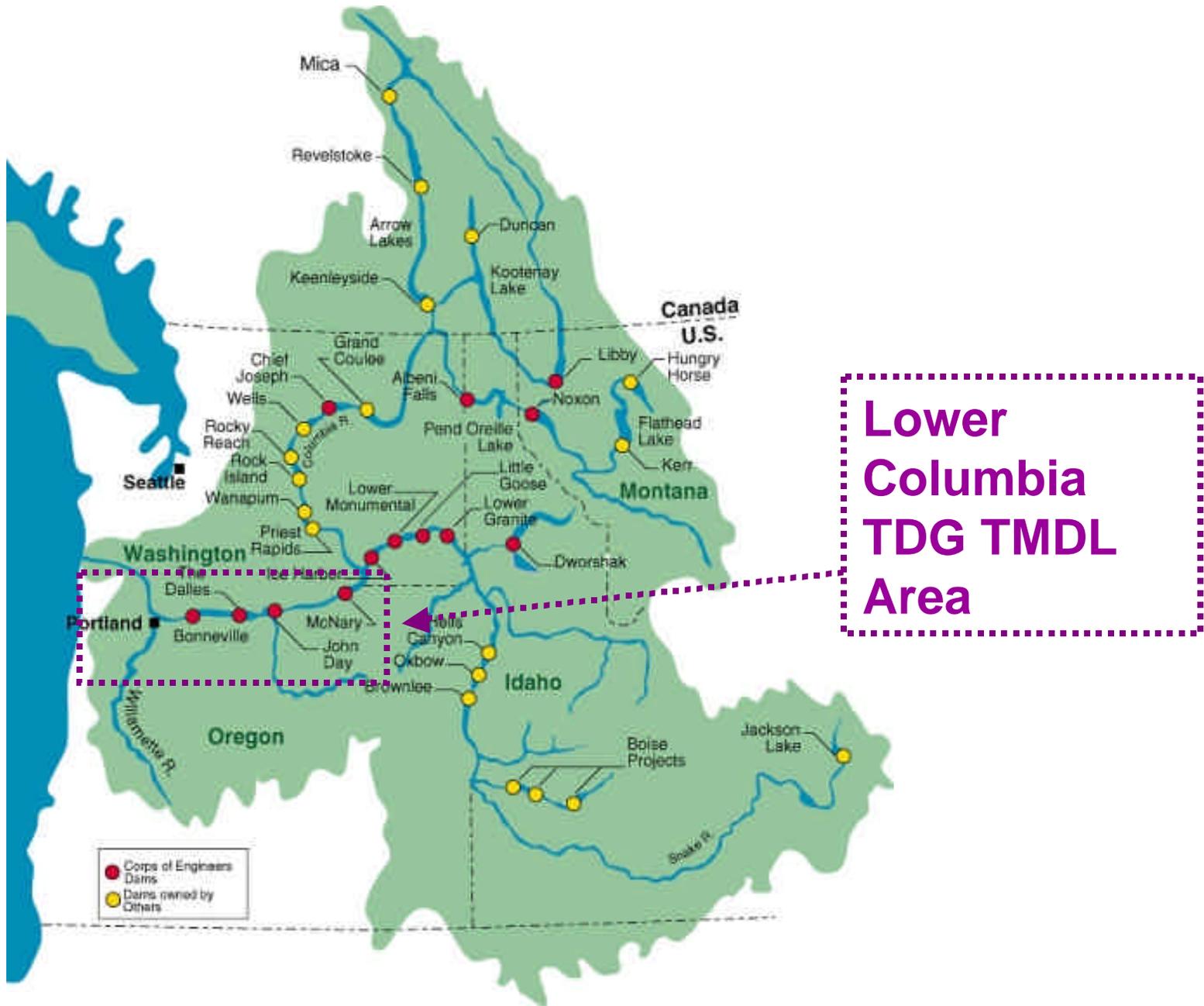


➤ What's being done?

- Lower Columbia River
 - Bi-state TMDL by early next year
- Lower Snake River by next summer
- Mid Columbia by end of 2002
 - Lake Roosevelt – unique issues
 - Colville and Spokane Tribal waters
 - International issues – upstream dams in Canada



- Columbia and Snake River Dams
 - Lower Columbia R – 4 Corps dams
 - Lower Snake River – 4 Corps dams
 - Upstream: Idaho (Dworshak, Hells Canyon)
 - Mid Columbia – 7 dams
 - Grant (2), Chelan (2), and Douglas(1) PUDs
 - Corps (1) and USBR (Grand Coulee)
 - Upstream: Canada, N. Idaho, Montana
 - Storage only in Grand Coulee and upstream





➤ Columbia and Snake River Dams

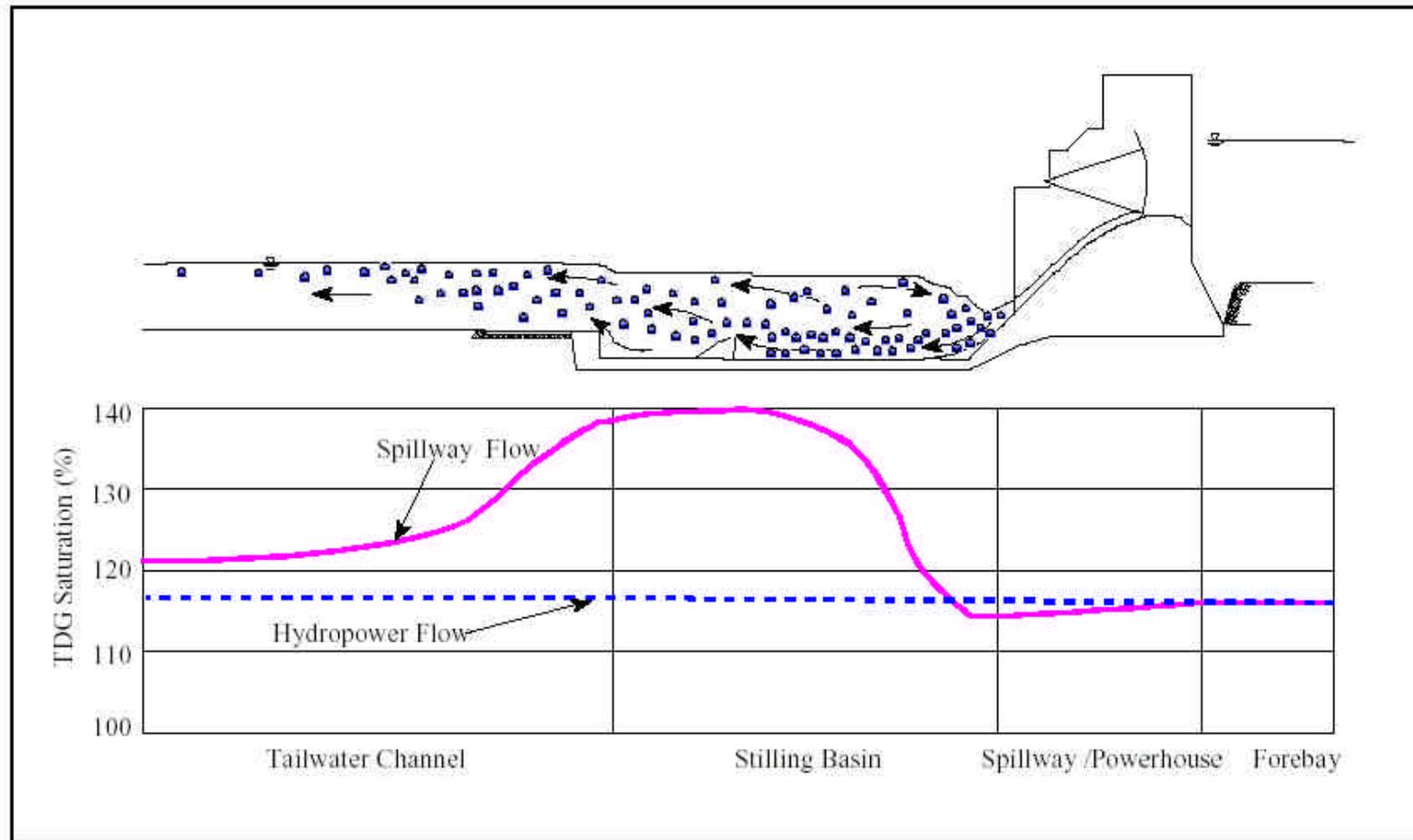
- Spills occur for several reasons
 - Fish passage spills (“voluntary spills”)
 - Flood flows exceed powerhouse capacity
 - Powerhouse off-line due to lack of power demand
 - Powerhouse off-line for maintenance or repair
- Spills can occur at any time, during any flows



➤ Technical Challenges

- Spillways strip gas
- Plunging spills absorb gas
- Portion of powerhouse flows entrain into spill
- Rest of powerhouse flow remains unchanged
- Spill water degasses in tailrace
- Degassing stops as water enters pool

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➤ Technical Challenges

- Effects of barometric pressure
- Effects of water temperature
- Location of Fixed Monitoring Stations (FMS)
- Where do standards apply?
 - Foot of spillway?
 - End of aerated zone?
 - At FMS sites?



➤ Policy Challenges

- Implementation at federal projects
- Tribal WQ standards and consultation rights
- Multi-state – Oregon and Idaho
- International – Canada
- NMFS Consultation on ESA issues
- ESA/CWA conflict under current conditions
 - Spills good for meeting ESA performance standards
 - Spills bad for meeting CWA water quality standards



➤ Key Issues - Short-term vs. Long-term

- Long-term Compliance must meet WQ Standards
- Short-term Compliance must meet compliance targets
 - Short-term compliance recognizes reality of current dam structures
 - Short-term compliance is consistent with ESA fish passage spill needs



- **Key Issues - Operational vs. Structural**
 - Long-term compliance will rely on structural modifications of dams
 - Assessed at TMDL point of compliance
 - Short-term compliance will be managed with operational controls
 - Based on spill volumes
 - Based on FMS monitoring

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➤ Operational control of TDG

- Limit fish passage spills to waiver limits
- Manage power demand to maximize generation
 - Needs support from BPA, NWPPC?
- Manage maintenance schedule to minimize spill

➤ Structural controls of TDG

- Implement DGAS recommendations
 - Deflectors or “flip lips” – less plunging
 - Separation walls – limit powerhouse flow entrainment
 - Submerged gates at Bonneville Dam
 - Add spillway bays where feasible
- Other alternatives (modify gates, spillway, or tailrace)

Columbia and Snake Rivers Total Dissolved Gas TMDL



➤ Key Issues - Point of Compliance

- Long-term compliance at Point of Compliance
 - In tailrace at end of aerated zone below spillway
 - * Distances specified in TMDL for each dam
 - Meet Loading Capacity at Point of Compliance based on $\ddot{A}P$
 - * excess TDG pressure above barometric
 - Loading Capacity of 75 mm Hg ($\ddot{A}P$) = Criterion of 110% TDG
 - Predict from spill flow, PH entrainment, and tailwater elevation
- “Compliance Targets” to assess short-term compliance
 - Spill volumes that meet $\ddot{A}P$ at the FMS sites
 - Fish passage spill volumes that meet waiver limits at FMS sites



➤ Key Issues - Compliance Monitoring

- Long-term monitoring at point of compliance (tailrace)
 - Special studies assess compliance after structural changes
- Short-term monitoring at FMS sites
 - Real-time assessment against compliance targets



- What's next - Lower Columbia TDG TMDL
 - Informal Public Review of Preliminary Draft
 - Comments to Paul Pickett by Nov. 16, 2001
 - Peer review by TetraTech
 - Final Draft to Formal Public Comment in December
 - Hearings in December and January
 - Submit to EPA by March 1, 2002