

BASIN LEVEL DROUGHT EXERCISE

Presentation to the
National Integrated Drought Information
System
(NIDIS)

Engaging Preparedness Communities Workshop

Chicago, Illinois

June 8 and June 9, 2011

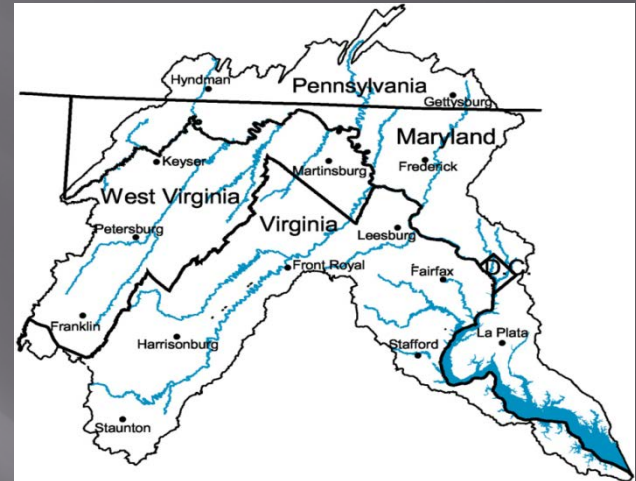
Joseph Hoffman, Executive Director
Interstate Commission on the Potomac River Basin

Presentation Outline

- ▣ Introduction
 - ICPRB
 - ICPRB CO-OP Section
- ▣ Governing Agreements
- ▣ Utilities, Service Areas, and Models
- ▣ Drought Planning as a “System”
- ▣ Drought Exercise
- ▣ Lessons Learned

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

Created in 1940 (Quality)
Amended in 1970
(Quantity)
5 Members & U.S.
Non-regulatory
River as boundary
Tributaries cross borders



MISSION: Enhance, protect and conserve the water and associated land resources of the Potomac River basin and its tributaries through regional and interstate cooperation.

CO-OP SECTION

- ▣ Drought of 1960s & 16 Dam Plan
- ▣ Capital Area Run Low on Water Withdrawal
- ▣ Special Section Authorized in Compact Created 1979
- ▣ Focus on Washington Metropolitan Area (WMA)
- ▣ Governed by LFAA & WSCA
- ▣ Three Utilities – “Operations Committee”
- ▣ Manage Metro Supply During Drought
 - Five Year Demand Studies
 - Annual Drought Exercise
 - Technical Support/ Advise/ Assistance

LFAA and WSCA

- Low Flow Allocation Agreement – 1978
 - U.S., Md., Va., DC, Fairfax Water, Washington Suburban Sanitary Commission (WSSC)
 - Consent of Congress (WRDA 1976)
 - Others w/MD permit are subject to LFAA (*low flow augmentation for consumptive water use, if the maximum consumptive water use can exceed 1 million gallons per day (mgd) at any time*)
 - Five year demand and resources studies
- Water Supply Coordination Agreement -1982
 - U. S., FW, WSSC, DC, ICPRB CO-OP Section
 - Coordination for mutual benefits to reduce possibility of implementing LFAA
 - Drought operations manual (Attachment to WSCA)

6.1 Million in Basin, 5.4 Million WMA; ~490 mgd (WMA, 390 from Potomac)

Drought Operations Manual

▣ Introduction

- ▣ Operations rules and procedures for reducing the impacts of severe droughts in the Potomac River Basin while providing water supply for WMA, and maintaining instream flow and water quality in both upstream and downstream portions of the basin.

▣ Objectives (Metrics)

▣ Facilities and Operations Affected

▣ Implementation Guidelines/Parameters

▣ Operating Rules

▣ Review by Operations Committee

Objectives (Metrics)

- Efficient use of water supply facilities, including but not limited to the Potomac River, Jennings Randolph, Occoquan, Triadelphia, and Duckett reservoirs, and Little Seneca Lake for the WMA.
- Maintain the probability of invoking the Restriction Stage of the LFAA at less than 5 percent during a repeat of the historical streamflow record.
- Maintain the probability of entering the Emergency Stage of the LFAA at less than 2 percent with full reservoirs on June 1 of any year.
- Maintain the probability of not refilling any reservoir used for WMA water supply to 90 percent of useable capacity by the following June 1 at less 5 percent during a repeat of the historical streamflow record.
- Maintain flows in the Potomac River below Seneca Pool as agreed to by the signatories to the LFAA.
- Minimize conflict between normal utility operations and drought operations.
- Provide consistency with the requirements of the LFAA.

Facilities and Operations Affected

- ▣ Potomac River facilities of the WAD, WSSC, and FW.
- ▣ WSSC water supply facilities on the Patuxent River.
- ▣ FW water supply and power generating facilities on the Occoquan River.
- ▣ Finished water interconnections between the FW and the WAD, subject to the approval of Arlington County and/or the City of Falls Church.
- ▣ Water supply releases from the proposed Little Seneca Lake.
- ▣ Water supply releases from water supply storage in Jennings Randolph.

Implementation

- Gauged flows, Point of Rocks below 2000 cfs, CO-OP compute flows in the Potomac River at Little Falls Dam, including all prior water supply withdrawals
- CO-OP issue water supply outlooks monthly May through October. Outlooks estimate probability of meeting long-range unrestricted demands .
- The rules shall take effect when one or both of the following conditions exist:
 - (1) The probability of meeting all unrestricted demands and refilling all reservoirs to 90 percent of useable capacity by the following June 1 is less than 98 percent.
 - (2) Flow in the Potomac as computed, less the amount required for flow-by over Little Falls Dam is projected to be less than twice the projected withdrawals for any of the next five days.

Operating Rules

- Each supplier report to CO-OP, no later than 8:30 A.M., its 24 hour demand ending at 6:00 A.M. on that day.
- During such times as these rules are in effect, the Director of CO-OP shall:
 - Consult with the suppliers and the USACOE and direct the appropriate releases from water supply storage in Jennings Randolph and Little Seneca Lake.
 - Prior to 10:00 A.M. daily set withdrawal rates from the Potomac for FW and WSSC for the 24 hour period beginning at 6:00 A.M. on that day.
- As early as practicable during each day, shall revise the FW and WSSC Potomac withdrawal rates use actual river flow and water demands.
- Whenever the Aqueduct declares the Restriction or Emergency Stage of the LFAA to be in effect, the allocation provisions of the Potomac River LFAA shall determine Potomac withdrawals.
- Should the probability of meeting unrestricted demand with existing storage fall below 95 percent, each supplier agrees to advise governing bodies which they serve and to recommend restrictions on water use.
- Raw water released from Lake Manassas and reimpounded in the Occoquan Reservoir shall be treated as Occoquan storage under these rules.

CO-OP Models

- ▣ Drought operation tools (EXCEL)
 - Predicts flow upstream of WMA intakes 1 to 9 days in
 - Simple flow accumulation models based on lagged upstream flows
- ▣ Potomac Reservoir and River Simulation Model (PRRISM)
 - Serves as CO-OP primary long-term planning tool
 - Water balance model simulating physical processes and operations of WMA system at daily time scale
 - Based on hydrologic record from 1929 – 2008
- ▣ Reservoir refill interactive prediction tools (EXCEL)
- ▣ OASIS model by Hydrologics – linear optimization model
- ▣ *NEED*: Basin Runoff Model

CO-OP Drought Operations

▣ Goals

- Meet WMA Potomac demand (~ 500 MGD)
- Meet 100 MGD flowby at Little Falls

▣ Data

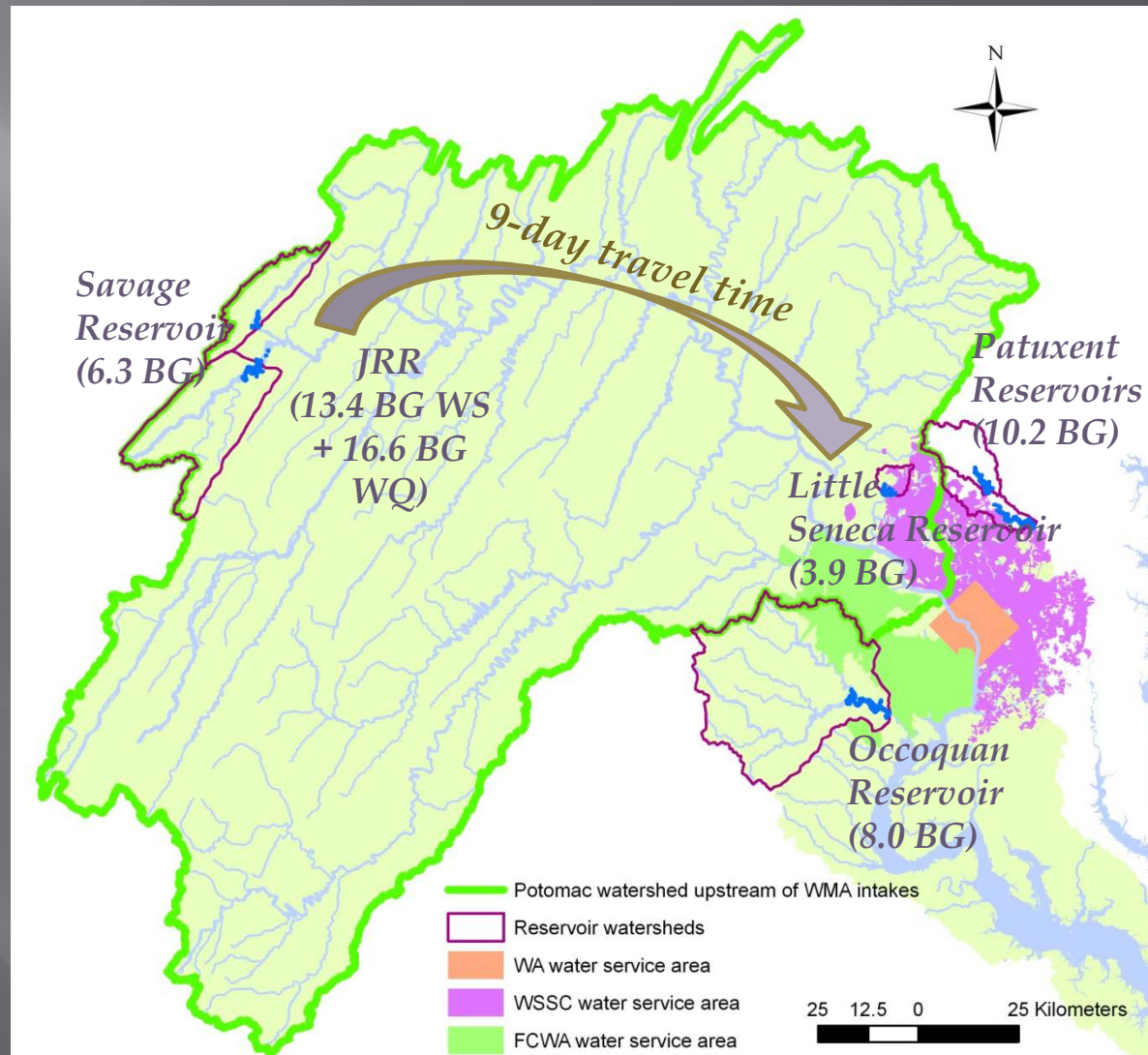
- Daily & real-time from 19 USGS gage stations
- Daily & hourly Potomac withdrawal data from WMA suppliers

▪ Activities

- Determine need for releases from upstream reservoirs
- Recommend intake withdrawal targets
- Send twice daily reports to water suppliers and stakeholders

Systems Approach During Droughts

- Operation of multiple reservoirs as a system increases yields
- Jennings RR provides significant storage
- Little Seneca 1 day travel time increases system efficiency
- Daily flexibility in operations of off-Potomac reservoirs
 - Can make up Potomac flow deficits
 - Can make use of Potomac flow excesses



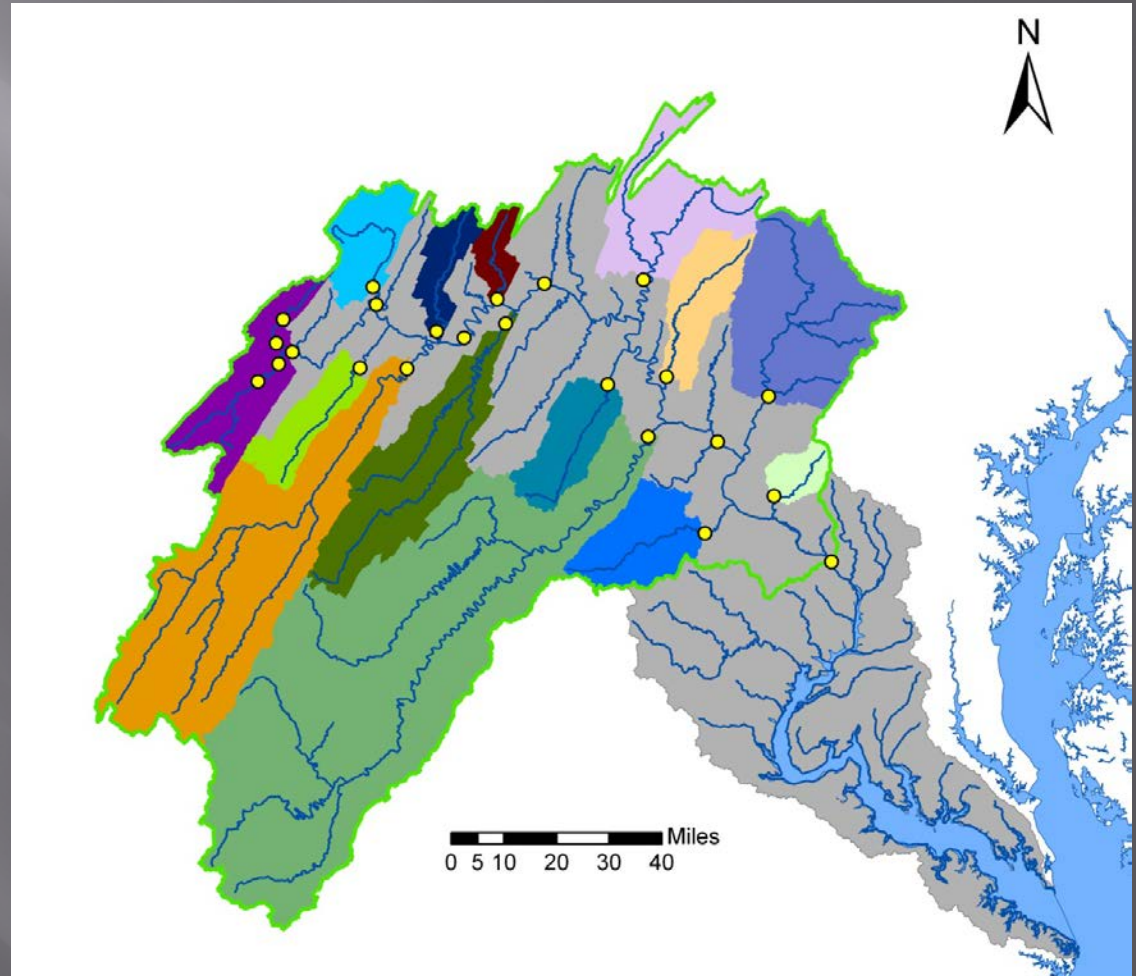
*See Hirsch, Cohen & ReVelle, "Gains from joint operations of multiple reservoir systems", *WRR 20*, 1977

CO-OP Drought Ops Challenges

- ▣ Gage accuracy often poor during low flows (grass effects)
- ▣ Need 9-day flow predictions - use linear recession models – but too conservative
- ▣ Water losses not quantified
- ▣ Basin changes due to development
- ▣ NWS great w/flood flows, less so with low flow data
- ▣ Duration of drought periods are operationally stressful

CO-OP Predictions of Flow at Little Falls

- ▣ Simple flow accumulation models based on upstream flows at
 - ▣ Point of Rocks
 - ▣ Hancock
 - ▣ Luke
- ▣ Empirically determined lag times
- ▣ Simple linear recession models for future flows



Drought Exercise

- ▣ Players/Participants: Utilities, CoE (Water Control, Dam Operator), County (park and governing body), MW Council of Governments, Media, ICPRB
- ▣ Driven by Drought Operations Manual
- ▣ Opportunity for “What Ifs” and test new concepts or plans
- ▣ Framework of Exercise:
 - Need/Plan by ICPRB w/Utilities (Last exercise or actual)
 - Kick-off Meeting ~ one week before – Review and set stage/update current status and exercise scenario
 - Exercise ~ One week (over weekend/multi-shifts)
 - Communicate status and plans/Conference call
 - Make (or simulate release(s))
 - After Action Report (Draft and final – Timeliness)
 - ▣ Results
 - ▣ Recommendations
 - ▣ Conclusions

Lessons learned

- ▣ Communications (real event and exercise) – KEY activity
- ▣ Staff changes impact
- ▣ Electronics and real-time are very beneficial – i.e., telework, off-site, etc.
- ▣ Test/exercise what can(will??) go wrong or be difficult – i.e., governing bodies and politics, recreation losses (Boat ramps, Little Seneca)
- ▣ Use as opportunity to explore – what ifs, new techniques, break the drought of record, synthetic extended record, etc.
- ▣ Where the rocks are so you can step across the creek and not get wet! (Or Building Bridges w/Players)

CONTACT ICPRB

▣ Web: www.potomacriver.org

http://www.potomacriver.org/cms/index.php?option=com_content&view=article&id=97&catid=47&Itemid=141

(Drought Exercise information and reports)

▣ Phone: 301 274-8126

▣ jhoffman@icprb.org