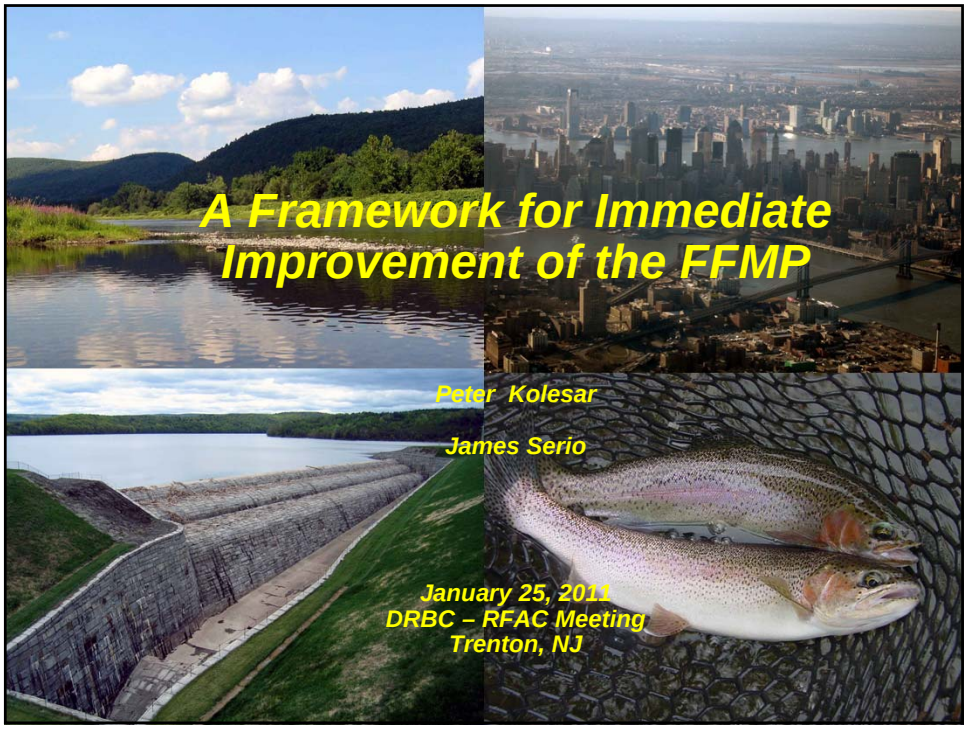


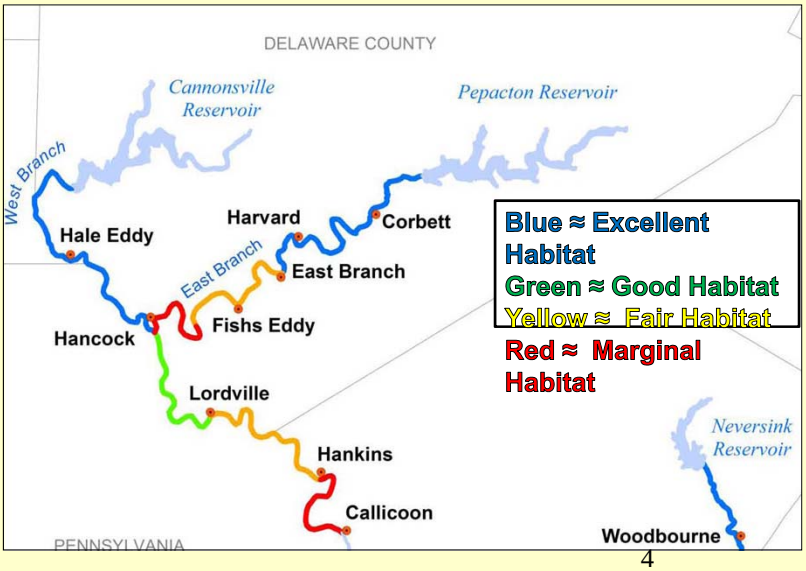
Our Goal for Today

To convince the Decree Parties and the DRBC to adopt an improved version of the FFMP when the current implementation expires in May 2011.

To urge you to give particularly serious consideration to the release recommendation made in the Joint PA/NY Fisheries 'White Paper' of January 2010.

Part I. Background and Motivation

Our Mission: More Trout Habitat
Getting More 'Blue' River Segments



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Why You Should Act Now!

- Continuing the current FFMP implementation or, worse, reverting to Revision 1, will needlessly punish the ecology and down-river stakeholders.
- We can improve the FFMP by building on the knowledge and experience assembled in the last 5 years:
  - The research underlying the design of the FFMP
  - The knowledge of the impact of releases on the River's ecology derived from the UGSS Habitat model.
  - The extensive research done by, and on behalf of, the joint PA/NY fisheries task force.
  - The OST framework developed by NYC-DEP.
  - The Delaware River Basin Flood Analysis Model.
  - The updating of the Delaware OASIS model to 2006.
  - The on–river experience with the FFMP since 2007.

The Keys to Improved Release Policies

1. ***Make realistic forecasts of New York City diversions.***
   - We know how to do this.
2. ***Key releases to the diversion predictions. Construct release tables that efficiently and equitably use the water that is predicted to be available.***
   - We know how to do this.
3. ***Build the flexibility to quickly and automatically adapt to changing circumstances – including worst case scenarios.***
   - We know how to do this.

Nothing Revolutionary Here

- ***Build on the existing FFMP framework***
  - While the FFMP is a sound framework and has been a modest improvement over previous release programs, actual river experience and research have shown that it can be substantially improved.
- ***Our proposals build on and are consistent with:***
  - Our own "Augmented Adaptive Release" proposal made to the DRBC and Decree Parties in January 2008.
  - The Joint Fisheries White Paper, and the extensive research we did in support of that initiative (January 2010.)
  - The NYC-DEP, OST White Paper and its concept of incorporating timely data and forecasts into water allocation decision making (March 2010.)

Our Release Rule Design Principles

- Equitable, efficient and sustainable use of Delaware River water – from the perspectives of all stakeholders.
- Be able to handle actual, as well as 'worst case', scenarios of water usage and availability.
- Build upon the current FFMP structure:
  - Use a set of conservation release tables – one for each of several anticipated levels of NYC diversions. There are already four such tables in the FFMP, OST adds three more. We only need one more.
  - Develop explicit switching rules for moving from one release matrix to another.
- Mitigate the pernicious impact of PPL releases on the Rivermaster directed releases.

The Bottom Line Objective: Correcting FFMP's Critical Flaw

- ***The current FFMP implementation assumes that NYC will divert 765 mgd, but recent diversions have been about 500 mgd. This design bias hurts all Delaware stakeholders, except perhaps New York City***.
- Basing releases on reasonable forecasts of actual NYC diversions will result in:
  - Larger conservation releases that will improve the year round trout habitat in all sections of the upper Delaware.
  - Reduced reservoir spills.
  - Reduced variability of flows at Montague and Trenton.
  - More accurate estimates of what is expected to happen in the Delaware from the OASIS, the DSS Habitat, the Flood Analysis and the NYC-DEP OST models.

Why This is So Critical:

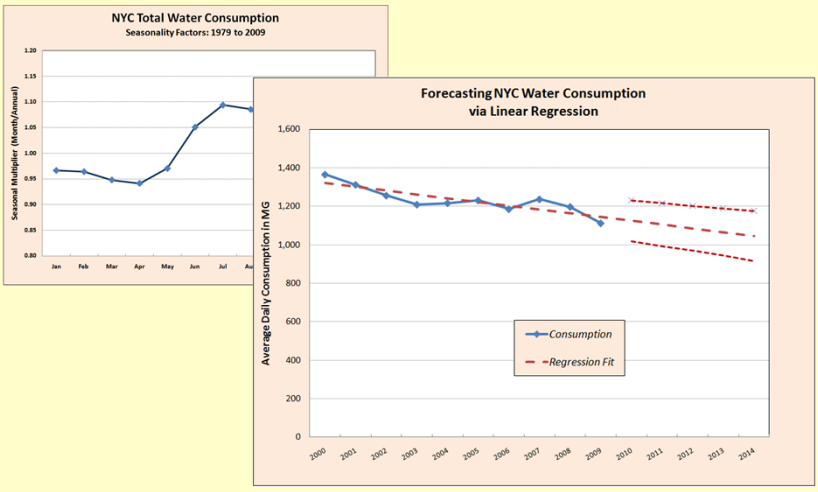
When diversions are overstated by 40 % (as in 765 vs 550 MGD) and releases are managed accordingly:

- ***Risks to New York City are dramatically overstated:***
  - Actual drought days will be 50% lower and reservoirs will refill 90% more frequently than predicted.
- ***Other constituencies interests are badly shortchanged:***
  - September reservoir voids will be 40% less and reservoirs will spill 90 % more than predicted.
  - Summer adult trout habitat could have been 150% higher had a more realistic, but still conservative release plan (such as the Joint Fisheries Proposal) been employed.

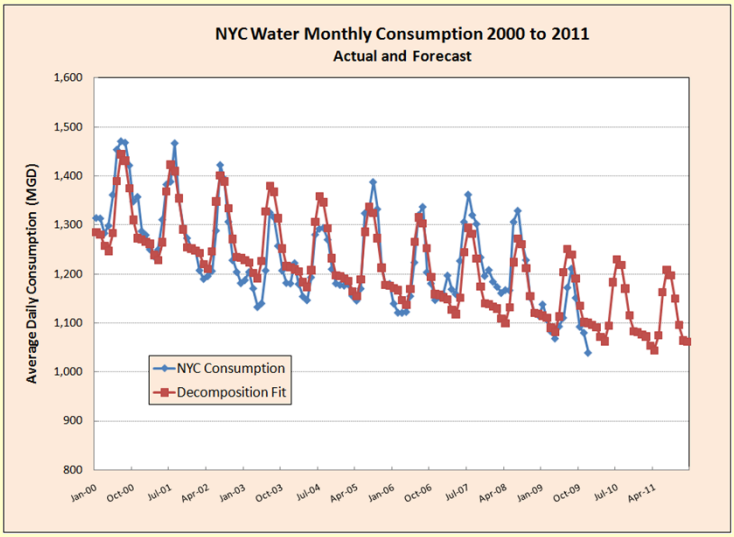
Part II. Forecasting NYC Delaware Diversions

I. The Driver of Delaware Diversions: NYC Water Consumption

- NYC total water consumption has been steadily declining and follows a predictable trend and seasonal patterns



Even monthly consumption can be predicted well

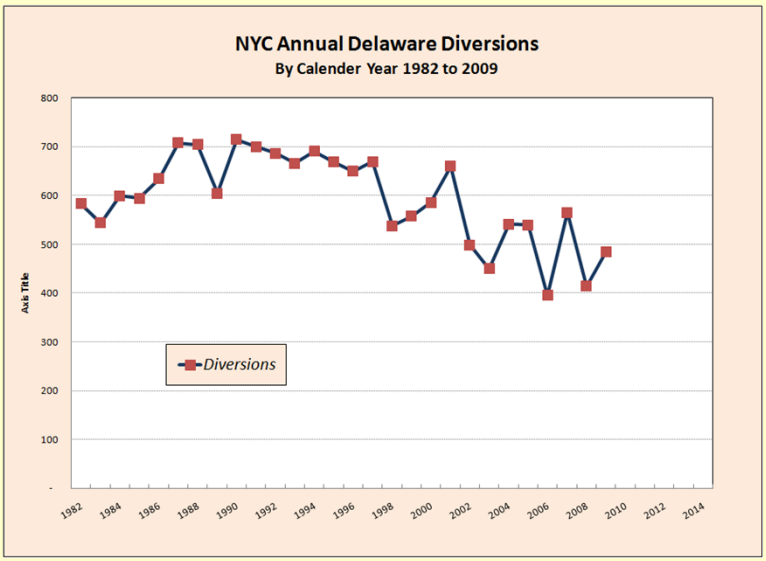


Diversion Forecasts are Also Feasible

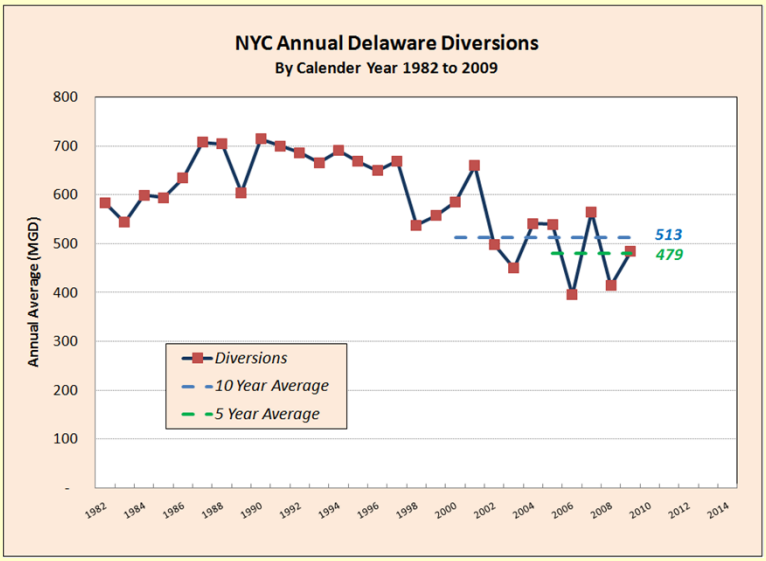
- Although New York City reservoir operations induce additional variability and uncertainly into diversions above the variation in consumption, a variety of statistical forecasting methods produce estimates with probability prediction limits that lead to the similar conclusions:
  - ***Over the next several years New York City Diversions are likely to be around 500 MGD and are very unlikely to exceed 650 MGD.***
- Such statistical forecasts can routinely be generated from available data at modest effort.
- Statistical forecasts can and should be adjusted by river administrators when significantly impactful events occur, or are anticipated.

NYC Delaware Diversions

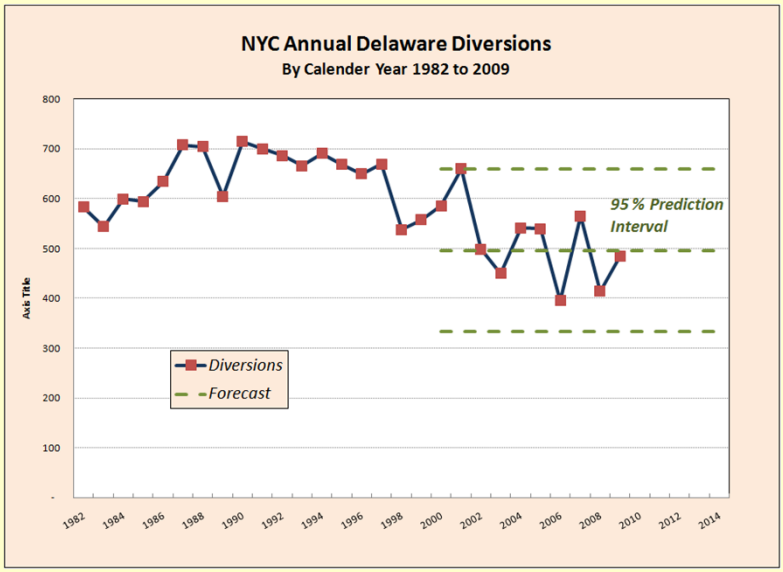
More variability and multiple influences



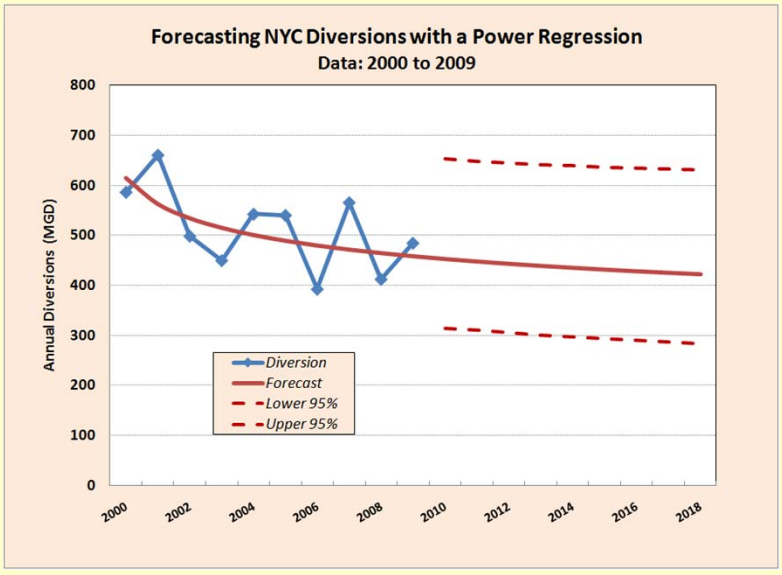
Simple Projections of Recent Diversions



Adding Probability Prediction Limits



More sophisticated forecasting of diversions, via Nonlinear Regression Analysis



Part III. The Release Recommendation of the Joint PA/NY Fisheries Task Force

One Path to Improvement

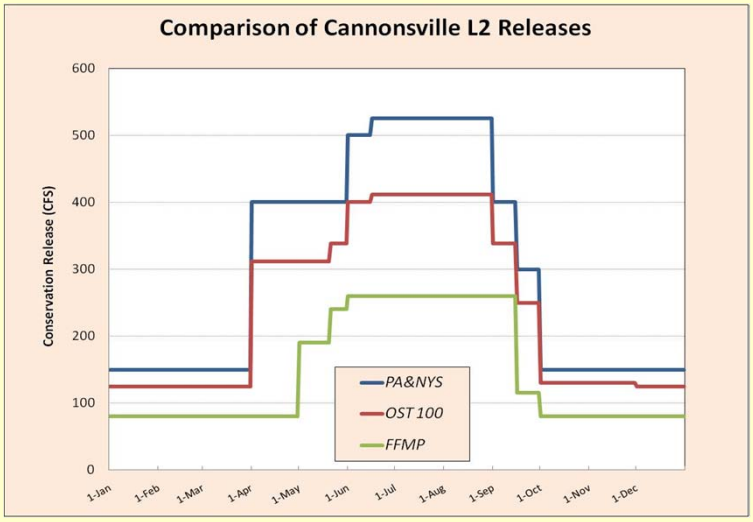
- The Joint PA/NY Fisheries task force recommendation is an off-the-shelf implementation-ready, improved version of the FFMP. It has been extensively evaluated.
- The benefits over current and past practices are substantial, and the risks are minimal.
- This Joint Fisheries policy is not the last word, however. We have already devised several release policies we believe to be superior.

What is Different:

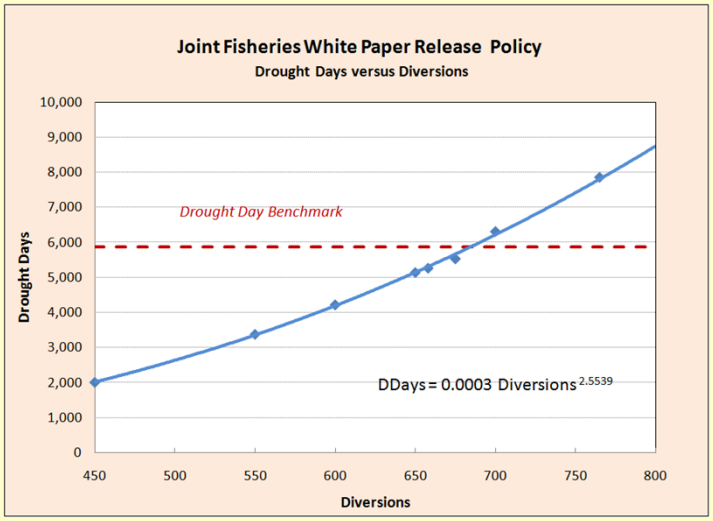
Comparing the Normal (L2) Releases of the Joint Fishery, OST 100 and FFMP Release Schedules

		Cannonsville			Pepacton			Neversink		
		PA &NYS	OST 100	FFMP	PA &NYS	OST 100	FFMP	PA &NYS	OST 100	FFMP
Winter	Dec 1 to Mar31	150	125	80	100	100	65	90	75	45
	Apr 1 to Apr 30	400	312	80	100	100	65	90	75	45
Spring	May 1 to May 20	400	312	190	100	100	100	90	75	75
	May 21 to May 31	400	338	240	100	100	125	90	90	90
Summer	Jun 1 to Jun 15	500	400	260	140	140	140	125	110	100
	Jun 16 to Aug 31	525	412	260	140	140	140	125	90	100
Fall	Sep 1 to Sep 15	400	338	260	100	140	140	90	75	70
	Sep 16 to Sep 30	300	250	115	100	100	85	90	75	70
	Oct 1 to Nov 30	150	130	80	100	100	60	90	75	45

Focusing on the Ecologically Critical Cannonsville Releases



This is a Safe Policy:
Risk neutrality at diversions below 675 MGD



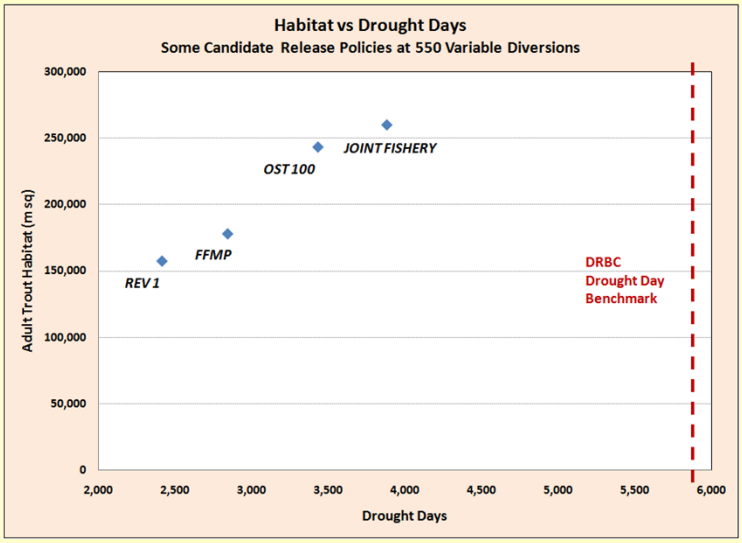
The Joint Fishery recommendation is a distinct improvement on many dimensions

Policy	Jun 1 Storage %	Sep 1 % Reservoir Void	Spills Mean	Drought Days	% Years Reservoirs Refill	Adult Trout Habitat	Pct Improve v Rev1	Pct Improve v FFMP
Rev 1	97	23	401	2,415	81	157,470		
FFMP	96	20	286	2,844	77	177,993	13	
OST 100	95	22	251	3,434	75	243,252	54	37
Joint Fishery	94	23	239	3,884	70	259,924	65	46

Footnotes:

Simulations over 1928 to 2006 run at 550 MGD Seasonally Variable Pattern Diversions
DSS Evaluations during the 1990s
Spills in MGD, Habitat in m sq
Decree Party Drought Day Benchmark = 5875 Days

Habitat vs Drought Day tradeoffs for some candidate policies:



Conclusions and the Path Ahead

- The current release rules can be improved now. We know how to do it.
- The possible improvements have already been extensively tested. They are substantial and safe – it would be negligent not to act now.
- The Joint Fisheries proposal is just one attractive possibility. Our research, shared with the Joint Fisheries Task Force in 2009, identified other 'risk neutral' release policies with summer time Cannonsville and Pepacton L2 releases as high as 600 and 175 MGD, respectively.
- Our recommendations can be implemented under current DRBC, Decree Party and NYC-DEP practices. They should not be held hostage to longer term resolution of Decree Party differences on the interpretation or measurement of 'sustained yield.'

Acknowledgements

In this work we have benefited from many discussions, working sessions and data sharings with many persons in the Delaware 'management' and 'conservation' communities. We particularly acknowledge:

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The End