



## **Flooding on the Delaware What's the Right Response? Not Flood Control Dams**

In response to the catastrophic floods of 2004, 2005 and 2006 along the main stem Delaware River a debate has been raging about whether to build a new dam on the Delaware, or to use existing dams on its headwater tributaries, for purposes of flood control. There has been a strong call by some along the River that void spaces should be maintained in the NYC Drinking Water Reservoirs for purposes of flood control. As much as a 20% void has been demanded by proponents of this concept.

The floods of September 2004, April 2005 and June 2006 were among the top-ten historic floods on the Delaware River.

Responding to the call for void spaces in the NYC Reservoirs, on December 15, 2009 the Delaware River Basin Commission released the results of a modeling effort designed to assess the impacts of flooding if the NYC reservoirs were maintained with void spaces.

The model demonstrated that the NYC reservoirs were not the root cause of flooding along the Delaware River and would not provide a level of protection that makes this option even arguable as a flood control measure compared to other more responsible solutions, particularly when the drinking water, health, safety and environmental ramifications are considered.

### ***What's a void space?***

Releasing waters from behind the dams in order to keep them at artificially low levels so they can collect more rainfall and runoff before they are considered full and would release overflows.

# The ramifications of voids in NYC Reservoirs for flood damage reduction along the Delaware River

DRBC’s modeling exercise compared the actual flooding that occurred during specific flood events with what would have happened had there been voids in the NYC reservoirs. Here is what they found:

The DRBC has determined that:

“Changes to the NYC Delaware Basin reservoir operations that would be required to achieve dedicated, year-round voids in the range of ten to twenty percent would result in measurable increased risks to water supply and instream aquatic life for varied flood mitigation benefits that cannot be guaranteed.”

“...continued development of the floodplains under most local land use and current flood plain regulations will allow future properties and inhabitants to be located in harms way, increasing the threat of damages to property and public health and safety. Although changes to the operations of the reservoirs to maintain dedicated year-round voids for flood storage would potentially reduce flood crests, those operational changes would not achieve the desired outcome of averting flood damages in the future.”

“NYC Reservoirs” – where are they?  
 Cannonsville – on the West Branch Delaware River  
 Pepacton – on the East Branch Delaware River  
 Neversink – on the Neversink River

## Summary of Inundated Structures – Residential – June 2006 Storm Actual vs 20% void

Municipality	Total # of Surveyed Structures in 100-year Floodplain	Structures Inundated w/o voids	Structures Inundated w/ voids	Difference
Yardley	282	266	262	4
Trenton	434	266	252	14
Ewing	156	141	131	10
Upper Makefield	309	171	142	29
Hopewell	22	19	17	2
New Hope	87	82	72	10
Lambertville	109	59	25	34
Stockton	95	59	22	37
Easton	18	8	5	3
Phillipsburg	16	8	0	8
Harmony	143	108	72	36
Belvidere	73	37	7	30
<b>Total</b>	<b>1744</b>	<b>1224</b>	<b>1007</b>	<b>217</b>

**Summary of Inundated Structures – Commercial – June 2006 Storm  
Actual vs 20% void**

<b>Municipality</b>	<b>Total</b>	<b>Inundated w/o voids</b>	<b>Inundated w/ voids</b>	<b>Difference</b>
Yardley	35	19	18	1
Trenton	68	22	17	5
Ewing	16	13	11	2
Upper Makefield	48	19	13	6
Hopewell	10	7	6	1
New Hope	68	61	58	3
Lambertville	63	30	13	17
Stockton	33	15	6	9
Easton	80	52	29	23
Phillipsburg	17	9	5	4
Harmony	3	2	2	0
Belvidere	20	11	6	5
<b>Total</b>	<b>461</b>	<b>260</b>	<b>184</b>	<b>76</b>

**The increased risk of drought created by maintaining voids:**

10% voids increase the number of drought days experienced in our watershed by 22% -- meaning:

- ☛ we would be in drought status on average an additional 15 days a year
- ☛ we would experience drought status 12 of every 78 years rather than 9 of every 78 years.

20% Voids increase the number of drought days experienced in our watershed by 61% -- meaning:

- ☛ we would be in drought status on average an additional 42 days a year;
- ☛ we would experience drought status 18 of every 78 years rather than 9 of every 78 years.

**Some Important Conclusions:**

With voids the majority of locations still experience moderate flood stage.

When looking at the 2006 flood, maintaining a 20% void, putting at risk the drinking water supplies of over 9 million people upstream and 2.5 million downstream, reducing the volume of water available to maintain the multi-million dollar ecotourism industry and the habitat required by the fish and aquatic life dependent on the Upper Delaware river flows, would prevent flood damages for 217 out of 1,744 residences and 76 out of 461 commercial structures during the projected 100 year flood leaving 1,527 residences and 385 commercial structures to continue to experience flood damages without any option for receiving benefits from the program. More extreme floods as those predicted resulting from global climate change would reduce the benefits further.

By Comparison, a program of voluntary buyouts and floodplain and riparian buffer restoration, along with floodproofing for historic and other structures of social or cultural significance, would provide complete and permanent protection to all structures participating in the program, leaving the option open to each structure owner about whether or not they wanted to receive such benefits.

**Some Other Important Points:**

- ✓ Seven of the ten worst main stem Delaware River floods reported at Trenton took place prior to the construction of the NYC Reservoirs or in the absence of any waters spilling from those reservoirs, demonstrating that the Reservoirs are clearly not part of the flood problem as some want to assert.
- ✓ Approximately \$237 million dollars in claims have been paid to 2,210 repetitive and severe repetitive loss properties since 1978.
- ✓ Approximately 13,150 persons live in the 100-year floodplain of the main stem Delaware River between Hancock, NY and Trenton, NJ.
- ✓ More than 15 million people rely on the Delaware River and the reservoirs (for both storage and releases) for drinking water. Up to 9 million people get their drinking water from the NYC Reservoirs. 8million downstream rely on the flows in the River for drinking water, including flows from the reservoirs.

**More specifics:**

***June 2006 flood, in New Hope***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			1.7 ft
Residential structures inundated	82	72	10
Commercial structures inundated	61	58	3

What does this mean in terms of the level of damage done to homes, structures and their contents? An example:

	Zero Damage Elevation	First Floor Zero Damage Elevation	2006 Flood Actual Flood Elevation	2006 Flood Elevations if 20% Void	Damage Reduction actual vs. w/out void
	60.95 ft	62.45 ft	66.87 ft	65.17 ft	
Feet Above First Floor Damage Elevation			4.42 ft	2.72 ft	
Structural Damage			38%	31%	7%
Content Damage			21%	17%	4%

***In other communities:***

***June 2006 flood, in Trenton***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			1.6 ft
Residential structures inundated	266	252	14
Commercial structures inundated	22	17	5

***June 2006 flood, in Ewing***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			1.6 ft
Residential structures inundated	141	131	10
Commercial structures inundated	13	11	2

***June 2006 flood, in Yardley***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			1.6 ft
Residential structures inundated	266	262	4
Commercial structures inundated	19	18	1

***June 2006 flood, in Lambertville***

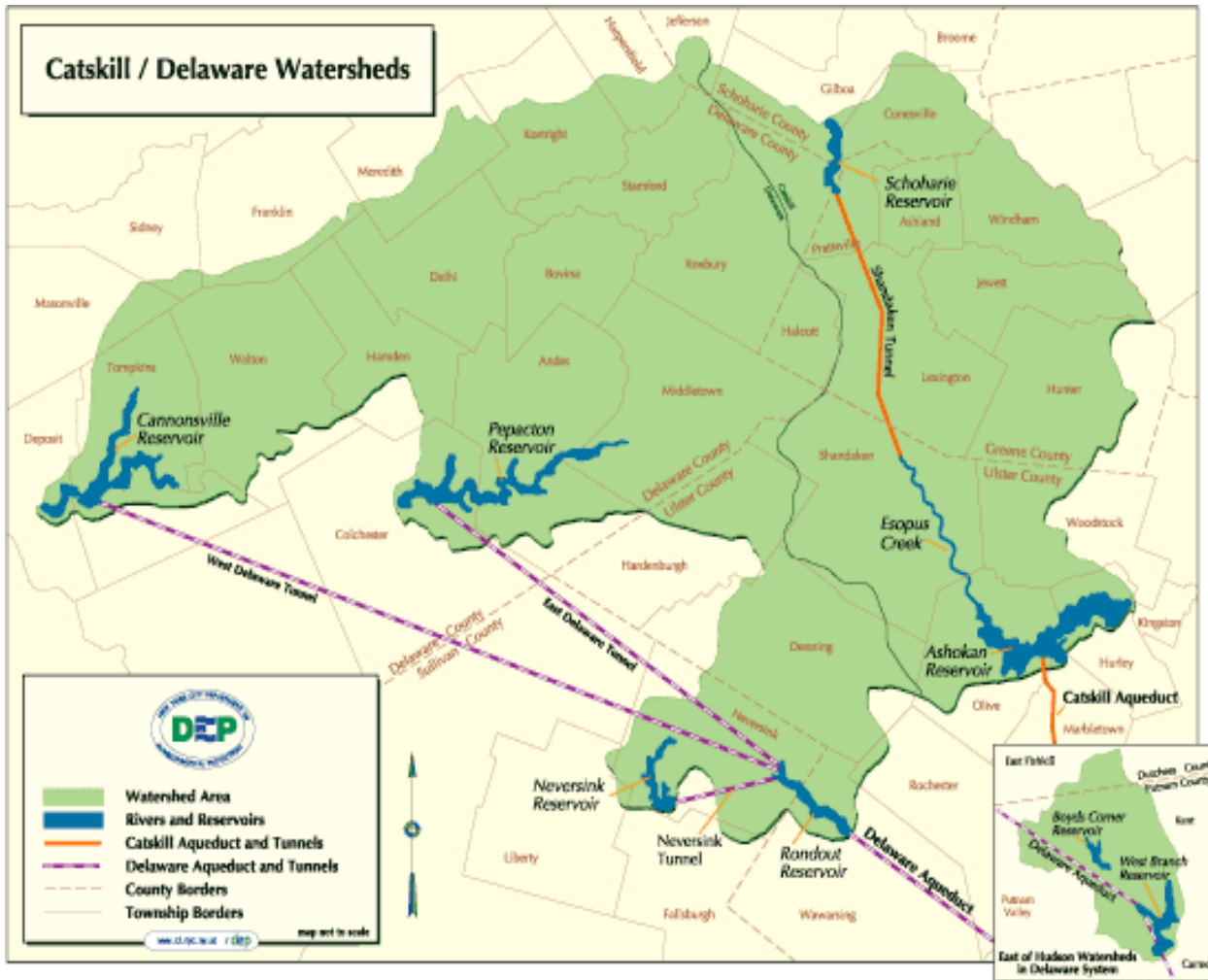
	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			1.7 ft
Residential structures inundated	59	25	34
Commercial structures inundated	30	13	17

***June 2006 flood, in Easton***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			4.5 ft
Residential structures inundated	8	5	3
Commercial structures inundated	52	29	23

***June 2006 flood, in Phillipsburg***

	As existing at time of flood	With 20% void	Difference
Flood peak reduction with vs without 20% void			4.5 ft
Residential structures inundated	8	0	8
Commercial structures inundated	9	5	4



New York City Reservoir System

Information retrieved from:

Delaware River Basin: Analysis of Potential Flood Mitigation with Existing Reservoirs, Powerpoint Presentation delivered by the DRBC December 15, 2009.

Delaware River Basin Flood Analysis Model and Associated Studies, Analysis of Potential Flood Mitigation with Existing Reservoirs; Overview of Results and Next Steps, DRBC, December 2009.

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