

New York State
Water
Resources
Institute

Hudson River Watershed Barriers: A Restoration Opportunity


State of the Hudson River Watershed Conference
Sept 29, 2009

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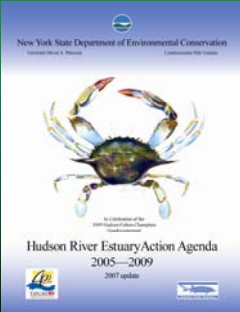
Discussion points

- Impacts of dams on rivers
- What we know about barriers (mostly dams) in the Hudson Estuary watershed
- Some current efforts and case studies
- Dam removal considerations
- Estuary Prog's future direction

* Not going to discuss a dam removal framework


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Hudson River Action Agenda Twelve Goals



Goals range from:

- - Providing people access to the river
- Educating public about river
- Protecting natural resources
 - On land in watershed
 - Watershed streams
 - Estuary aquatic habitat
- - Cleaning up pollution

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Barrier Context in HR Action Agenda 2010-2014

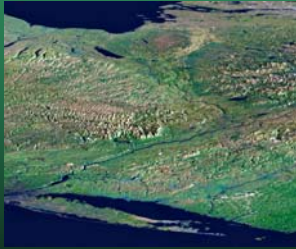
Goal 4: Streams and Tributaries

- "...provide assistance, guidance and technical support to municipalities, landowners and other watershed partners for the restoration of free flowing rivers including the removal of dams and other stream barriers to benefit water quality and aquatic connectivity.

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HR Watershed Nuggets

- Entire HR watershed 13,390 sq. miles
- Estuary watershed 5,400 sq. miles
- 315 miles long
- > 65 named tributaries to tidal estuary
- 8,800 miles of streams/rivers
- 1,400 lakes/ponds – 37,600 acres



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Dam and Barrier Impacts to Streams



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Dams Provide Important Human Functions

- Scenic and recreation
- Drinking supply
- Flood attenuation
- Hydropower
- Some nat. resource benefits
 - Depends on perspective



- But, we must remember - they aren't natural or permanent

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Dams Impact Streams in Many ways Fundamental shift from natural system to artificial pond/lake



The presence of a dam/impoundment impacts the stream from its natural condition

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Impacts Beyond the Impoundment Disrupts river continuum



Impacts can reach miles downstream

- Barrier to upstream (sometimes downstream) movement
- Alters critical sediment, nutrient, coarse material, and debris transport
- "Hungry water"
- Flow (if impounding)
- Water quality degraded
 - Temp higher or flux
 - DO

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Migrating Fish Barriers River Herring and others

- Can limit access to historic spawning habitat of migrating fishes
- 1996 Hudsonia study ranked barrier mitigation priorities in Estuary Tribs
 - Rondout (Ulster)
 - Pocantico (Westch.)
 - Cocksackie (Greene)
 - Stockport (Columbia)
 - Sparkill (Rockland)

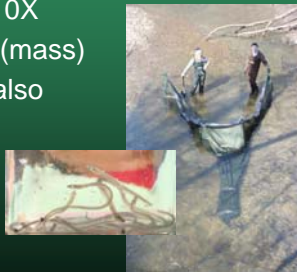


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Migrating Fish Barriers Impacts to Amer. Eel

- Densities reduced by 10X
- Eel condition declined (mass)
- Riparian urbanization also impacted eel condition
- Suggest:
 - tribs are important
 - barrier mitigation vital



Machut, 2007

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Other "People" Impacts

- Danger to canoeists and kayakers
- Swimming liability
- Downstream flooding risk
- Can create upstream/adjct flooding



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Culverts can Also Have Biological Impacts

- Fish barrier
 - other semi-aquatic riparian species
- Perched or velocity barrier
- Creates scour, erosion, & instability



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Culverts and Undersized Bridges Can Also Cause Localized Flooding

- Undersized opening +
- debris moving downstream =
- pinch-point =
- Constriction and adjacent flooding



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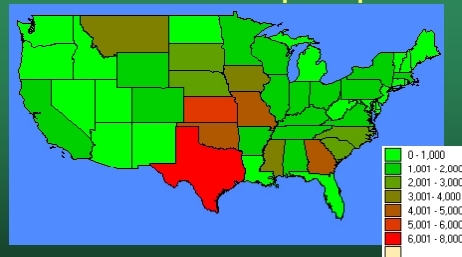
How big of an issue are dams in the Hudson watershed?

You be the dam judge.

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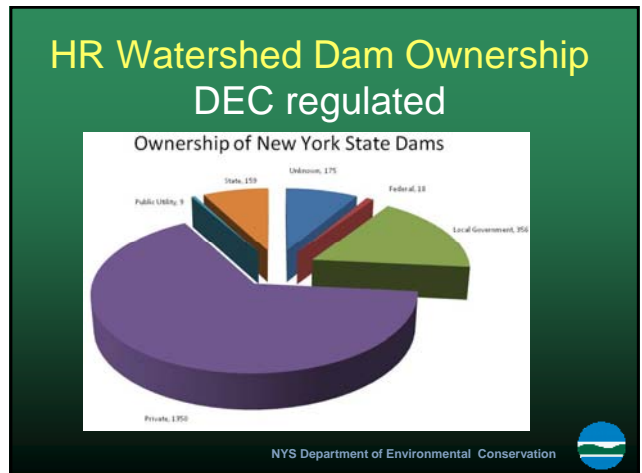
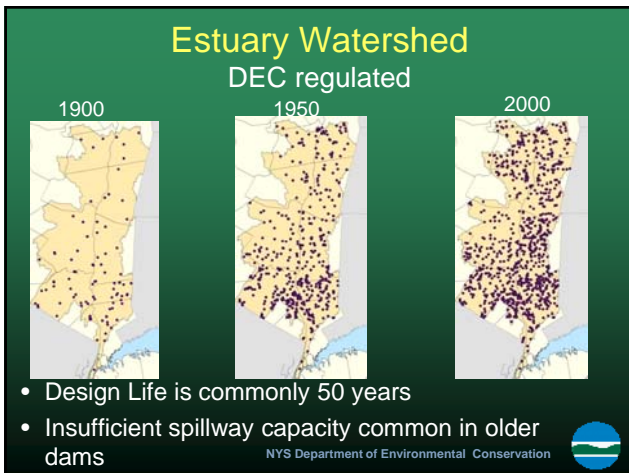
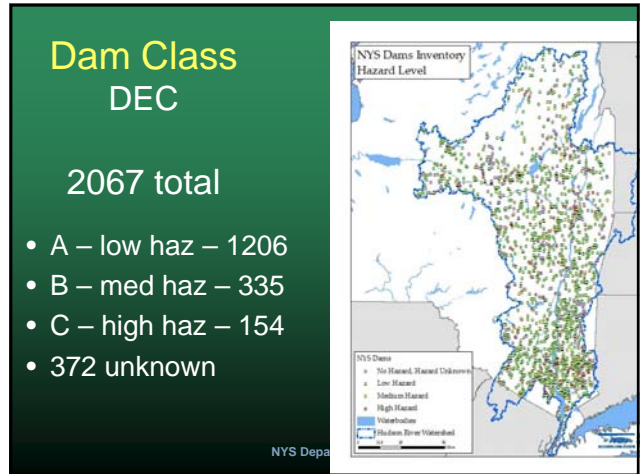
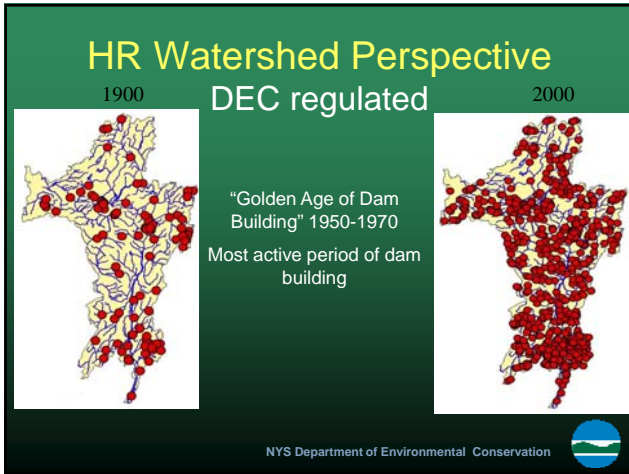
National perspective



- Over 79,000 dams in database
- Over 600 have been removed

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A Few HR Tributary Case Studies

And other noteworthy activities

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Inventory and Characterization Methodology

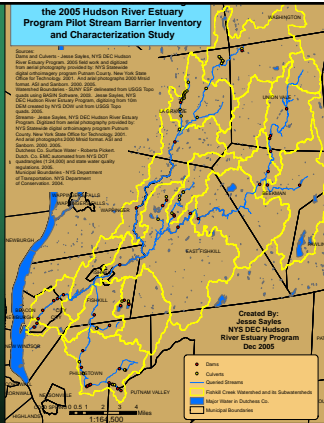


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Fishkill Watershed Inventory (2005)

- 49 dams
- 34 culverts
- Prior to study
 - 26 known dams in the Fishkill Creek to DEC

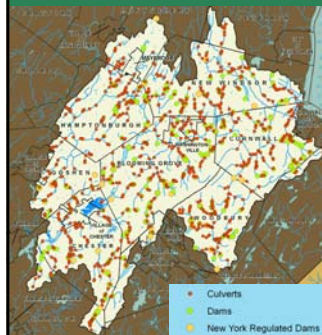


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Moodna Creek Study (2006)

- 180 sq miles
- 651 road crossings
- 184 impoundments
- 64 DEC regulated



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Moodna Creek

1st dam upstream of Estuary

Post 2007

Pre 2007

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Fish diversity fragmentation study

Fishkill and Moodna data

Bain and Wine, 2009

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Dam Removal is a Restoration Opportunity on the Hudson River Tributaries

1. Many obsolete and derelict dams in HR watershed
2. Many low hazard class dams and below DEC's reg. threshold
3. Few serve economic or ecological purpose

≡ opportunities for restoration

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Some Dam Removal Benefits Watershed and Site Specific

- Restore historic spawning habitat
- Restore stream continuum and sediment regime
- Improve water quality
- De-fragment communities
- Eliminate owner liability and downstream risks
- Reduce upstream/adjac flooding

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Emerging Concern/Removal Opportunity

Three ingredients

1. Climate Change
2. Unknown contaminated sediment?
3. dams exceeding design life



Before



After

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Emerging Eel Passage Initiative



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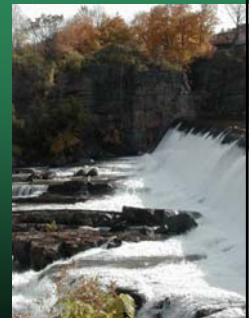
Updated NYSDEC Dam Safety Regs

- May serendipitously foster dam removal
 - persuade some dam owners
- More explicit requirements for dam owners than before
 - E.g., Class A - Need an inspection and maint plan



Dam Removal Considerations

- Opportunistic or targeted?
Or a little of both?
- Should take into account watershed issues
- Barrier context
- Free flow at expense of established habitats, such as wetlands

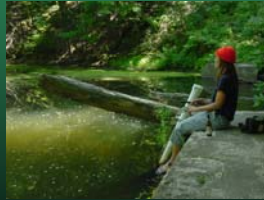


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Dam Removal Consid. Cont.

- Loss of recreational or historic resource
- Lost hydropower resource?
- Monitoring pre and post
- Sediment management
- Removal 1st alternative to passage



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Future Direction

- Initiate a pilot project in the HR
 - All barriers
- RFP for barrier mitigation coordination in the HR Estuary watershed



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Closing thought:

Do we want manage small dam breaches or not?



Acknowledgements

- Alon Dominitz, DEC Dam Safety Section
- American Rivers (Brian Graber and Steph Lindloff)
- Dan Miller, HRNERR
- Jesse Sayles, former SCA member
- Erony Whyte, former SCA member

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