Economist's Just Don't Give a Dam About Everything We Want to Do

Learning From the Economics of Others' Natural Resource Decisions—the Case of Flood Control

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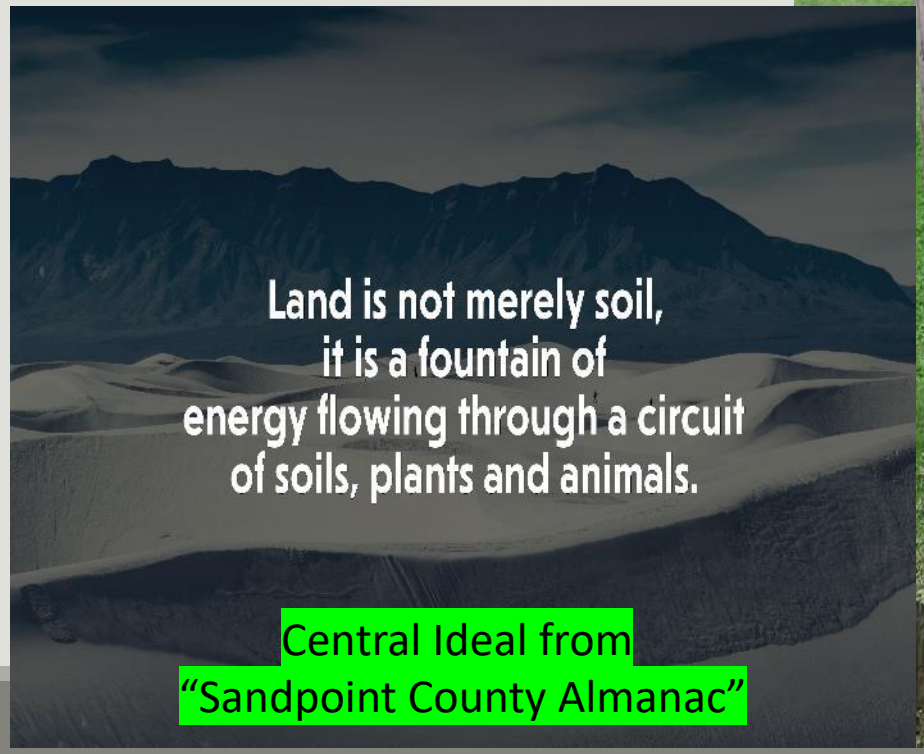
Coon Valley WI 2018
after 5/23 Dams Breach

Heartfelt Ideals Outscore Hard-Headed Realities

Much revered Aldo Leopold Proposed a massive soil conservation project in1930



Central Ideal from "Sandpoint County Almanac"

Let to This

In this case Leopold was right!

Coon Creek is early intensive soil conservation—The Model for all US NRCS Conservation

Before 1938 delivered silt load 441 Mt/year

1938 SCS Ag conservation practices start

- Contour plowing,
- pastured hillsides,
- crop changes,
- alternating crop bands,
- reforestation

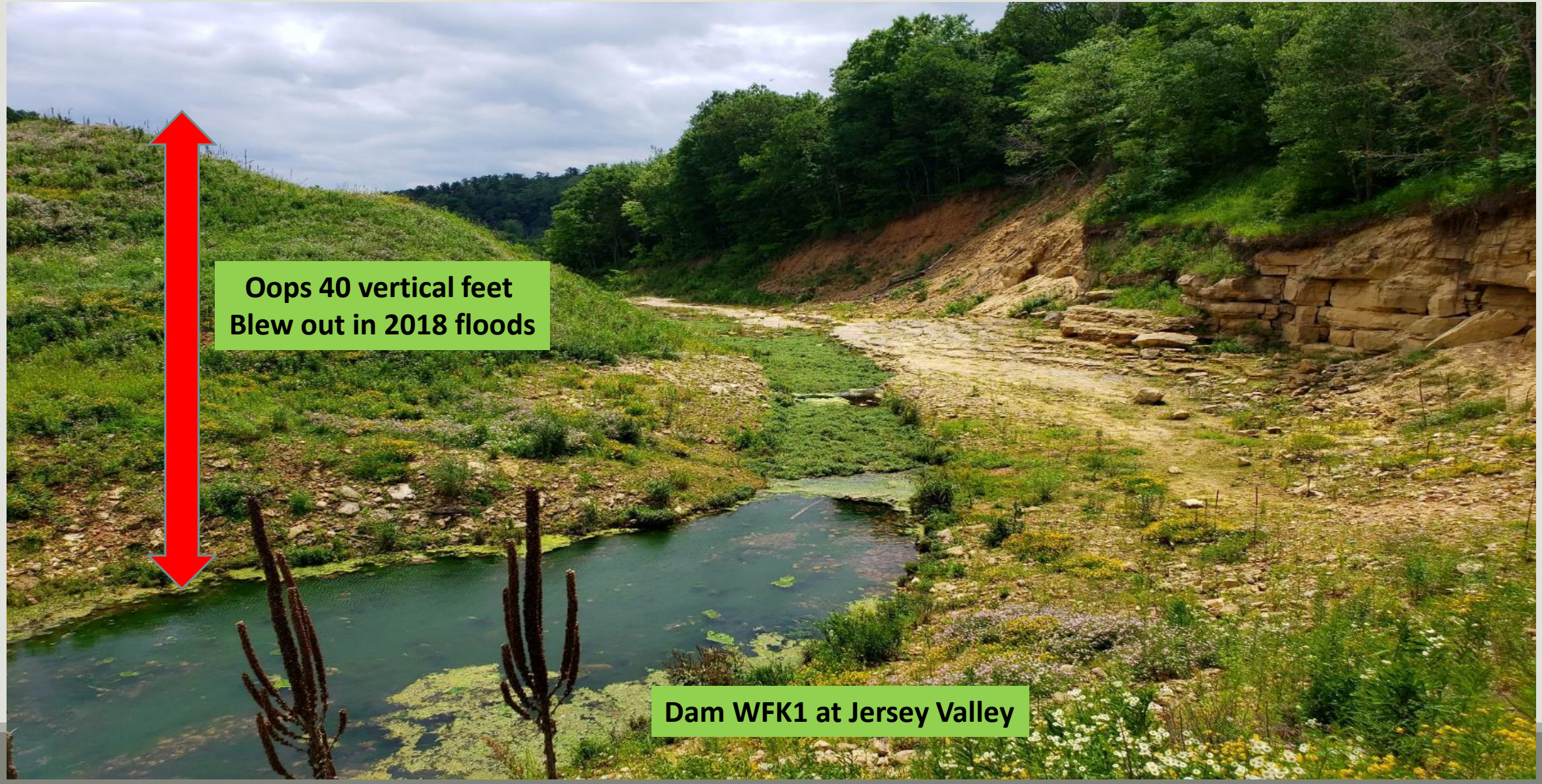
1951-1956 SCS builds 14 flood protection dams

1975-1993 Delivered Silt load 117 Mt/year

Significant water temperature drop

Trimble, Stanley. 2013

Should Failed Dams Like This be Replaced?



The Fallacy of Outcome Attribution

SW Wisconsin 2018 200-yr storm

When 12.3” of rain falls in 36 hours it has to go somewhere!

Now who do we blame?

- God thought he was doing a good thing
- Noah had left the building

Ah! Weren’t the NRCS dams supposed to stop this?

- Small & high up only 5 of 19 tributaries
- Dam protection areas were only 8% to 14% of rivers
- But they are visible & symbolic
  - And their stated intent is flood protection
  - And people want the system functioning again

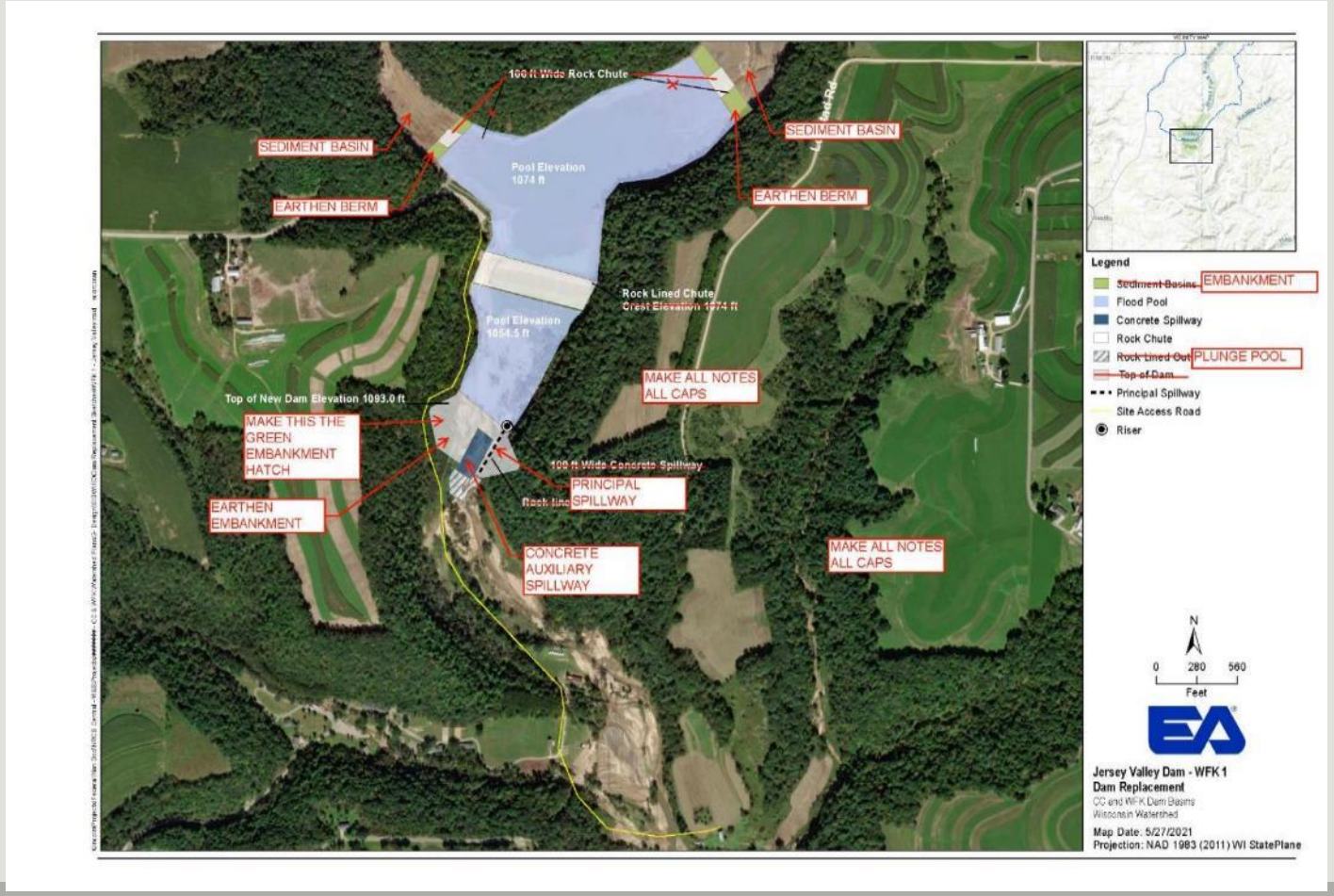
Even though most flood water was sheet run-off

Changing Economic Conditions Change Long-run Project Viability

Original Dam Cost 1971	$ 247K
1971 cost in 2022 Dollars	$ 1,629K
Replacement Cost 2022	$19,000K

Why?

1. Change in overhead costs
2. Change in standards
3. Change in material/labor costs
4. Change in durability specs
5. Change in regulations



Test Presumptions of Historical Performance?

9-dam West Fork Kickapoo Watershed Example

	Σ events
Value of protecting land uses	$2,830,037
Value of protecting infrastructure	$1,690,419
Value of protecting buildings	$1,593,250
Value of protecting bridges	$216,563
Σ Values of traditional flood protection	$6,330,269
Original system costs (2020$$)	$33,870,379
Net Present Value Watershed	-$27,540,110
Service Lifespan B/C ratio	0.19

OOPS!

Plus--Notice the glaring errors of spurious precision?

Saved by the Law of Unintended Consequence

Let's add in unplanned achievements

	Σ events	% Contrib.
Value of traditional flood prevention	$6,330,269	12%
Value of protecting new recreation opportunities	$46,738,902	88%
New Σ Values of all protection benefits	$53,069,171	100%
Original system costs (2020$$)	$33,870,379	
Net Present Value Watershed	$19,198,792	
Service Lifespan B/C ratio	1.57	

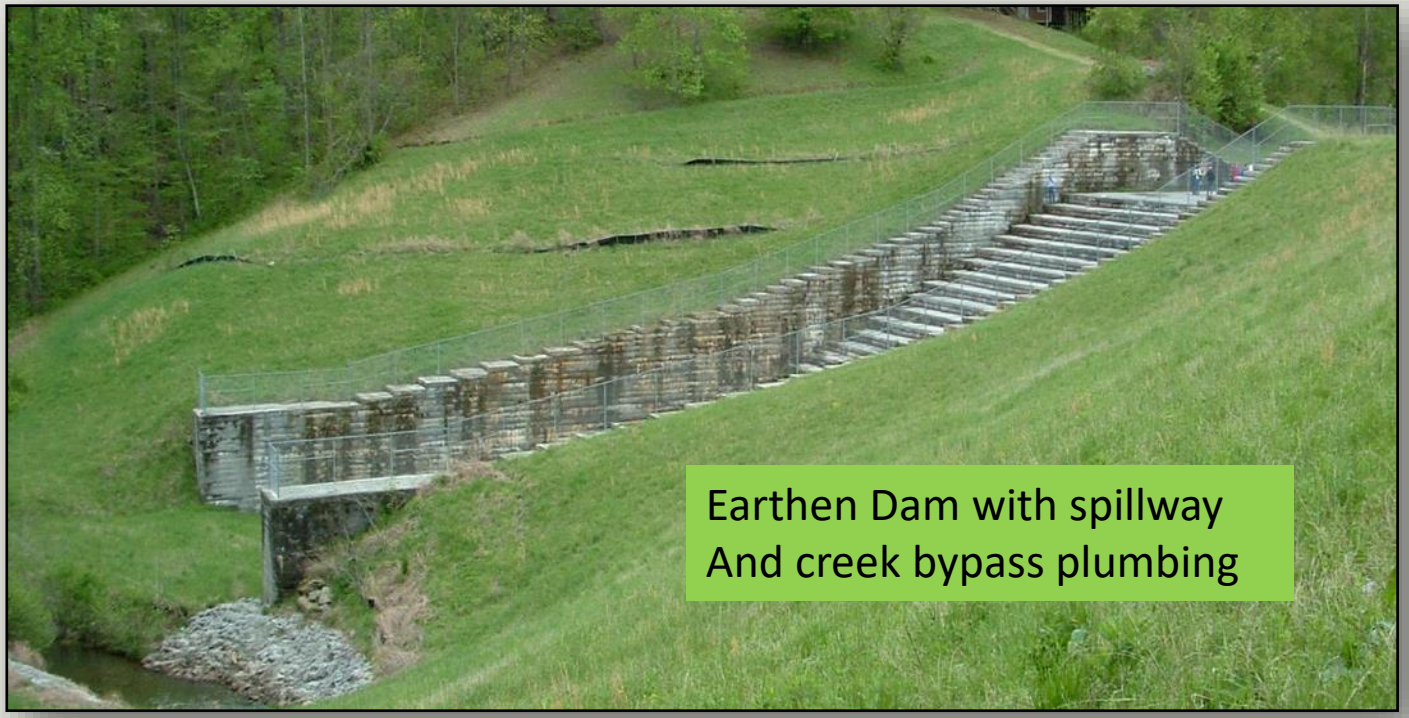
WOW!

Gosh, it's a shame regulations don't count recreation values in flood project funding justification

Decisions about Mid-Life Projects

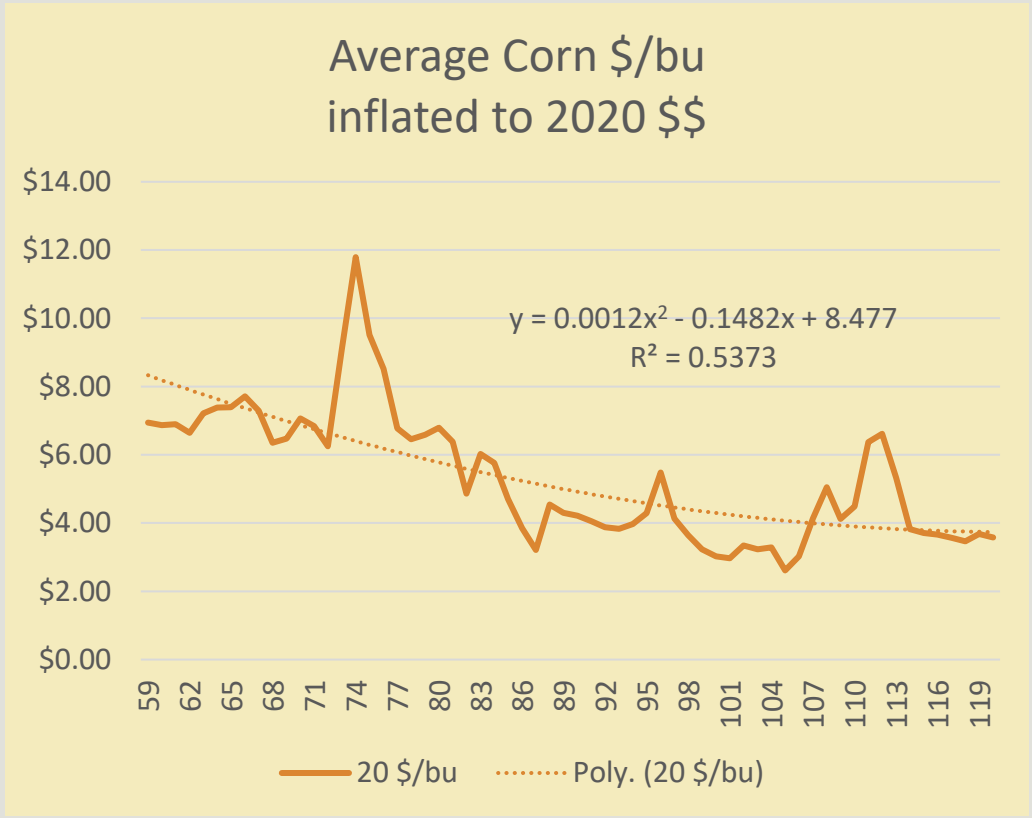
Remaining 18 dams old and crumbling

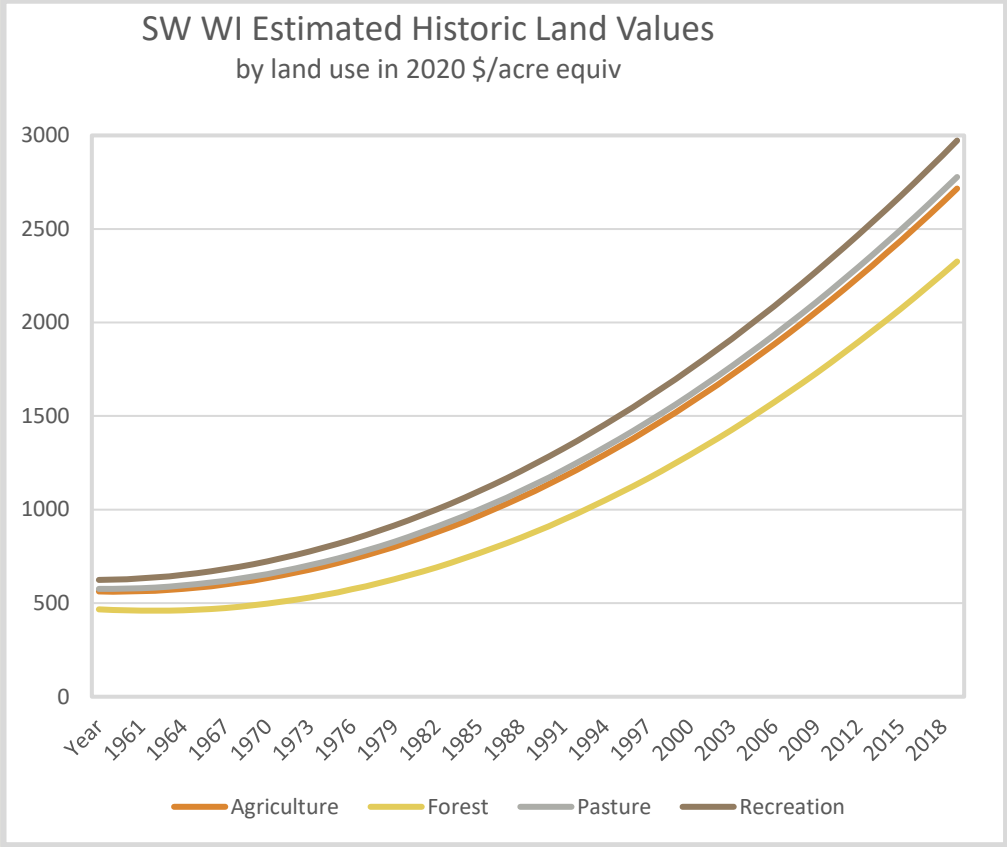
- Constructed 1956—1971
- Remaining life — 20+/- years
- **? Pull ‘em or Keep ‘em?**
- Pros: sunk costs are sunk
  - no up-front costs
  - years of remaining benefits
- Cons: $4 million each
  risks of future failures



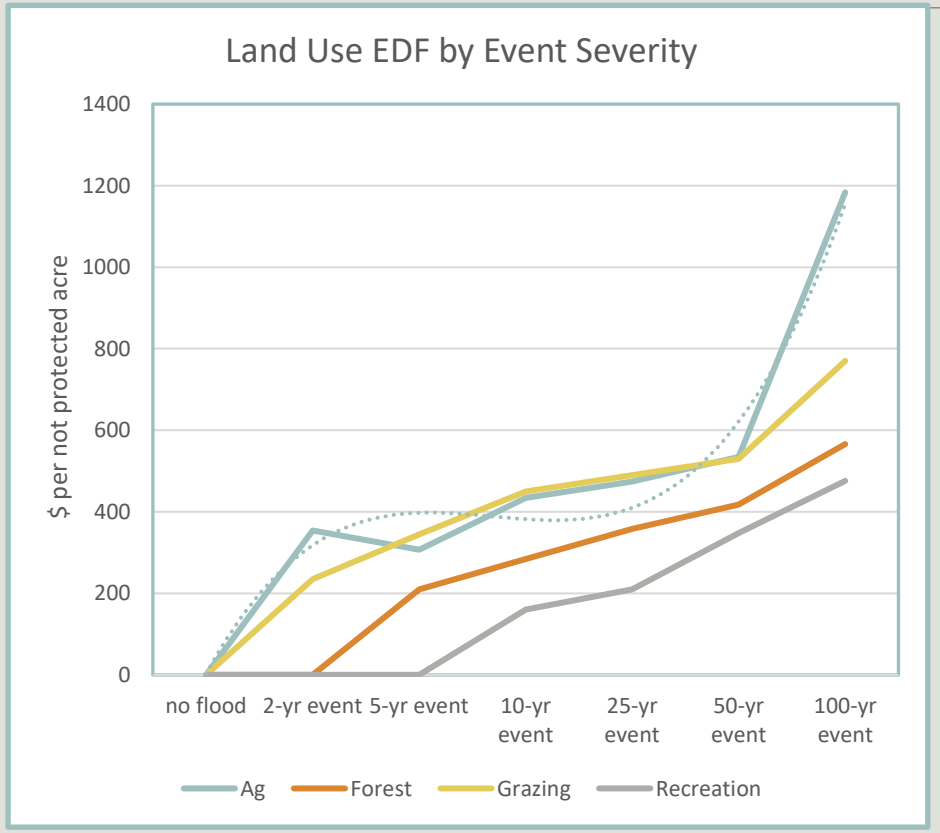
Earthen Dam with spillway
And creek bypass plumbing

Protected Land Values are Dynamic
But not product related—just like Forests

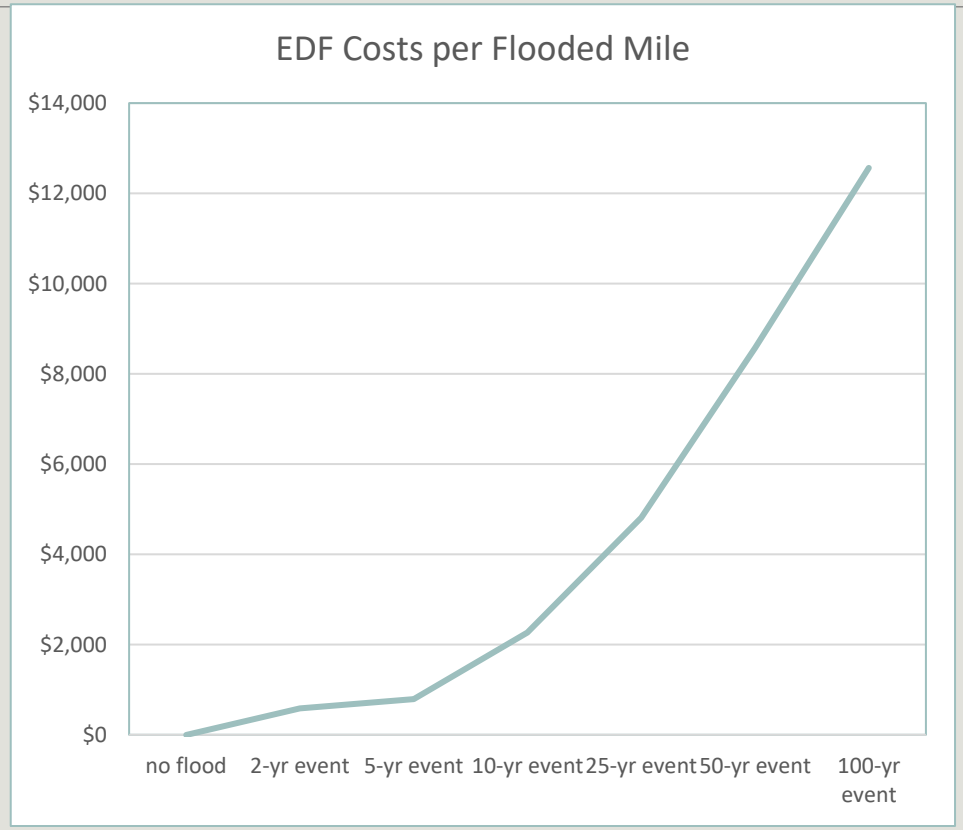




What's the Expected Outcome Worth?
EDF is a Backwards way of Getting at Dam Benefits



Acres by 4 Uses



Infrastructure & Emergency Service

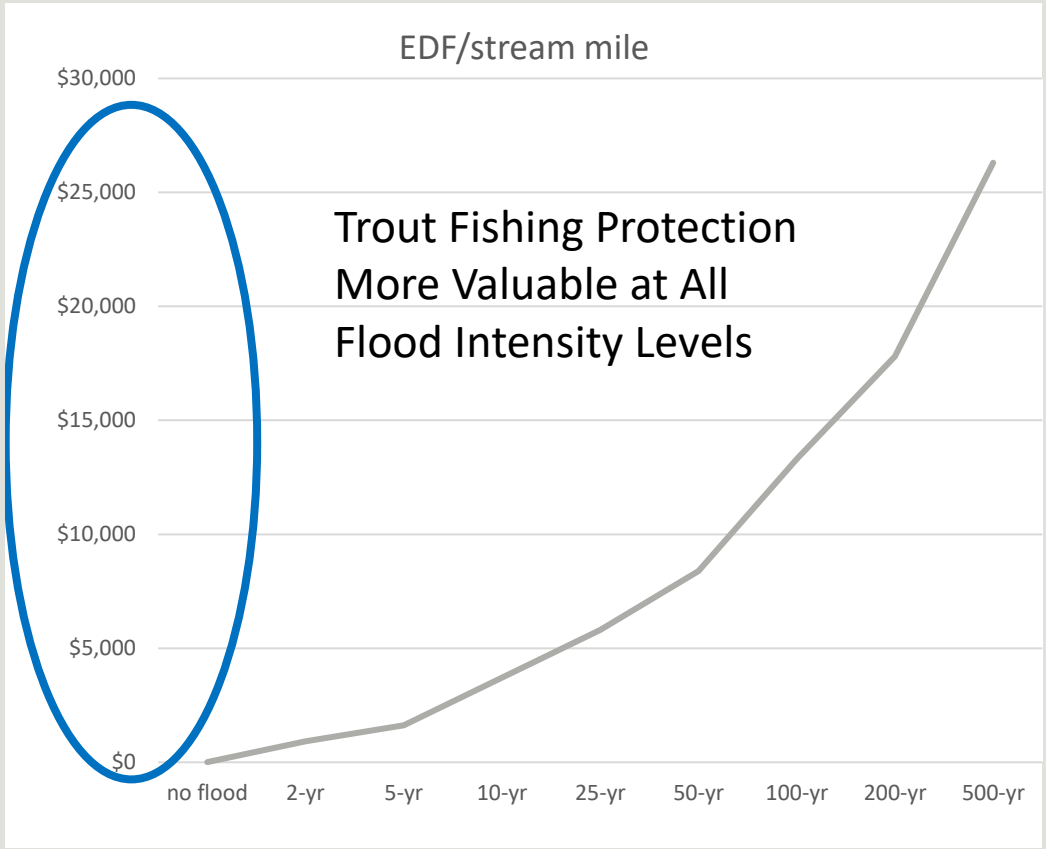
Changing Project Intent For New Opportunity
The case for considering recreation in dam evaluation

Blue Ribbon Trout Fishery

- Separate brookies from browns
- Protect habitat improvements
- Limited lost fly-fishing days

Park & Water Rec (1 dam)

- 11 recreation types
- 80K annual rec user days (RVD's)
- $1.6 million in RVD value/year



The Reality of Annual Flood Event Probability

Here's Flooding—Think About Event Risk in Forests

Flooding Events		Affected Land Uses Area EDF's								
Event Cycle	Probability	Ag acres	$/acre	Forest ac	$/ac	Rec acres	$/ac	Pasture ac	$/ac	Σ of area EDF's
Null	0.123	0	$0	0	$0	0	$0	0	$0	$0
2	0.500	1.2	$354	0.3	$0	0.8	$0	0.3	$235	$495
5	0.200	2.7	$307	0.6	$210	1.8	$0	0.7	$345	$1,196
10	0.100	2.1	$434	0.5	$284	1.3	$160	0.5	$450	$1,486
25	0.040	1.8	$474	0.4	$358	1	$210	0.4	$490	$1,402
50	0.020	0.3	$534	0.1	$418	0.2	$348	0.1	$530	$325
100	0.010	3.5	$1,184	0.7	$566	1.8	$476	0.8	$770	$6,013
200	0.005	3.6	$1,421	0.8	$679	1.8	$571	0.9	$924	$7,518
500	0.002	2.3	$1,658	0.5	$792	1	$666	0.6	$1,078	$5,522
All	1.000									

A Small Probability Times Even A Big Damage is a Small Number ex .002x$5,522 = $11.04 annual effect

5 Dams' Flood Protection ROR?

Criteria by Dam	CC 21	CC 23	CC 29	WFK 1	Mlsna
NPV Rebuild	-$3.88	-$3.57	-$4.15	-$18.25	-$4.02
B/C Ratio Rebuild	0.05	0.05	0.11	0.02	0.13
NPV with park recreation	NA	NA	NA	$27.42	NA
B/C with park recreation	NA	NA	NA	2.48	NA

So—Even Though Everyone Loves Them and The Intent is Good,
Should these Famous Dams be Rebuilt and Refurbished?

Why Not Just Convert More Uplands to Fallow?

1. Only better for 2-yr events
2. Lose only 47,000 farm acres
3. Lessons about diminishing marginal returns
4. Oops, conversion costs
5. Oops, lost production costs
6. Oops, pissed off farmers
7. Oops, eliminates the export industry of 2 ag counties
8. And all the economic sectors that depend on it.

Protected Acres by Technique

Event	CC LUC	CC Dams	CC: LUC/Dams	WFK LUC	WFK Dams	WFK: LUC/Dams
2-yr	193	160	120.9%	190	236	80.5%
5-yr	150	203	74.0%	141	321	43.9%
10-yr	152	220	68.9%	117	204	57.3%
25-yr	120	297	40.4%	72	242	29.7%
50-yr	114	356	32.0%	92	274	33.6%
100-yr	123	276	44.6%	94	255	36.8%
200-yr	90	231	39.0%	49	220	22.2%
500-yr	48	163	29.4%	58	186	31.1%

Will Tomorrow be like Today?
Factoring in a Climate Change Scenario

Climate Scenario	5-yr flood	500-yr flood
Atlas-14 Inundation inches	3.5	10.8
UW Climate Scenario inches	4.1	11.1
flood gain %	14.6%	2.7%
Atlas-14 Ag land EDF $/ac	$307	$1,658
UW Climate Ag land EDF $/ac	$352	$1,703
EDF gain between scenarios	$45	$45
Annual event probability	0.050	0.002
Climate Influence $/ac	$2.24	$0.09

OH THE IRONY

Wisconsin: they love non-functional dams & want more

Washington: they hate functional dams & want fewer

Dam Solutions Will Be Political!

Analysis Just Gets in The Way &---

They both hate & ignore economists!

What Did We Learn From Their Project Lessons?

Why Would I Analyze Any Projects on My Family Forest?

I'm Going to Do Them Anyway!