Basin-Wide Benefits, Local Costs: Levee Setbacks, Federal Farm Support, and the Benefit-Cost Analysis of Flood-Risk Management on the Lower Missouri River

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Motivation and policy context

Federal flood-risk management in the United States is moving from protecting individual sites toward managing whole river systems, and levee setbacks — relocating levees landward to give the river more room — are central to that shift. The clearest current example is the U.S. Army Corps of Engineers' Lower Missouri River Flood Risk and Resiliency System Plan (draft, December 2025), developed with Iowa, Nebraska, Kansas, and Missouri after the record floods of 1993, 2011, and 2019. Its recommended Balanced Plan covers 735 river miles and includes 55 levee setbacks, 85 levee removals, levee raises, hundreds of resiliency measures, and nonstructural actions, potentially reconnecting up to 147,000 acres of floodplain that is today mostly cropland. The plan has become a focal point of conflict — farm communities and levee districts would lose productive, tax-paying land, while the Corps argues that system-wide conveyance gains reduce flood risk for everyone else.

The plan's own economics sharpen the question. Estimated first costs for the Balanced Plan range from $7 billion to $27.6 billion, against roughly $197 million in annual benefits, for a benefit-cost ratio of 0.18 to 0.72. Every alternative in the final array fails a conventional national economic development (NED) test except the upper bound of the resiliency alternative. The Balanced Plan is instead selected as the "Total Net Benefits Plan" under the Corps' 2023 planning policy (ER 1105-2-103), which weighs environmental, regional, and social accounts alongside NED. Whether the benefit-cost analysis that informs such decisions measures the right things is therefore not an academic detail — it determines how a multi-billion-dollar program of climate adaptation will be justified, prioritized, and contested.

Research questions

First, does conventional benefit-cost accounting correctly measure the social costs and benefits of converting protected agricultural land to reconnected floodplain? Second, who bears the costs and who captures the benefits — setback landowners, neighboring producers, levee districts and county tax bases, downstream and urban areas, or the federal taxpayer?

Why conventional accounting may mislead

The paper focuses on three mechanisms, each grounded in how the System Plan is actually evaluated.

- **Agricultural losses are measured inconsistently.** The plan lists agricultural losses as an objective metric, but the NED tools it describes (LifeSim and Total Risk) quantify damages to structures, contents, vehicles, roads, and cleanup. Its assumptions about riverward land also differ across sections: one assumes land stays in crop production, which the plan notes overstates crop losses; another assumes all riverward land is acquired and converted to habitat. We show how much agricultural damage valuation, and the choice among valuation methods, moves the estimated net benefits and the ranking of setback sites.

- **Land acquisition costs may overstate the social opportunity cost of land.** Setback costs are dominated by acquiring land at market value. But floodplain farmland prices capitalize federal support: premium-subsidized crop insurance, prevented-planting coverage, ad hoc disaster payments, and P.L. 84-99 levee rehabilitation at 100 percent federal cost for federal levees and 80 percent for enrolled non-federal levees. Because landowners capture part of farm program benefits in land values (Kirwan 2009), acquisition prices include a component that is a transfer rather than a real resource cost. The same subsidies weaken private incentives to adapt (Annan and Schlenker 2015), raising the private value of cultivating flood-prone land relative to its social value. This wedge helps explain why the conflict is so sharp, and it implies that benefit-cost ratios for setbacks may be biased downward.
- **Federal fiscal flows determine incidence but are outside the ledger.** Repeated levee repairs (more than $1.3 billion in the Omaha District alone since 2011), crop insurance indemnities and disaster payments are largely borne by federal taxpayers, while acquisition, lost tax base, and payments in lieu of taxes that do not reach levee districts are borne locally. Counted correctly, some of these flows are transfers and some are real resource costs; confusing them risks double counting in one direction and omission in the other. Our incidence analysis separates the two, following the efficiency-and-equity framing of Boomhower and Fowlie (2026) for catastrophe insurance.

Data and approach

The analysis links four components:

- **Hydraulics and exposure.** Stage-frequency relationships and with- and without-setback water surface elevations from the Corps' system-wide HEC-RAS model, mapped onto USDA Cropland Data Layer fields.
- **Agricultural damages.** Expected annual damages computed with two published, complementary methods developed by our team — an empirical-stochastic approach using 30 years of historical data (Maltsbarger et al. 2026) and a probabilistic, phenology-based approach that accounts for flood timing within the growing season (Jalilov 2026) — applied to corn, soybeans, and winter wheat and weighted by annual exceedance probability.
- **Federal fiscal flows**. County-level crop insurance indemnities attributed to flooding and excess moisture (USDA Risk Management Agency cause-of-loss data), prevented-planting payments, ad hoc disaster assistance following the 2019 flood, and P.L. 84-99 levee repair expenditures.
- **Land values.** County farmland values and cash rents (USDA NASS), combined with capitalization rates from the literature, used to bound the share of acquisition cost attributable to capitalized federal support.

The study reconstructs the plan-wide accounting for the System Plan as a whole and recompute site-level net benefits for the setbacks in the Holt County reach in northwest Missouri, one of the plan's designated spinoff study areas, where levee setbacks and the 2011 and 2019 flood experience make the trade-offs concrete. For these sites we compare net benefits under alternative accounting conventions and decompose costs and benefits by who bears them. Both damage methods are published and already calibrated for Holt County under an ongoing, funded research project on agricultural flood risk in the Lower Missouri River Basin, which makes a complete draft by April 2027 feasible.

Preliminary evidence

RMA Cause of Loss data already show the scale of the fiscal channel. In 2011, crop insurance indemnities attributed to flooding in the 45 counties bordering the Missouri River between Sioux City and St. Louis totaled about $159 million, roughly half of all flood-caused indemnities nationwide that year ($322 million), with a further $50 million paid for excess moisture. Holt County alone, one of the System Plan's spinoff study areas, accounted for $31 million. One flood year therefore routed insured crop losses through the federally subsidized program on a scale comparable to the System Plan's total estimated annual benefits (about $197 million). The 2019 flood was larger still: nationally, indemnities for excess moisture and flooding reached a record $6.6 billion that year, about 1.8 times the next-highest year since 1990 (USDA ERS 2024). We will extend the county series through 2019 and apportion county indemnities to floodplain cropland using the Cropland Data Layer and modeled flood extents.

Expected contribution

The paper will provide:

(i) a transparent reconstruction of how agricultural losses and land costs enter federal flood-risk benefit-cost analysis,

(ii) estimates of how much the plan's benefit-cost ratios change when agricultural damages are measured consistently and when capitalized federal support is separated from the real opportunity cost of land, and

(iii) an incidence table showing how costs and benefits of system-wide adaptation are distributed across landowners, local governments, and the federal government.

Rather than recommending a particular plan, the results clarify which parts of the current dispute concern efficiency and which concern distribution — a distinction that matters for the design of voluntary acquisition, easement, and compensation programs (for example, the flood-risk acquisition authority added to the Missouri River Recovery Program in WRDA 2024) and applies well beyond the Missouri, wherever system-wide adaptation meets locally concentrated costs.

References

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