Levees Program: Acres Flooded

What Is This Indicator and Why Is It Important?

This indicator measures the number of acres in the Delta flooded each year, and displays them in relation to actions taken to invest in levee stability. Flooding is of concern for two main reasons. It can cause significant damage, especially to agriculture, but to other land uses as well. In addition, levees are important for the control of salinity at key points in the Delta, and flooding at certain locations can thus threaten fresh water supplies crucial to a wide range of agricultural, urban, and ecosystem uses.

What Has Happened to Affect This Indicator?

The amount of flooded acreage is influenced by the frequency and severity of high flow events due to natural causes, to the subsidence of recovered land due to dewatering, and to the resources available for levee reconstruction and maintenance. The Program's ultimate goal is to raise all levees in the Delta to a common level of performance. While there is a variety of funding mechanisms that can combine federal, state, and local dollars, there is no formal Delta-wide plan for upgrading levees and local concerns can often influence the prioritization of projects.

What Do the Data Show?

The data (Figure 1) clearly show that the number of acres flooded has decreased dramatically since 1986, as have post emergency recovery expenditures. Given that this period includes both dry and wet years, this strongly suggests that expenditures on levee reconstruction and maintenance have had their desired effect.

Discussion

This indicator provides a clear signal of the response of a key part of the system to prevention efforts. While this provides a certain amount of information, there are other important parts of this system that could eventually be included in a set of integrated indicators. This is a focus of ongoing effort within the Program, because appropriately designed and effectively monitored performance measures are essential to the successful implementation of complex and long-term programs such as this.

Such performance measures must reflect the Program's overall management objectives and incorporate direct tracking of outcomes as well as of intermediate milestones and indicators of progress. In addition, the system of performance measures must include indicators that help confirm the continuing validity of core assumptions about how key processes in the system are functioning. This is because such assumptions form the basis for decisions about how to mitigate the risks of levee failure and/or the consequences of such failures.

For example, the Levees Program has begun development of performance measures that track the relationships among FEMA claims, annual levee maintenance costs, the number of levee failures, and the number of acres flooded. Properly normalized and analyzed, such measures will demonstrate whether ultimate desired outcomes (fewer levee failures and reduced damages) are being achieved and how they have responded to specific management actions to improve levee integrity and to improve emergency response.

Some results on such performance measures are now becoming available from analyses of historical data. However, while extremely valuable, these are in essence retrospective measures, since they can only provide information after the fact about whether past actions have worked as expected. Because of the potentially long time lag between preventive actions being taken now and the future incidence of levee failure, there is a further need for performance measures that indicate whether the actions currently being undertaken are likely to reduce the risk of future levee failures.

Such measures will have three key characteristics. First, they will be based on a risk assessment that identifies levee failure modes, their precursor events, their likelihood under different circumstances, and their consequences. Second, they will be an integral part of a risk management plan that focuses on controlling and/or reducing key precursors of risk by, for example, explicitly balancing investments in maintenance, levee improvement, and emergency response. Third, they will measure the degree to which current actions reduce the precursors of risk, as well as system parameters needed to evaluate the continuing validity of the overall risk model. Finally, indicators of levee performance could also be expanded to address the degree to which investments in levee stability help meet other CalFed goals such as ecosystem restoration.

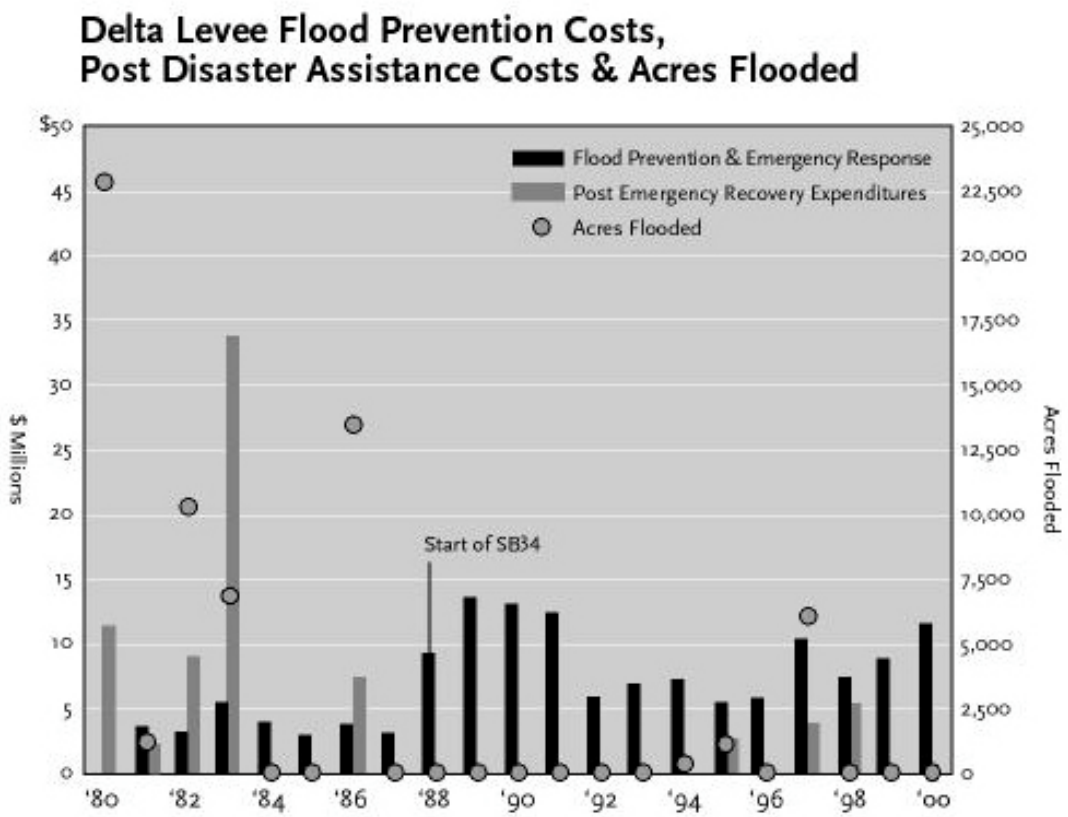

Figure 1. The relationship among flood prevention costs, recovery expenditures, and acres flooded from 1980 through 2000.