BUILDING LAND IN COASTAL LOUISIANA

Expert Recommendations for Operating a Successful Sediment Diversion that Balances Ecosystem and Community Needs

Report Summary

WHAT ARE SEDIMENT DIVERSIONS?

Sediment diversions are a vital restoration tool needed to confront Louisiana's land loss crisis. A sediment diversion is a structure built into the Mississippi River levee system to allow river water, sediment and nutrients to flow into nearby wetlands to help sustain and rebuild land. By harnessing the power of the Mississippi River, sediment diversions mimic the natural processes that once existed and built the land of coastal Louisiana. They are foundational to Louisiana's coastal restoration efforts needed to help reduce risks from sea level rise, subsidence, hurricanes and other threats.

MOVING SEDIMENT DIVERSIONS TO CONSTRUCTION:

Sediment diversions have been recognized for decades as critical coastal restoration projects, and they have been included as a principle element of Louisiana's Coastal Master Plan. Louisiana's Coastal Protection and Restoration Authority (CPRA) is currently advancing two sediment diversions south of New Orleans for construction in 2020. These diversions are crucial investments in the state's future as they will build and help maintain tens of thousands of acres of land over time and help support other restoration projects needed to protect communities, wildlife and industries across southeastern Louisiana.

OPERATING A SEDIMENT DIVERSION:

As CPRA studies how to design and construct a diversion, community members are concerned about how the diversion will be operated. To date, the only operation strategies currently being discussed are for modeling and engineering studies that use simplified and standardized operation strategies. These simplified strategies allow consistent comparisons between various scenarios, such as location or size alternatives. However, they are not representative of operations in the real world. For instance, at times these simplified operations result in a diversion flowing at maximum capacity for months on end. The reality is that sediment diversions will be operated only at certain times carefully chosen through a specific operations strategy to maximize land building while also accounting for ecosystem and community needs.

CPRA will develop an Operation and Adaptive Management Plan that defines how, when and why the diversion structure will be opened and closed, what factors will be considered, what monitoring is required, what governance will be used to oversee these decisions and what role affected communities and industries will play in the decision-making process. As CPRA develops this operations strategy, understanding the science of how and when a sediment diversion could (or should) be operated, including how to manage for secondary effects, could not be more important.

DIVERSION OPERATIONS EXPERT WORKING GROUP:

Environmental Defense Fund (EDF), in coordination with Restore the Mississippi River Delta coalition partners, formed a Sediment Diversion Operations Expert Working Group to discuss and advance the latest science regarding how to maximize land building through a sediment diversion while considering other effects. The group, comprised of 12 leading scientists with decades of experience working in coastal Louisiana, along with 42 guest experts, participated in monthly meetings to provide information and recommendations based on experience and knowledge in their respective fields. The group developed and shared operational recommendations with CPRA, the U.S. Army Corps of Engineers

(USACE), other state and federal agencies, the larger scientific community and communities and businesses with a stake in the operation of diversions. The full report can be downloaded at www.MississippiRiverDelta.org/DiversionOpsReport. They examined a variety of topics related to diversion operations, including:

- River Hydrodynamics and Sediment Loads
- Basin Geology and Land Building
- Water Quality
- Wetland Health
- Fish and Wildlife
- Communities, User Groups and Socio-Economic Effects
- Operation Strategies
- Governance, Legal and Stakeholder Involvement

The working group used the Mid-Barataria Sediment Diversion as a case study to examine the above factors, with the assumption that a large-scale 50,000 to 75,000 cubic feet per second (cfs) diversion will be constructed into Barataria Basin. The working group selected the Mid-Barataria Sediment Diversion as a case study because it is furthest along in the Engineering & Design process.

Location of the Mid-Barataria Sediment Diversion, a structure to deliver fresh water, sediment and nutrients into Barataria Basin.

OVERALL RECOMMENDATIONS

1. The primary goal of operating a sediment diversion should be to build and sustain land.
2. Secondary objectives should be developed in coordination with agencies and stakeholders to consider the needs of the ecosystem and the people who live and work in it.
3. Operations plans should be living documents with robust monitoring and adaptive management that improve over time based on continued learning and knowledge improvement and changing environmental conditions.
4. Operations plans should consider an array of key operations strategies (detailed below).

RECOMMENDED KEY OPERATIONS STRATEGIES:

1. Initial operation strategies will differ from long-term operation strategies:

- **a.** Initial operation plans should include robust monitoring and flexibility to modify operations as the conditions in the basin change and adjust rapidly. Updates to the plan may be required more frequently based on an integrated and near real-time operations-monitoring feedback loop.
- **b.** A sediment diversion cannot be operated at full capacity on Day 1. Gradually opening the diversion over time (an estimated 5-10 years) will facilitate the development of a distributary channel network, reduce the risk of flooding to communities, limit erosion of adjacent marshes, reduce the shock to marsh plants and fish and wildlife species and allow them time to adjust and self-organize around the new conditions.
- **c.** To ensure that opening a diversion does not cause unnecessary plant stress and/or wetland loss, start operations during the non-growing season for the first 2-3 years to allow vegetation to adapt to the new conditions.

2. Use high river flows and sediment loads of the river strategically:

- **a.** Operation plans should be developed based on the water year (defined as October 1 through September 30).
- **b.** Sediment diversions should be operated on a pulse that mimics the natural flood cycle of the Mississippi River.
- **c.** Operations should take full advantage of winter flood peaks and operate as much as possible from November through February.
- **d.** The river can experience anywhere from one to more than four flood peaks in a given water year. Operations should take full advantage of the first peak of the water year as it carries the largest concentration of sediment.
- **e.** Operating a diversion during the rising limb and peak in river flow should be explored, especially in the spring and summer floods. Closing or reducing the flow on the falling limb of the flood peak will limit the duration and quantity of fresh water moving into the basin while maximizing sediment capture.
- **f.** Maintain flexibility to operate a diversion when the river is below 600,000 cfs, specifically to capture suspended sediment loads essential to sustaining marshes. Maintenance flows should be considered under an adaptive management plan for specific ecosystem conditions in the basin. These include the potential establishment of freshwater habitats at the outfall that could be damaged by saltwater intrusion, preventing an increase in oyster predation and disease, and preventing waterfowl and alligators from nesting in low-lying areas that will later be flooded during a flood peak.
- **g.** Maintain a minimum residual flow of approximately 300,000 cfs in the river to ensure continued navigation and community and industry use.

h. There are six typical flow patterns of the Mississippi River (termed hydrograph typologies) that vary in the number and timing of flood peaks. These typologies should be used to develop, test and communicate operation strategies.

3. Work with the geology of the receiving basin to build land:

a. A sediment retention target area should be defined and a sediment retention rate should be set that maximizes retention based on basin geology and diversion location.

b. CPRA should develop an outfall management plan for the diversion receiving basin to manage water flow and maximize sediment retention to meet the project and sediment retention goals.

c. Landscape features or actions should be designed and built in the receiving basin to accelerate the land-building process by increasing the sediment retention rate in this specific area (Sediment Retention Enhancement Devices or SREDs).

4. Maintain and improve water quality and wetland health:

a. To prevent nutrient-laden water from the river from becoming stagnant and creating favorable conditions for algal bloom formation,a diversion should be shut down gradually rather than abruptly.

b. Winter operations of a diversion prior to the passage of a cold front can push nutrient-laden water onto the marsh surface, allowing wetland plants to use those nutrients for growth, also removing the nutrients from the water and increasing water quality.

c. Any operations during the growing season should include adequate dry periods to allow vegetation to recover, and operations at the beginning of the growing season (April-May) should be monitored closely.

d. Maintain as much intermediate and brackish marsh as possible to prevent episodic loss of freshwater vegetation that can occur from salinity spikes during droughts and to ensure wetlands are more resilient in the face of rising sea levels and increases in daily salinities.

5. Balance the needs of fish and wildlife species:

a. Operations should focus on community abundance and productivity rather than an individual species, understanding that some species are going to be affected detrimentally with or without action. The benefits and adverse effects of a sediment diversion on indicator species are important for transparency and expectation management.

b. Winter operations will reduce or eliminate affects on fish and wildlife species, especially during initial operations. Closing the diversion in March can facilitate the larval recruitment of blue crab and shrimp into Barataria Basin.

c. Spring and summer operations require a more intricate and balanced operation strategy that considers the life cycle needs of indicator species, such as nesting season for alligators (once established), spawning of blue crab and oysters, brown shrimp larvae recruitment and birthing season for dolphins.

6. Analyze potential effects to communities and industries and clearly communicate them:

a. Expedite studies on socio-economic effects and mitigation opportunities that will need to be considered when operating a diversion.

b. Be transparent about potential effects, use two-way sharing of information and genuine attempts to mitigate socio-economic effects without compromising the effectiveness of the diversion is crucial.

c. Begin two-way dialogue with individuals that could be affected by diversion operations. Negotiations should not occur over how to operate the diversion, instead on how to manage and deal with any predicted and unforeseen effects.

d. Visualizations and outreach materials should be developed to help communicate expectations to the public, the processes for building and sustaining land, as well as the positive and negative effects of sediment diversions.

e. Once the diversion is operational, outreach tools and technologies (online webinars, easy-to-understand real-time data, websites and interactive apps) should be used to inform the public when the diversion is operated and communicate basin conditions.

7. Monitor before and after construction, and make the data publicly available:

a. Develop a robust, ongoing monitoring program to measure and understand conditions in the river and receiving basin before, during and after sediment diversion construction and operation. Monitoring should incorporate the entire area of interest to understand the full effects of the diversion, both near the diversion site and elsewhere in the basin.

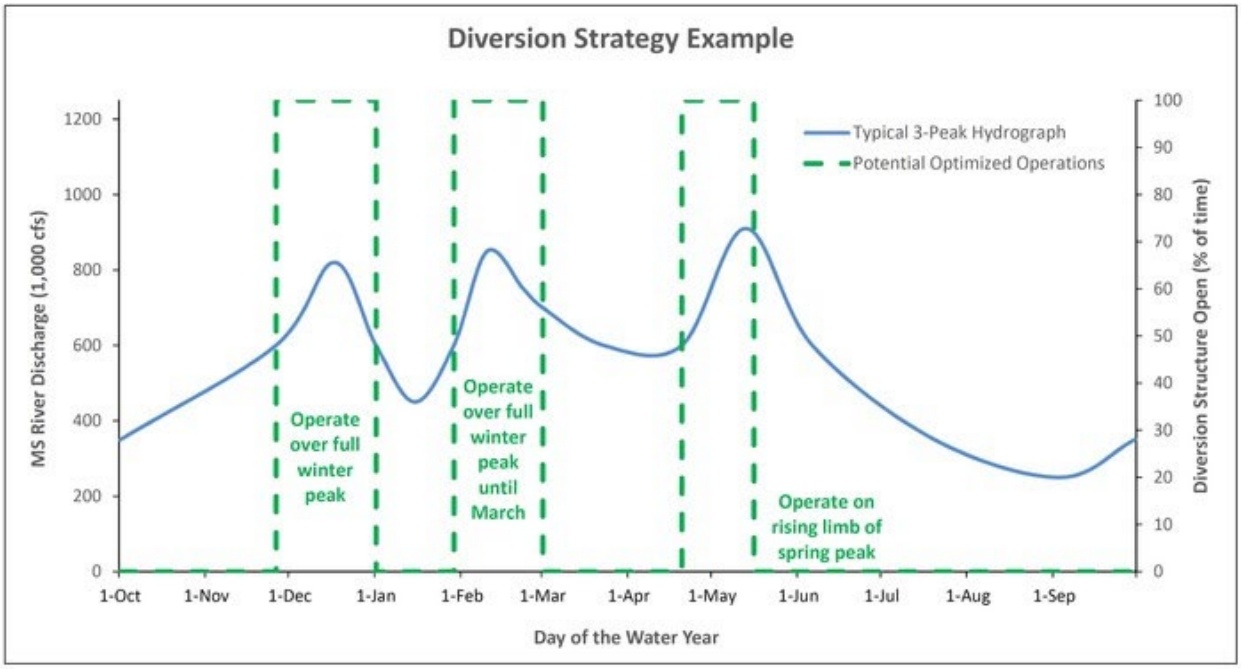
b. An active and robust adaptive management program with regular assessments and indicators of projects outcomes is essential to an effective operations plan.

8. Define a clear governance structure supported by federal, state and local government:

a. Establish a formal governing structure to determine the roles and responsibilities of all parties and the decision-making process in diversion operations.

b. Form advisory councils to provide formal input, and technical and scientific (including social sciences) committees should be formed to provide unbiased analysis of the monitoring data and recommend modifications to the operation plan or adaptive management strategies.

By merging all of the recommendations above, an operation strategy can be developed and tested for each hydrograph typology (demonstrated here on a three-peak hydrograph typology) that effectively captures sediment for land building, while balancing the needs of the ecosystem and communities. For this example, the diversion operates throughout the winter flood peak, most of the late winter flood peak (closing by March to allow estuarine recovery), and closes after the peak of the spring flood, focusing on the rising limb of the flood to capture the most sediment and reduce effects to the ecosystem. Note: Although the diversion is depicted as completely opened or closed, each opening and closing could happen gradually over time.



NEXT STEPS

The Working Group's hope is that the CPRA will take its recommendations into account and incorporate them into ongoing modeling and planning efforts as it advances proposed sediment diversions toward construction and upon operation of these diversions. The Working Group thinks these carefully researched and documented recommendations will maximize the tremendous land-building opportunity that exists through these restoration projects while minimizing unintended effects to Louisiana's abundant natural resources.

OPERATIONS EXPERT WORKING GROUP MEMBERS

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