Background

Decision Support System for Water Infrastructure Security™ Lite (DSS-WISE™ Lite) is a web-based, automated two-dimensional dam-break flood modeling and mapping capability developed by the National Center for Computational Hydroscience and Engineering (NCCHE), the University of Mississippi. Its development, operation, and maintenance are supported by FEMA.

DSS-WISE™ Lite has been used extensively during numerous dam incidents and emergencies. FEMA reached out to several states asking for case studies of their experience with DSS-WISE and received over 100 examples.

4

Total States

Four States Responded across Four Regions

Four states completed case studies: South Carolina (Region IV), New Mexico (Region VI), Colorado (Region VIII), and California (Region IX).

75%

Emergency Response

Three States Show How DSS-WISE™ Lite Affected Emergency Response

Three of four states provided examples where DSS-WISE™ Lite affected emergency response.

100%

Positive Impact

When Used in an Emergency, 100% Agreed DSS-WISE™ Lite had a Positive Impact

All states that used DSS-WISE™ Lite in an emergency agreed it was effective and had a positive impact on emergency response.

We Can Agree

Participants unanimously agreed their experience with DSS-WISE™ Lite would impact how future emergency events were handled.

100% of participants also agreed that DSS-WISE™ Lite was helpful.

We see DSS-WISE™ Lite as a vital tool for hazard classification of dams.

—South Carolina

Speed and ease of use allowed users to model actual conditions at time of failure.

—California

Results helped state Dam Safety [officials] make quick decisions in the face of questions from emergency managers.

—Colorado

Activation of an Emergency Action Plan (EAP)

Four of the case studies identified the use of DSS-WISE™ Lite after an EAP was activated. An EAP is a formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize loss of life and property damage.

2017: Oroville, California

Most noteably, DSS-WISE™ Lite was used in the Oroville Dam Incident in 2017. Only an inundation map for the main dam was available at the time. In response to the release of high flows through a damaged spillway and use of an emergency spillway with hillside erosion, over 60 independent model runs were submitted in a 4-day period. DSS-WISE™ Lite was used to model various failure modes and determine appropriate evacuations.

2018: Snelling, California

In California, an EAP was activated for Moccasin Lower Dam during a flood event due to inadequate spillway capacity that resulted in high seepage flows at the downstream toe of the dam and potential for dam overtopping. DSS-WISE™ Lite confirmed a dam failure would flood the fish hatchery downstream, impact a highway road, and be absorbed by the downstream reservoir, which led officials to dewater the reservoir through a water supply tunnel to alleviate seepage concerns and prevent overtopping.

2018: South Carolina

In South Carolina, multiple EAPs were activated for several dams during the approach of Hurricane Florence. Dam Safety Program staff identified dams that were expected to receive the most rainfall and conducted DSS-WISE™ Lite simulations to evaluate hazard classifications and ascertain accurate mapping would be available for distribution to emergency management.

2019: Soda Springs, California

In California, Lake Van Norden Dam suffered damage to the spillway channel concrete liner. The dam owner's approved innundation map was used during the incident, but DSS-WISE™ Lite was used to confirm the owner's inundation area and flood parameters.

About the Dams Studied

The dams from these case studies were diverse. The dams were made from different materials and methods, owned by different entities, and had various Population at Risk (PAR) statistics.

15

The dams from the case studies were owned by 15 different stakeholder groups.

For each DSS-WISE™ study, PAR ranged between 0 to >200,000, with an average PAR of 6,000.

85%
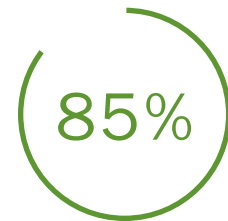
A large majority of the dams listed in the case studies were earthen dams.

DSSWISE™ HCOM

DSS-WISE™ Human Consequence Module (HCOM) is an analytical module for automated assessment of the human consequences of dam-break floods. It's accessible 24/7 to registered users from FEMA, federal agencies, and state dam safety offices. DSS-WISE™ HCOM uses the results of flood simulation using DSS-WISE™ Lite to provide maps of:

- Flood hazard risk for people caught outdoors and indoors.
- Potentially lethal flood zones (PLFZ) for children and adults

Conclusion

DSS-WISE™ Lite is a proven tool that enhances dam safety risk management. Diverse stakeholders use DSS-WISE™ Lite as a tool both to prepare ahead of the activation of an EAP and as a response tool once an EAP has been activated. Overwhelmingly, these case studies show that DSS-WISE™ Lite has a positive impact, and those who use it want to see a continued investment by FEMA to run this program.

> We are more apt to go to DSS-WISE™ for initial dam failure consequence estimates after this experience.
>
> —Colorado

> DSS-WISE™ has greatly improved risk assessment capability for the New Mexico Dam Safety Program.
>
> —New Mexico

> DSS-WISE™ Lite allowed for confident identification of downstream hazards in the event of a dam failure.
>
> —South Carolina

> Given the efficiency and versality of DSS-WISE™, it allows users to model real-time conditions.
>
> —California