IHRB
IOWA HIGHWAY RESEARCH BOARD

TRANSFER OF THE IOWA DOT CULVERTS WEB-TOOL PROTOTYPE TO IOWA DOT MAINFRAME

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RESEARCH PROJECT TITLE
TRANSFER OF THE IOWA DOT CULVERTS WEB-TOOL PROTOTYPE TO IOWA DOT MAINFRAME (IHRB RESEARCH PROJECT TR-744)

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The prototype web-platform developed through a previous IIHR project is now residing on the IDOT information technology mainframe.

BACKGROUND

A data-driven approach embedded in a web-based problem-solving environment was developed through a previous Iowa Highway Research Board IHRB project (IHRB TR-655) for providing the critical information needed for designing and maintaining culverts operational and free of sedimentation.

The web-tool was succesfully presented at several state, regional and national events and was well received by a wide variety of potential users. Based on this positive feedback the TR-655 Technical Advisory Committee suggested to transfer the prototype portal within Iowa Department of Transportation (IDOT) information technology infrastructure for internal usage by IDOT personnel associated with culvert design and operations.

OBJECTIVES

The IHRB project TR-744 provided the funds for customizing the prototype and transitioning the culvert web-tool in the IDOT computer environment. The web-tool makes relevant pre- and post-construction culvert data easily accessible in one place irrespective of their provenance. User-friendly portal interfaces allow users to prepare a systematic plan for culvert monitoring, and offer means for quantitative assessment of the potential for sediment deposit formation.

IOWA DOT CULVERTS PLATFORM

(http://culverts)

The portal enables four workflows:
- (1) storage and query of culvert and drainage area characteristics;
- (2) monitoring of culvert sedimentation using in-situ or remote sensing technologies;
- (3) analysis of the sedimentation at culverts; and
- (4) support of culvert design by forecasting the sedimentation potential for existing or new culvert sites.

The core of the Iowa DOT Culverts platform is a Multiple-Criteria Decision Analysis (MCDA) visual analytics module, a data-driven engine that uses quantitative and qualitative data, along with expert judgment, to develop quantitative relationships between the degree of culvert sedimentation and the key process drivers within the drainage area of the culvert, using the power of machine-learning and visual-analytics techniques.

The forecasting of the degree of sedimentation at culverts is the premier role of this platform. The degree of sedimentation is defined as the ratio of the total area of the expansion upstream from the culvert divided by the area covered by sediment deposits. The artificial-intelligent tool provides the degree of sedimentation for existing or new culvert sites using only freely available data stored in various repositories.
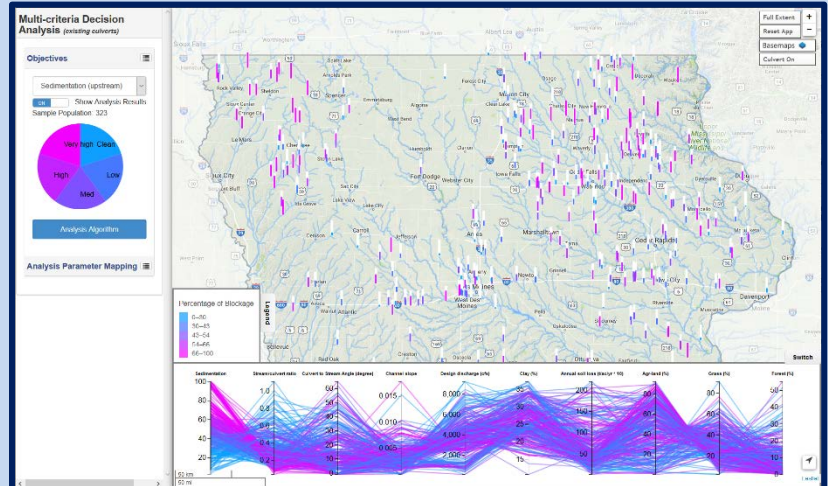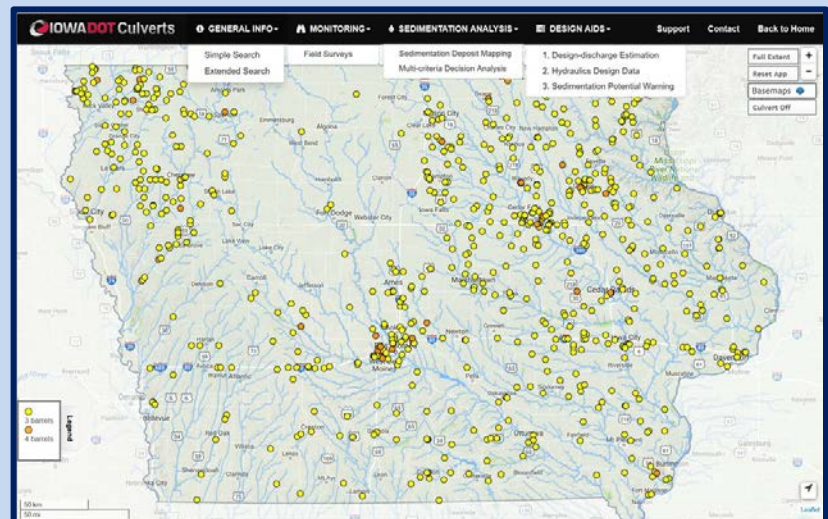
TECHNOLOGY TRANSFER: The prototype Iowa DOT Culverts platform has been presented in several national, state, and regional events: Transportation Research Board Meeting (2017, Washington D.C.), AASHTO TC on Hydrology & Hydraulics (2017, Des Moines, Iowa), State Transportation Innovation Councils dissemination workshops (2017, 5 Iowa locations), MINK Local Roads Meeting (2018, St Joseph, MO), and National Hydraulic Engineering Conference (2018, Athens, OH)