USDA
United States Department of Agriculture
Agricultural Research Service

Innovations in Hydraulic Engineering Research since 1940

Agricultural Research Service
HERU
Hydraulic Engineering Research Unit

1936

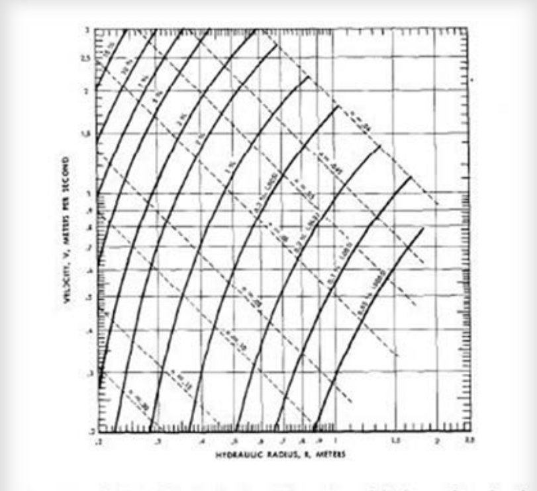
USDA-Soil Conservation Service Outdoor Hydraulic Laboratory established near Spartanburg, SC. Mission: To study vegetal characteristics for waterway lining.

1937

Maurice Cox and Vernon Palmer begins grass-lined channel research in conjunction with the Oklahoma A&M University Agricultural Experiment Station.

1939

Construction of Lake Carl Blackwell Dam was completed as a Land Utilization Project.



1946

SCS-TP-61, *Handbook of Channel Design for Soil and Water Conservation*, was published. This document has been used worldwide and incorporated in many engineering textbooks used by universities today.

1947

Bill Ree's one of a kind slide rule for calculating Manning's Formula.

1954-1958

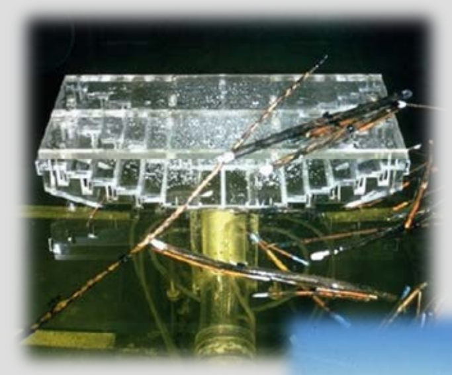
Friction factors study for large diversion terraces planted to row crops.

1956

Watershed Protection and Flood Prevention Act of 1954 (PL-566) passed.

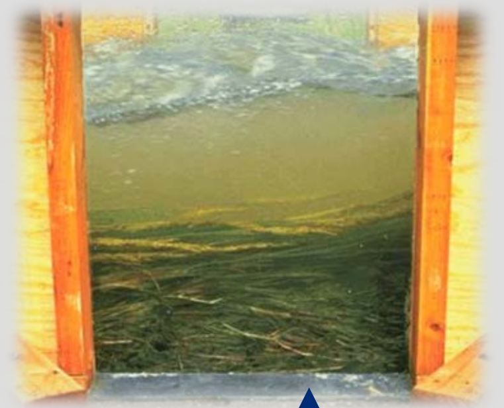
1961

Research begins on trash racks to investigate restriction of entrance flow conditions due to collection of debris.



1976

USDA-NRCS engineer, M.M. Culp conceived the stepped baffled trash rack design he felt would eliminate some of the debris collection of the open trash rack risers. Wendell Gwinn completed the research, and indeed it proved to be effective in reducing the debris. The USDA-NRCS adopted the stepped baffled trash rack into their standard designs.



1980s

Research on grass-lined channels began with a focus on developing a stress based design method rather than a velocity based design method.

1983

The USDA-ARS St. Anthony Falls Hydraulic Laboratory, Minneapolis, MN, closes. The function of this unit was incorporated into the research program of the Hydraulic Engineering Research Unit.

1984

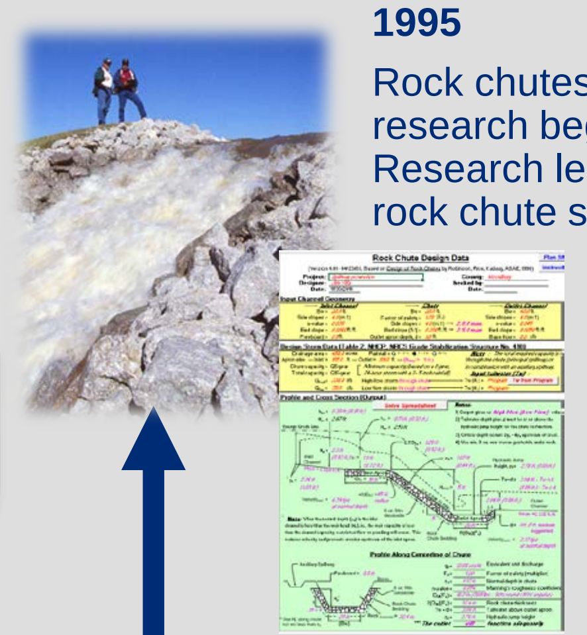
Discharge calibration relationships were developed for a drop box approach to the H, HL, and HS flumes such that they could allow for bed load material to pass through the flume without a change in calibration.

1989

Fred Blaisdell published *ARS-76 Scour at Cantilevered Pipe Outlets.*

1991

Greg Hanson, Research Hydraulic Engineer, develops the laboratory, and later field submerged-jet testing device to evaluate the erodibility of soils. Three patents were issued for this device, and the methodology led to the development of ASTM standard D5852-95.



1995

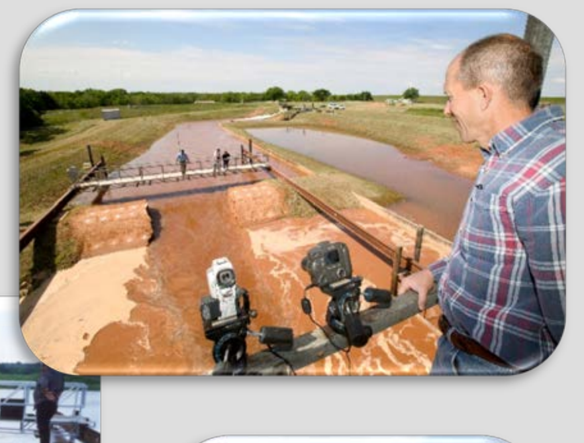
Rock chutes for grade stabilization research begins at the HERU. Research led to the development of the rock chute spreadsheet design tool.

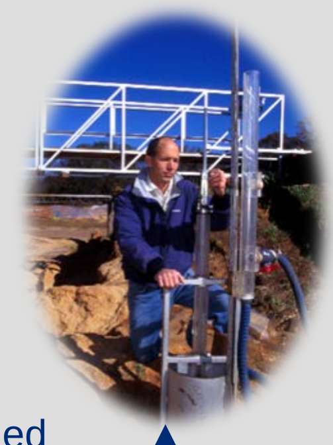
1998

Low-drop grade stabilization research begins.

2000

Embankment overtopping and internal erosion research begins.





2006-2012

Greg Hanson named Research Leader in 2006 and served until 2012.

2008

Generalized research begins on stepped chutes applied to embankment dams.

2011

USDA Small Watershed Program named a historic landmark by the American Society of Agricultural and Biological Engineers.

2013

Sherry Hunt named Research Leader in 2013.

1935 1945 1955 1965 1975 1985 1995 2005 2015

1939

William "Bill" O. Ree arrived to start surveying land downstream of Lake Carl Blackwell Dam to establish a new Outdoor Hydraulic Laboratory.

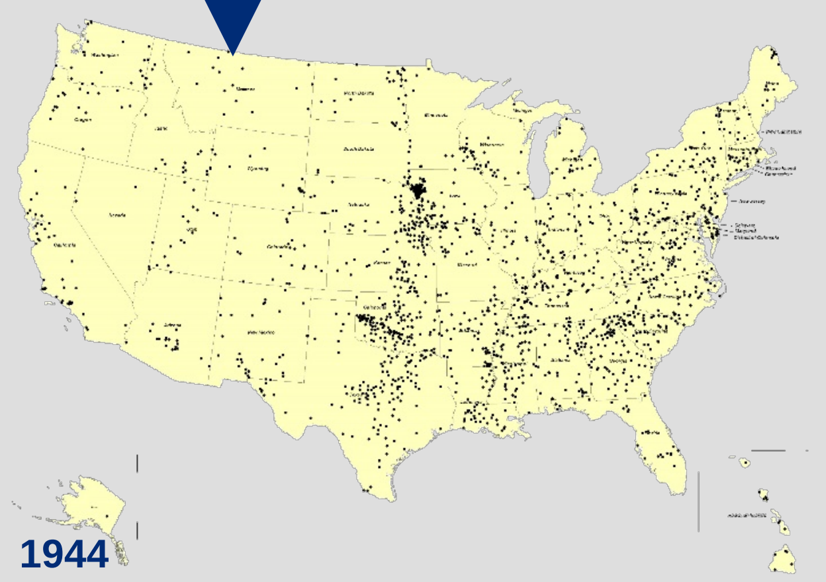
1940

The Outdoor Hydraulic Laboratory was relocated to Stillwater, OK. Mission: Continue the study of vegetal characteristics for waterway lining. Bill Ree named Laboratory Director, serving from 1940-1943 and 1945-1976.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STILLWATER OUTDOOR HYDRAULIC LABORATORY
PROJECT OK-R-3
in cooperation with
OKLAHOMA AGRICULTURAL
EXPERIMENT STATION

1942

Construction of the siphons completed. Original siphons supplied up to 200 cfs of gravity flow according to Bill Ree.



1944

Flood Control Act of 1944 (PL-534) passed. This led to the creation of the USDA Small Watershed Program that resulted in nearly 12,000 dams constructed across the U.S.

1940s to 1950s

Grass-lined channel research commenced under the direction of Bill Ree. From 1943-1945, Vernon Palmer served as acting Laboratory Director while Bill Ree served his country in World War II. Grass-lined waterway research consisted of test on various conditions including plant species, cutting, freeze/thaw cycles, dormant, burning, and other maintenance effects (i.e. seasonal growth).

1954

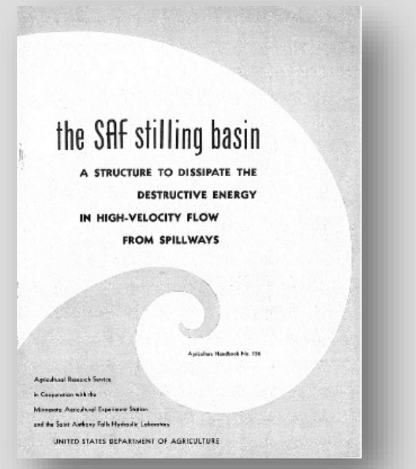
The Outdoor Hydraulic Laboratory found a new home within the newly created USDA-Agricultural Research Service.

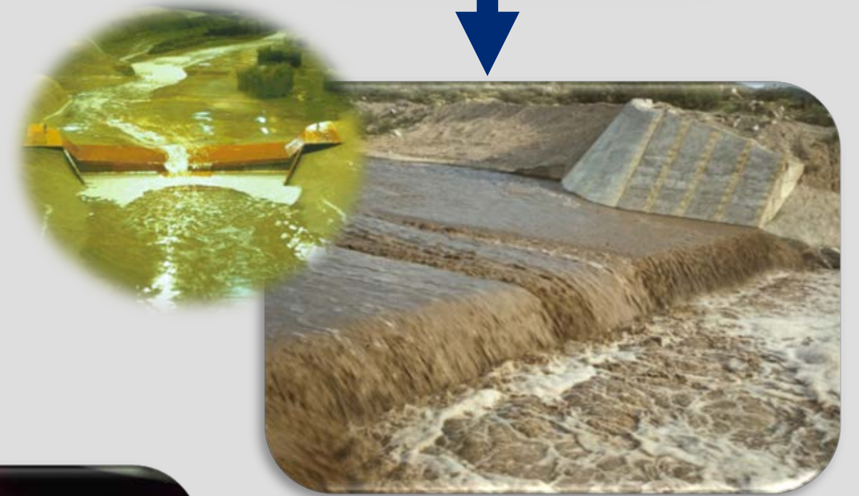
1950s

The mission of the Outdoor Hydraulics Laboratory expanded to hydraulic structures.

1959

Fred Blaisdell publishes *Ag. Handbook 156 on SAF Stilling Basins.*





1957

Due to the nature of the research at the Outdoor Hydraulic Laboratory, methodology was developed for flow-measuring devices including the Walnut Gulch supercritical flow measuring flume for use in southern Arizona.

1967

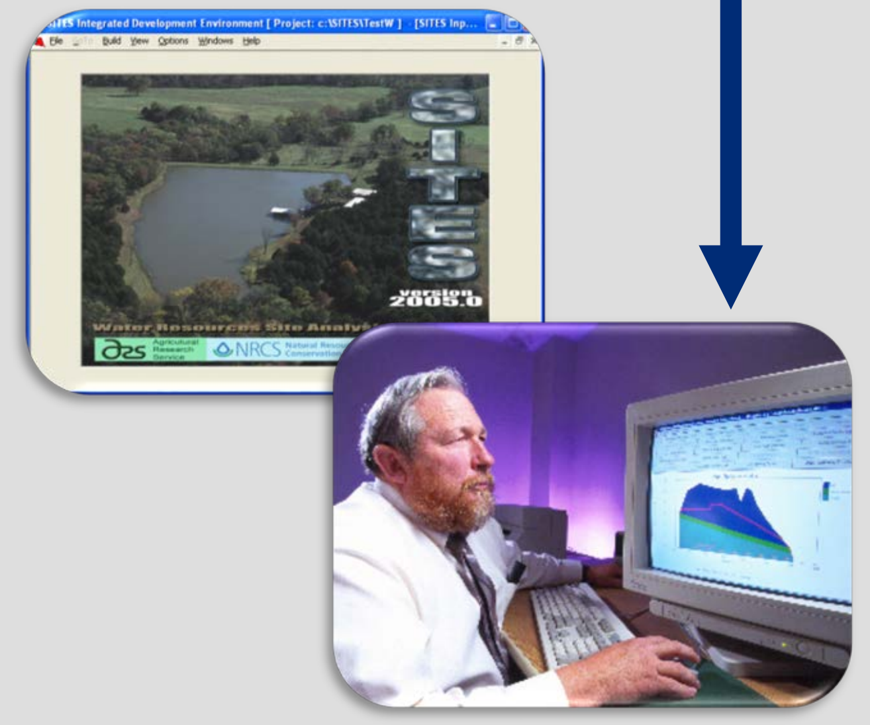
Hood inlet grade stabilization research completed.

1976-1981

Wendell Gwinn named Research Leader in 1976 and served until 1981.

1981-1998

Charles Rice named Research Leader in 1981 and served until 1998.



1987

Ag Handbook 667 Stability Design of Grass-lined Open Channels was published.

1984

Fred Blaisdell, Research Leader of the USDA-ARS St. Anthony Falls Hydraulic Engineering Laboratory relocates to the Hydraulic Engineering Research Unit in Stillwater, OK.

1983

USDA-NRCS engineers and USDA-ARS scientists joined forces to form the Emergency Spillway Flow Study Task Group. Engineers from NRCS gathered filed data from spillways experiencing spillway flow while ARS scientists conducted research to examine erosion processes. In cooperation with Kansas State University, these efforts between ARS and NRCS led to the development of the SITES software for predicting erosion in vegetated earthen spillways.

1990

Design Concepts for Vegetated Waterways named a historic landmark by the American Society of Agricultural Engineers.

1994

Charles Rice completes research on submerged cantilever pipe outlets to build on previous research completed by Fred Blaisdell.

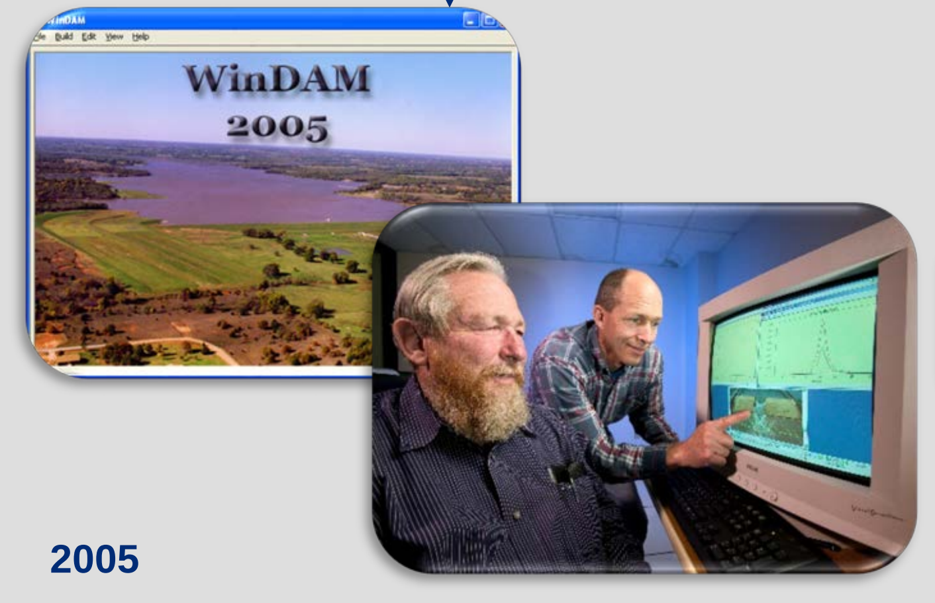
1998-2006

Darrel Temple named Research Leader in 1998 and served until 2006.

2004

USDA-ARS celebrates 50th Anniversary.

The Future Grows Here
50



2005

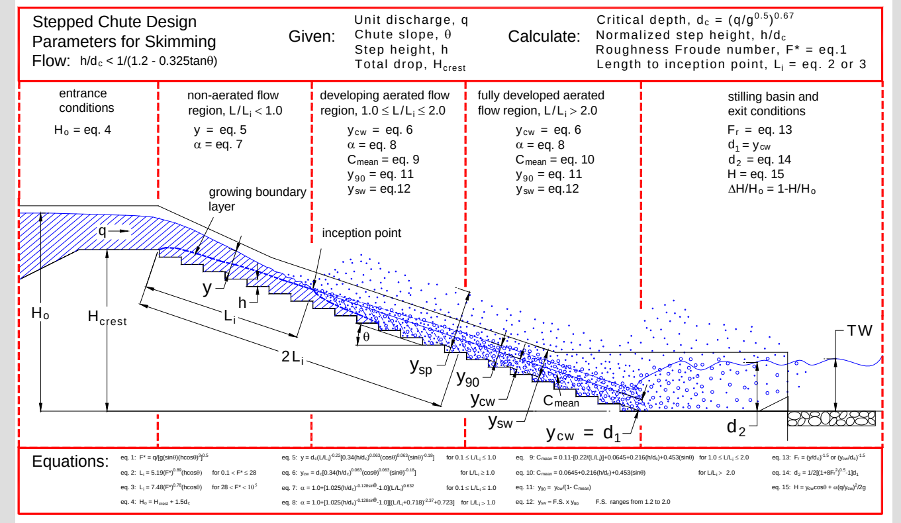
Windows Dam Analysis Modules, WinDAM, is released to predict embankment failure due to overtopping. Subsequent release in 2016, WinDAM C, include modules to predict embankment failure due to internal erosion.

2006

Construction begins on prototype stepped chute facility

2015 and Beyond

Research on complex geometries and zoned embankments in the planning stages. Research on stilling basins associated with stepped chutes commences.



2014

Step by step design procedures released for stepped chutes applied to embankment dams.

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