

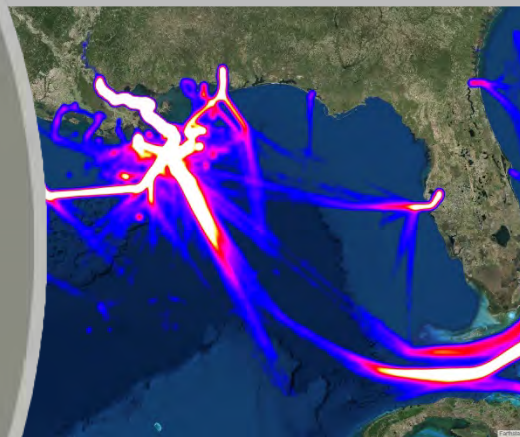


USACE DREDGE PROGRAM OPTIMIZATION STRATEGIES

Drew Allan Loney, PhD PE

Research Mechanical Engineer
Coastal and Hydraulics Laboratory
US Army Corps of Engineers

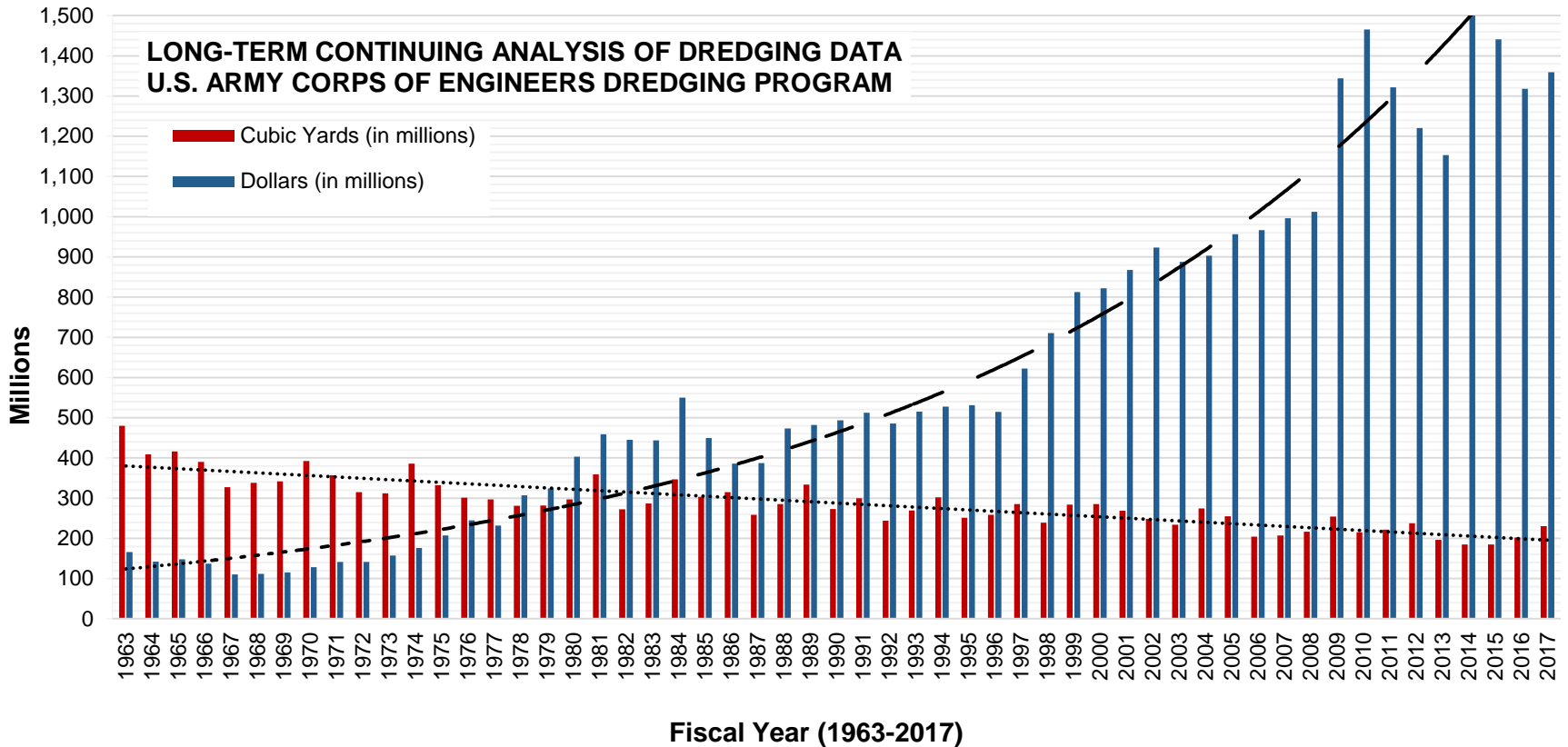
06 June 2019



US Army Corps
of Engineers®

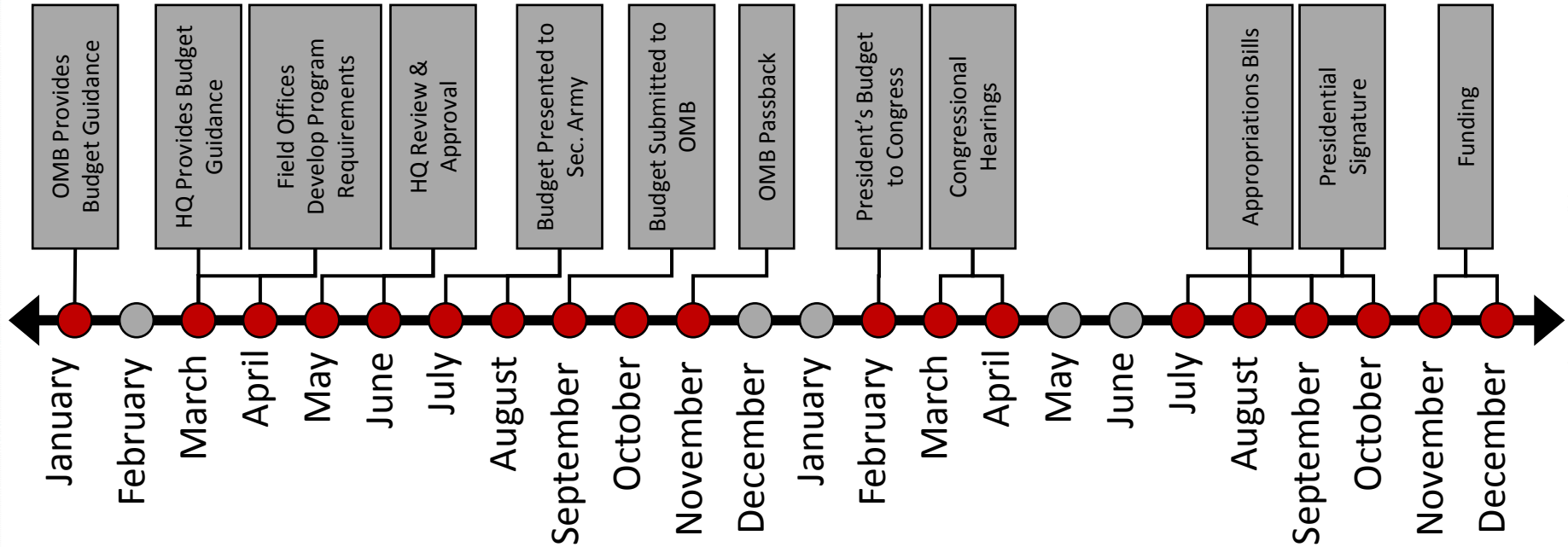


Motivation



Optimization helps USACE and its industry partners better maintain the U.S. marine transportation system

Motivation



Project Selection

Project Scheduling

Project Selection

Goal

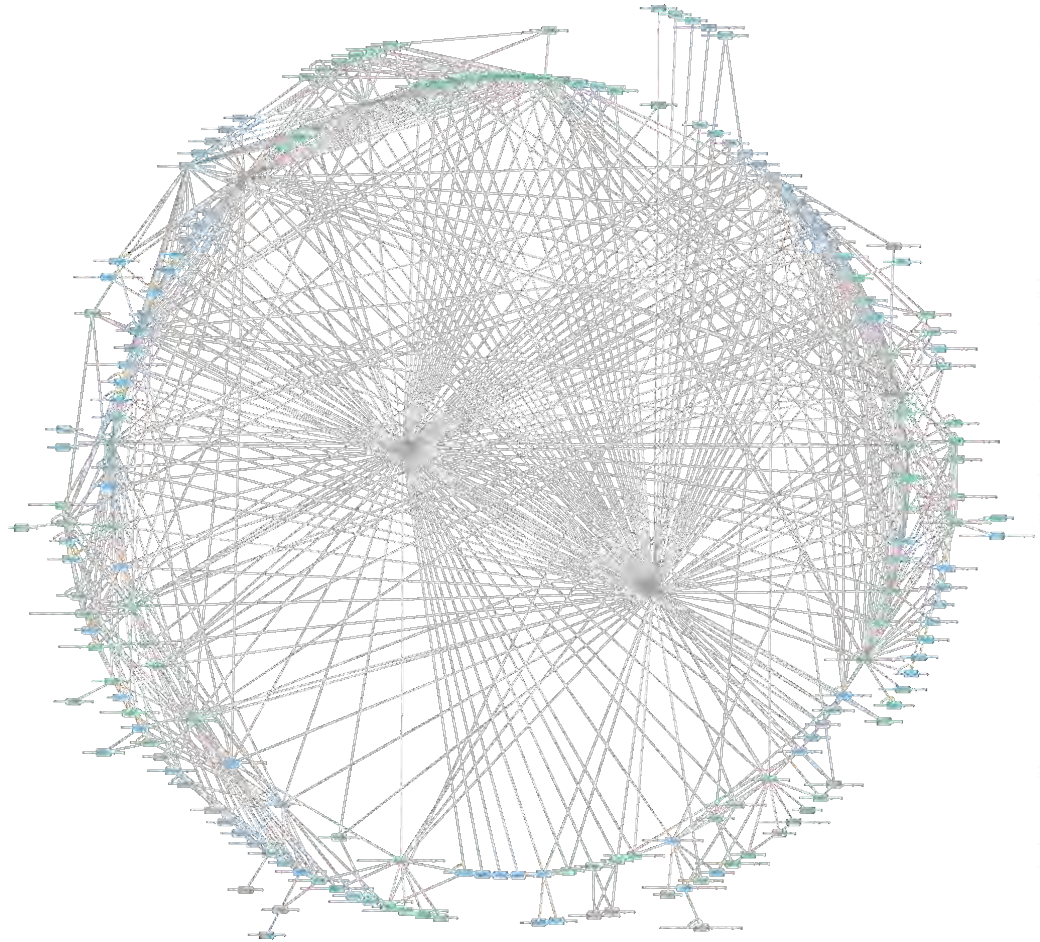
Inform the allocation of limited resources to maintain dredging projects nationwide

Projects

- 535 federal navigation projects included in initial treatment
- 172 with sufficient historic channel survey data available

Solutions

- Possible permutations = 10^{130}
- Atoms in the universe = 10^{82}



Inputs

Civil Works Identification System (CWIS)

Active Projects

Historic Project Expenditures

Relation Tables

Channel Portfolio Tool (CPT)

Cargo Routes by Port

Tonnages by Draft Increment

e-Hydro

National Channel Framework

Maintained Depths

Project Reaches

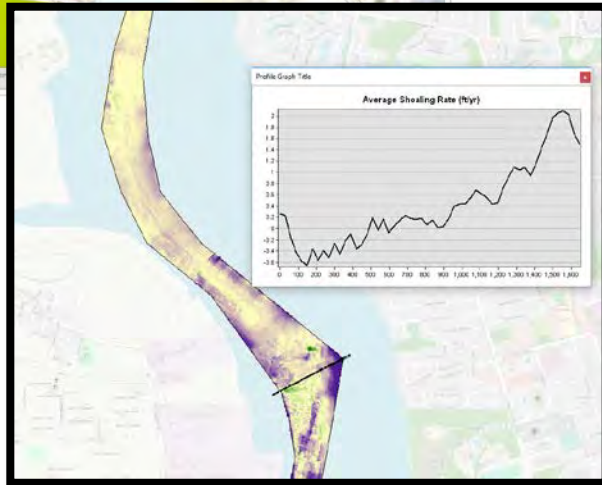
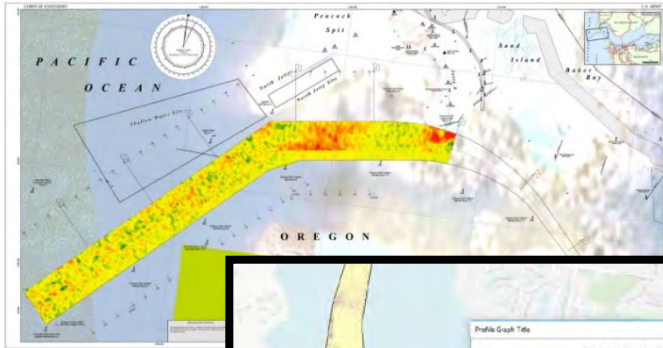
Corps Shoaling Analysis Tool (CSAT)

Shoaling Forecasts

Channel Prisms

Historic Pre/Post Dredge Surveys

Inputs

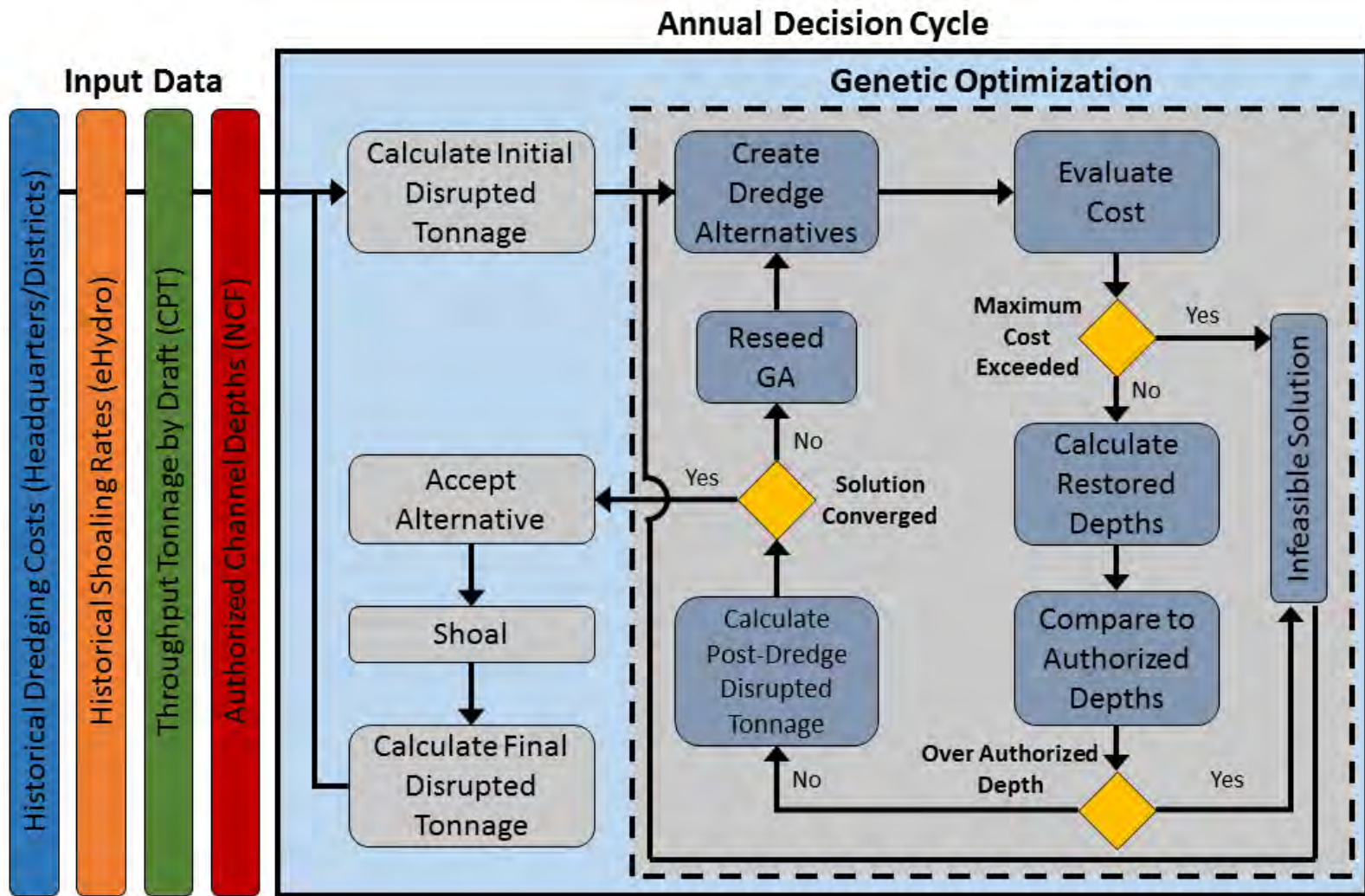


Channel Shoaling Analysis Tool (CSAT)

Channel Portfolio Tool (CPT)



Process

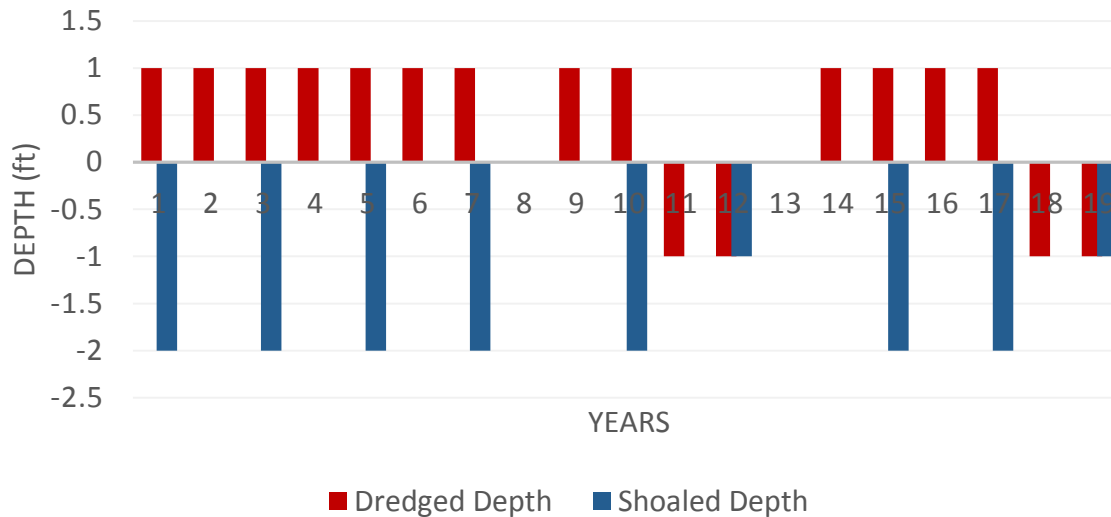


Output

Project Rankings

- Disrupted tonnages
- Shoaled depths
- Shoaled volumes
- Cost

Project	Cost	Volume (CY)
A	\$10,000,000	3,000,000
B	\$8,500,000	1,000,000
C	\$3,000,000	500,000
D	\$1,000,000	100,000



Forecasts

- Project dredge frequency
- Project shoaling rate
- Dredge cycles

Project Scheduling

Inputs

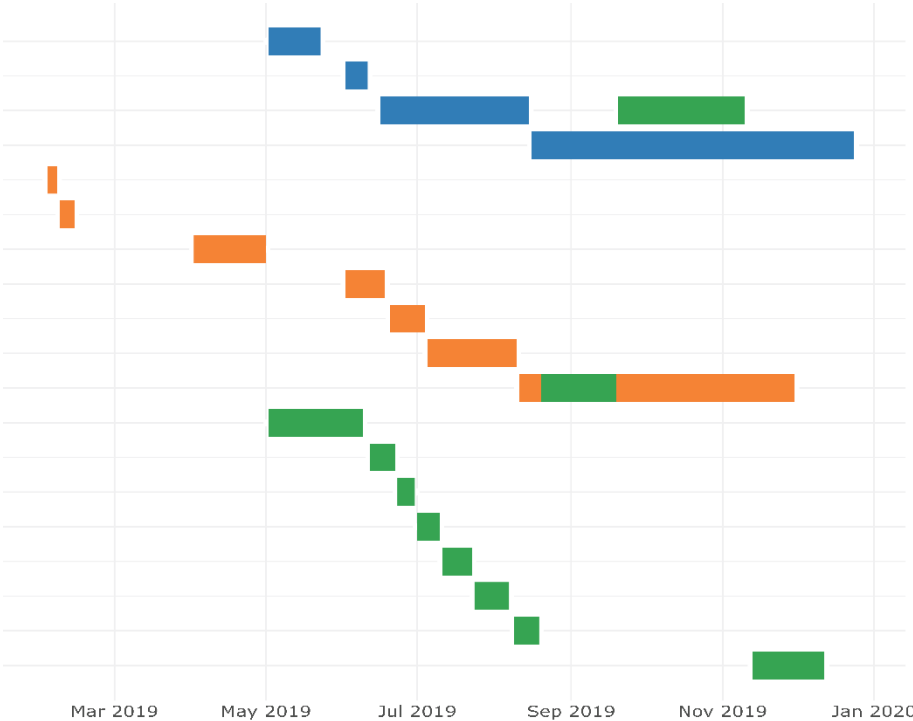
- Dredge fleet configuration (number, types)
- Dredging requirements (CY, available budget)
- Historic production rates and unit costs at each project
- Environmental and/or seasonal work restrictions
- Distance matrix

Outputs

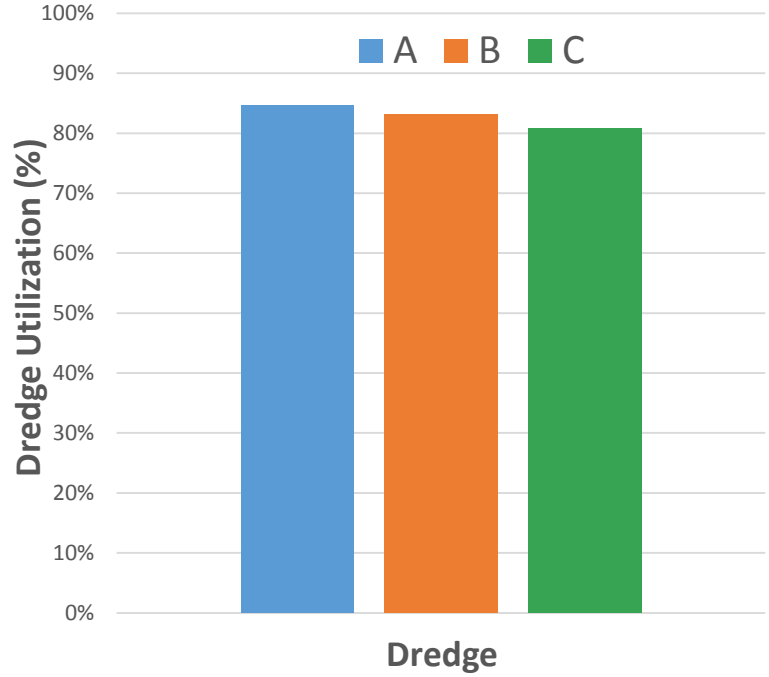
- Dredge types and sizes
- Work sequencing
- Inferred groupings of projects for potential regional contract mechanisms

Output

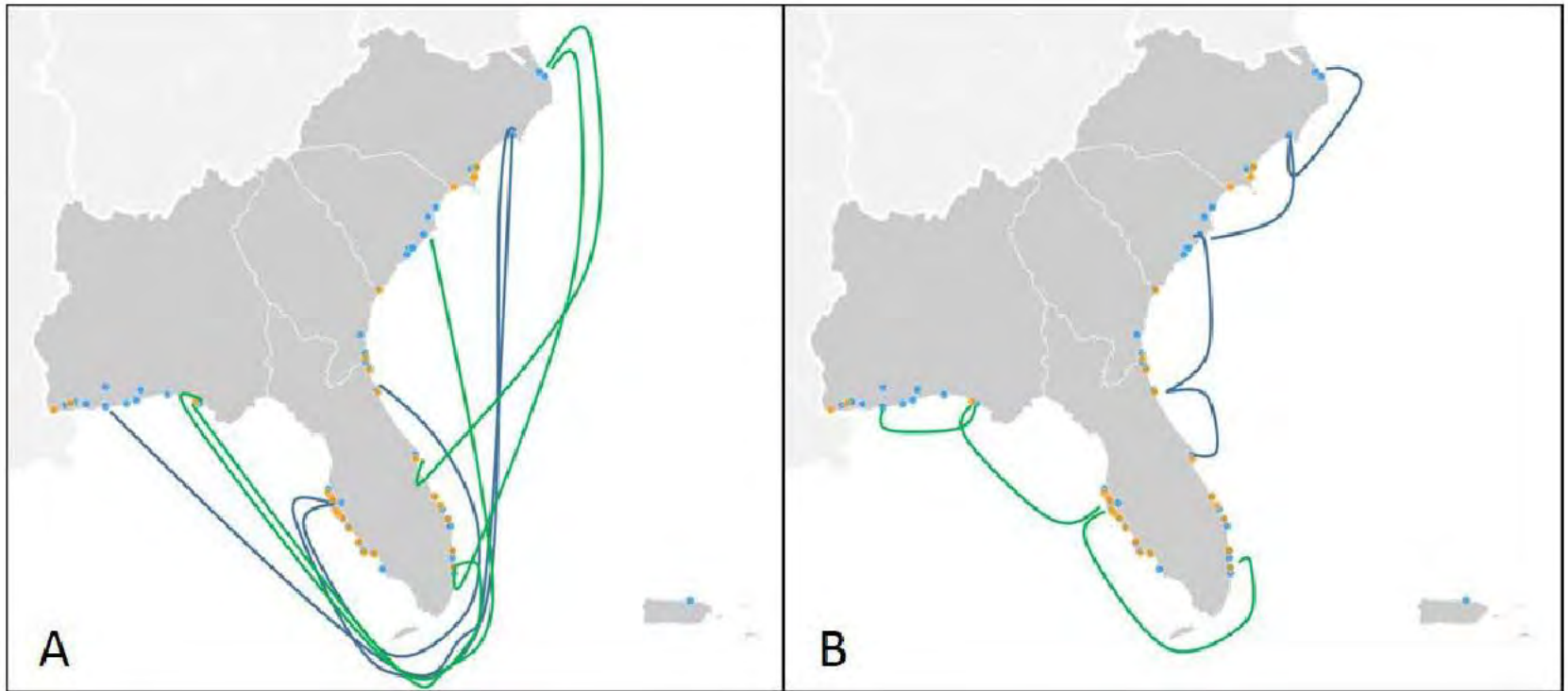
Work Schedule

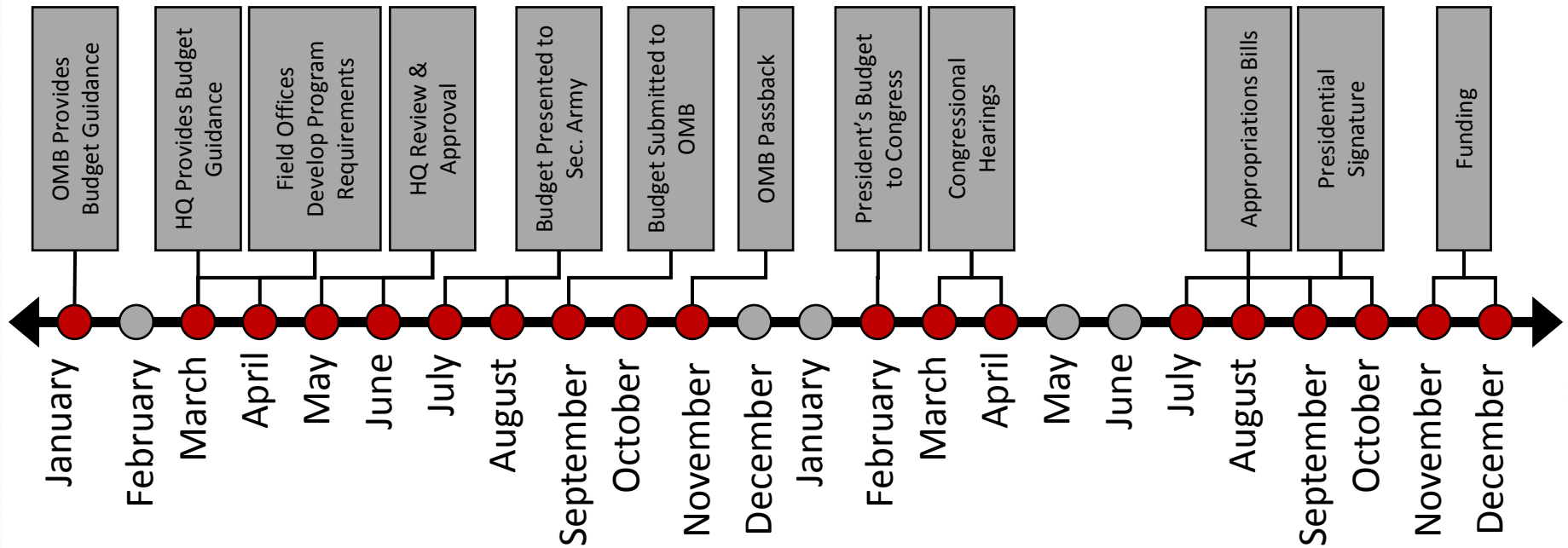


Dredge Utilization



Output



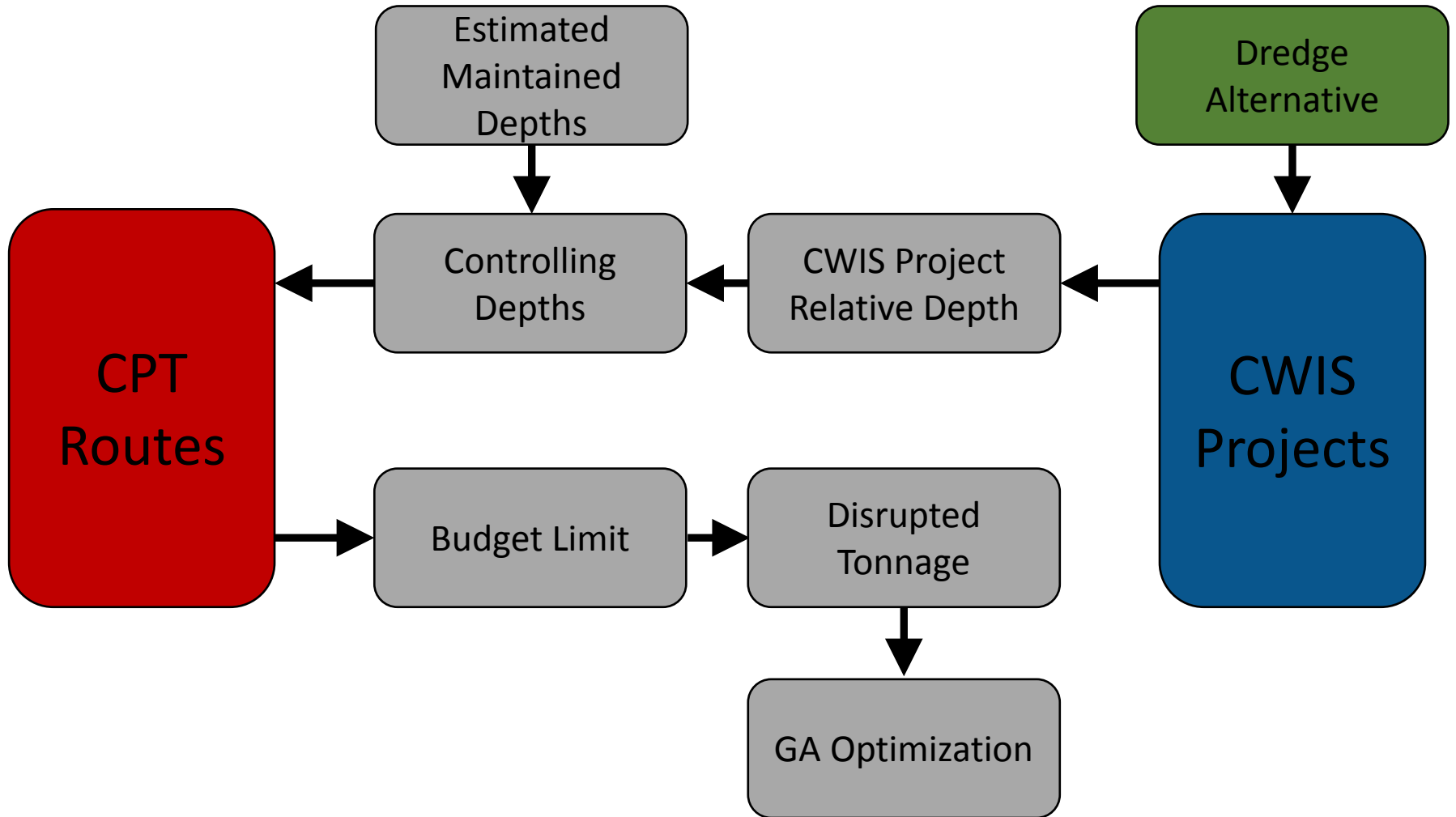


Questions?

Drew Allan Loney, PhD PE
drew.a.loney@usace.army.mil
 (601)634-3490

Ned Mitchell, PhD
kenneth.n.mitchell@usace.army.mil
 (601)529-9005

Alternative Evaluation



Genetic Optimization

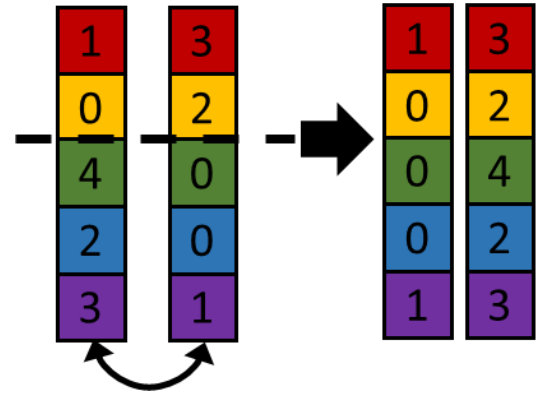
Chromosome Representation



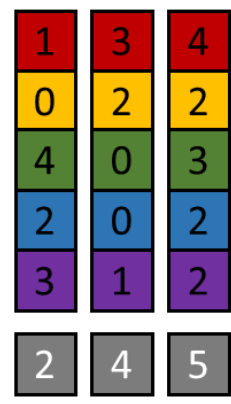
Initial Alternatives



Recombine



Evaluate



Mutate

