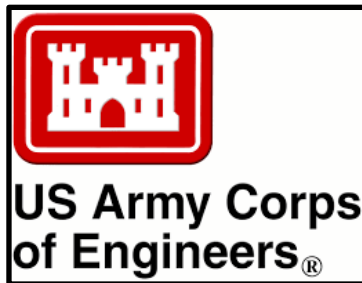


# Ravine 8 Ecosystem Restoration Project



Fiscal Stability

Public Safety

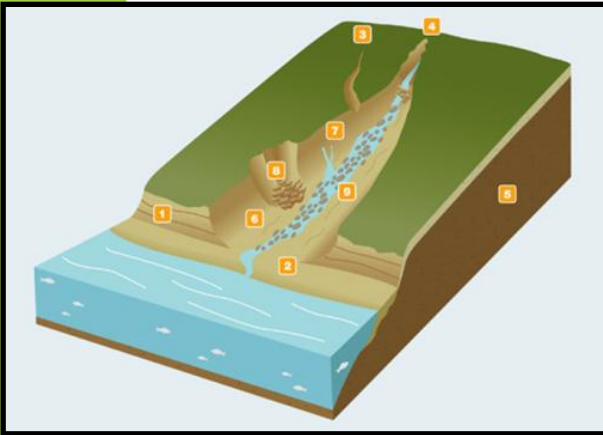
Infrastructure  
Investment

Community  
Vibrancy

# Project Details

- ▶ Ravine Restoration
- ▶ Lakefront Bluff Preservation
- ▶ Public Private Partnership
- ▶ Army Corps Grant Funding
- ▶ Easement Considerations
- ▶ BMPs

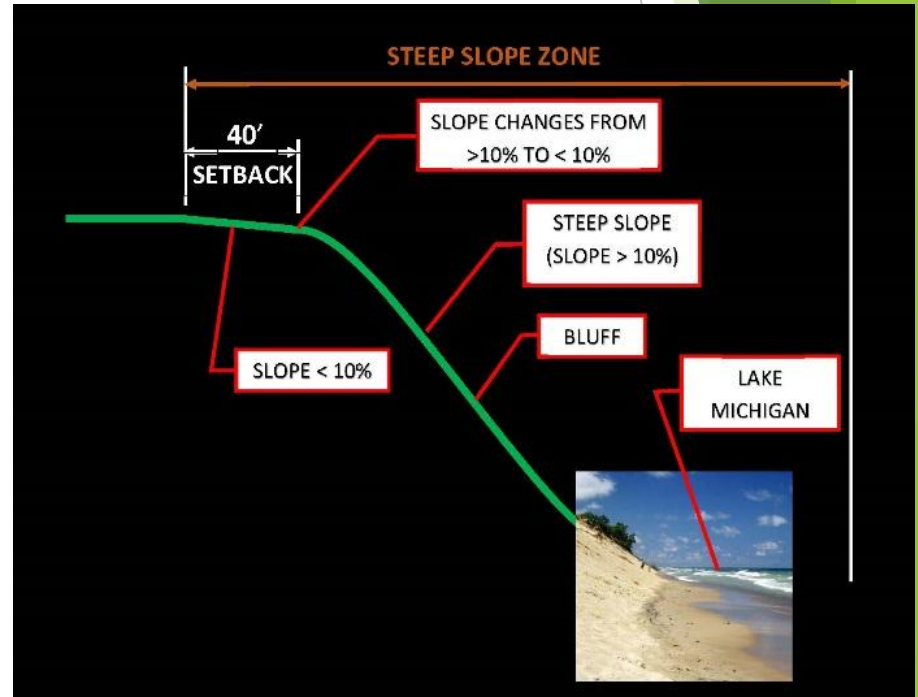
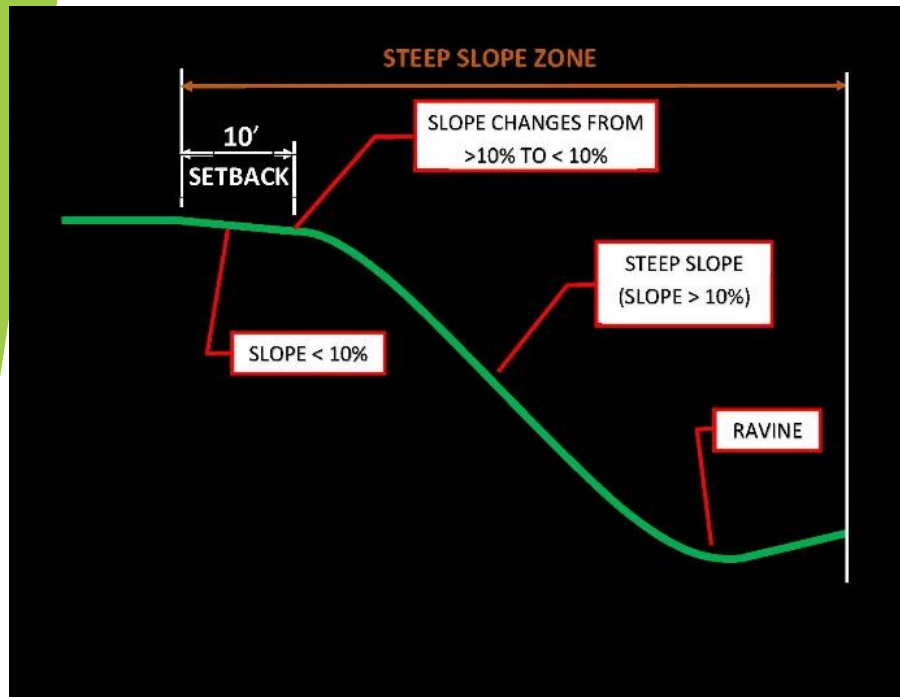
## RAVINE



## BLUFF



## STEEP SLOPE



# Pre-Restoration Pictures













# Prescribed Burning



Before



After

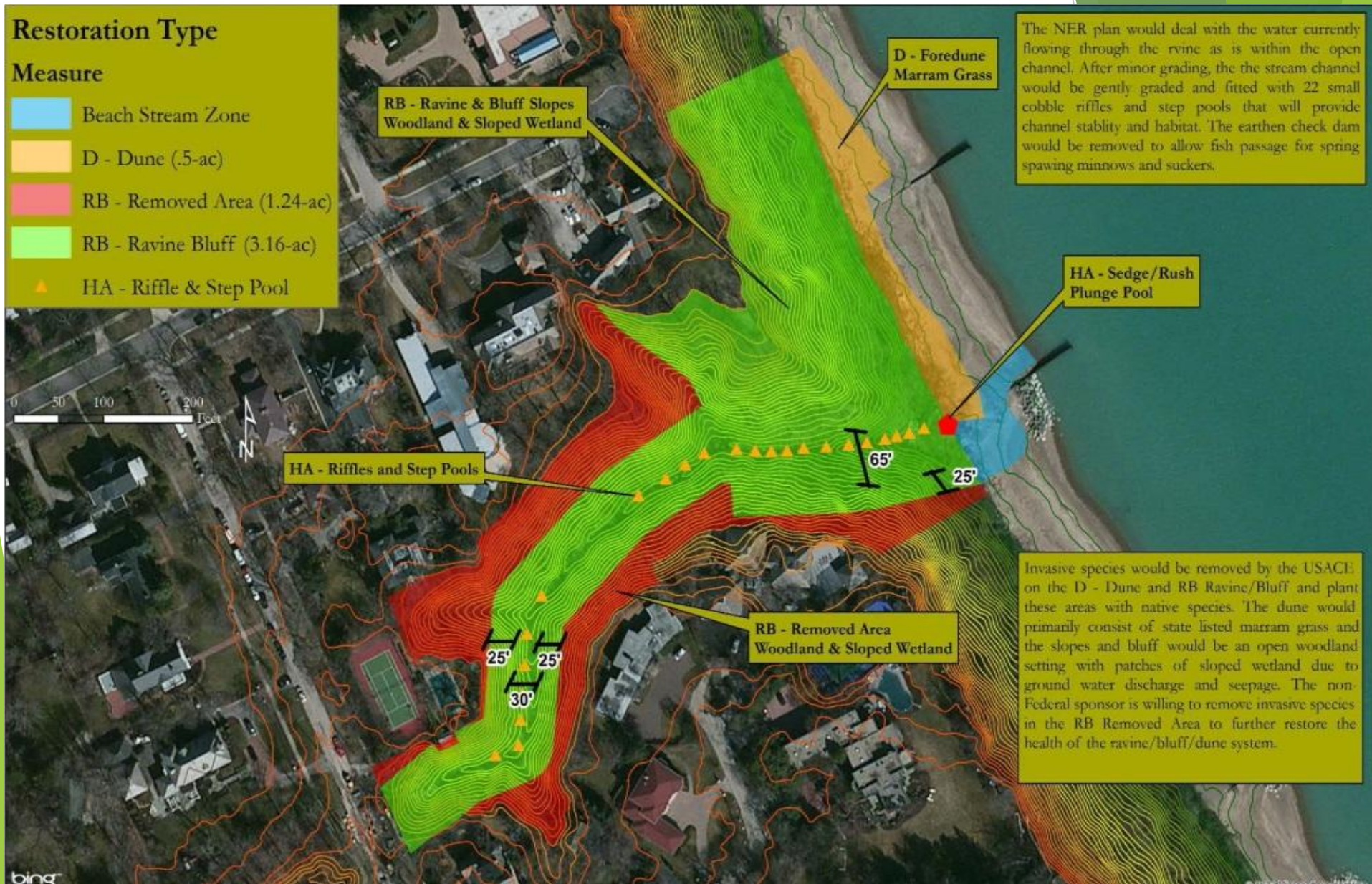




# Restoration Type

## Measure

- Beach Stream Zone
- D - Dune (.5-ac)
- RB - Removed Area (1.24-ac)
- RB - Ravine Bluff (3.16-ac)
- HA - Riffle & Step Pool





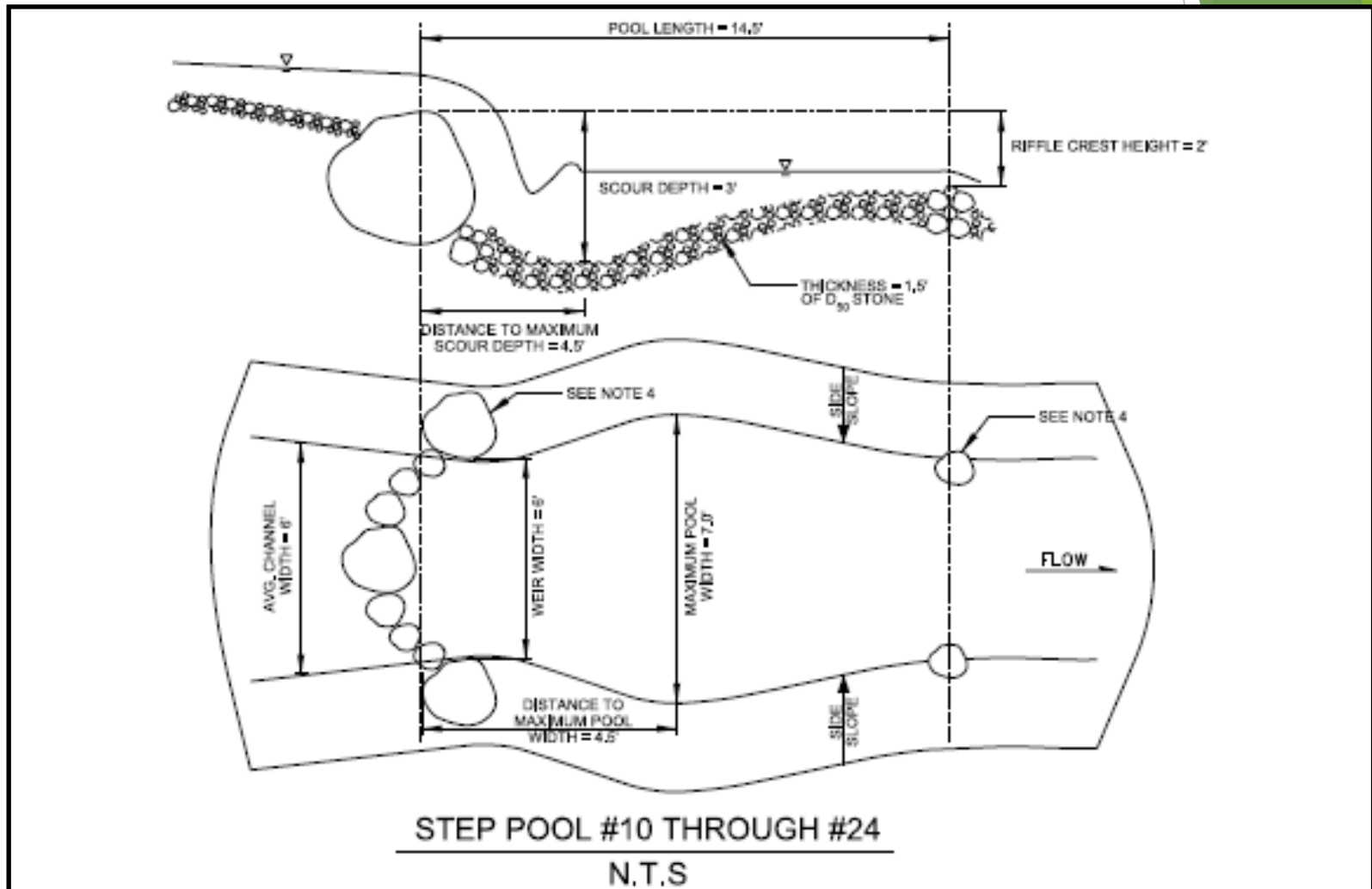


Collapsed Ravine Toe/  
Distressed Utility Lines  
(Before)

Restored Step Up  
Pool (After)



## Including : A. 24 Each Step Pools & Riffles





## Ravine 8 - Step Up Pool (After)







Bluff Restoration  
(Before)

Bluff  
Restoration  
(After)





## Bluff Restoration (Vegetation)





## Upstream Plunge/Step Pool-Riffles Under Construction, 2016 (Panoramic View)





# Upstream Pools and Riffles Under-Construction



# BMP's Summary

- ▶ Step Pool/Riffles Cobble Stone - 740 Tons
- ▶ Plunge Pool Cobble Stone - 100 Tons
- ▶ Step Pool Weir Boulders - 113 Tons
- ▶ Trees/Shrubs - 100 Each
- ▶ Plugs - 48,000 Each
- ▶ Beech Grass - 2,500 Each
- ▶ Invasive Tree Specie Removal/Prescribed Burning
- ▶ Migratory Birds/Lake Fish Spawning Habitat Restoration



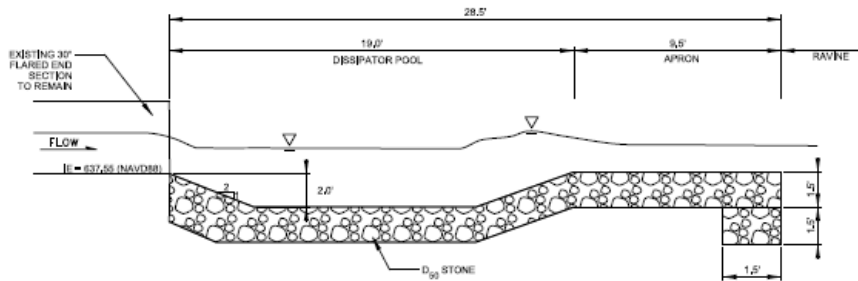


Lake Avenue Outfall  
(Before)

Restored Plunge Pool  
Outfall (After)

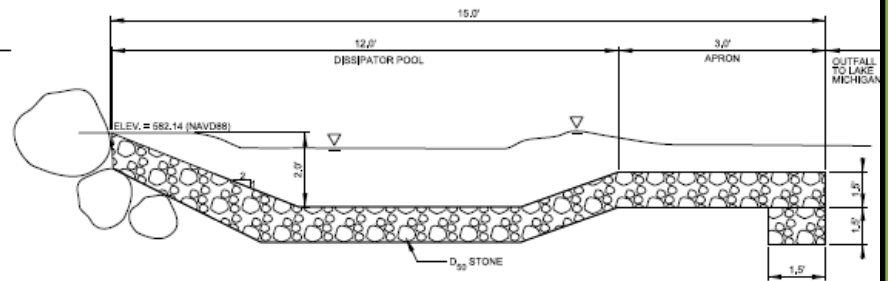


## B. 2 Each - Ravine/Lake Shoreline Plunge Pools



PLUNGE POOL AT RAVINE HEAD - SECTION DETAIL

N.T.S.

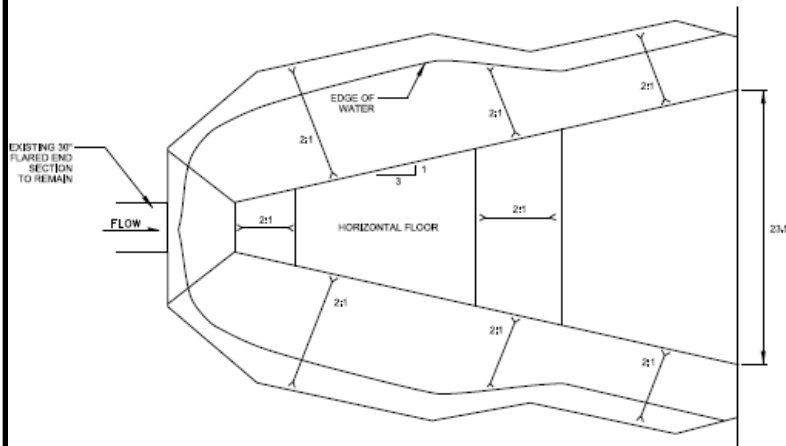


PLUNGE POOL AT RAVINE MOUTH - SECTION DETAIL

N.T.S.

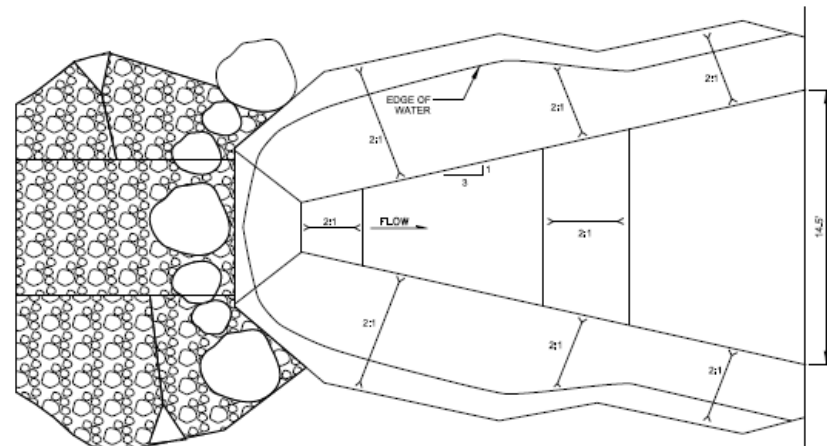
### NOTES

1. BOULDERS TO BE USED FOR PLUNGE POOL SHOULD HAVE DIAMETERS BETWEEN 1 FT AND 2 FT.
2. A DECREASE OF 6" IN ELEVATION FROM THE TOP OF OUTSIDE BOULDERS TO THE MIDDLE BOULDERS IS REQUIRED.
3. END BOULDERS KEYED INTO RAVINE SLOPE TO FUNCTION AS RETENTION CUTOFF.



PLUNGE POOL AT RAVINE HEAD - PLAN VIEW

N.T.S.



PLUNGE POOL AT RAVINE MOUTH - PLAN VIEW

N.T.S.

### NOTE:

END BOULDERS KEYED INTO RAVINE SLOPE TO FUNCTION AS RETENTION CUTOFF.



## Restored Plunge Pool Outfall (After)







Collapsed 8 Toe  
(Before)

Armored Step-Up Pool/  
Ravine Toe (After)







Ravine 8 North Bluff/  
Sand Dunes (Before)

Ravine 8  
Completed North  
Bluff/  
Sand Dunes (After)

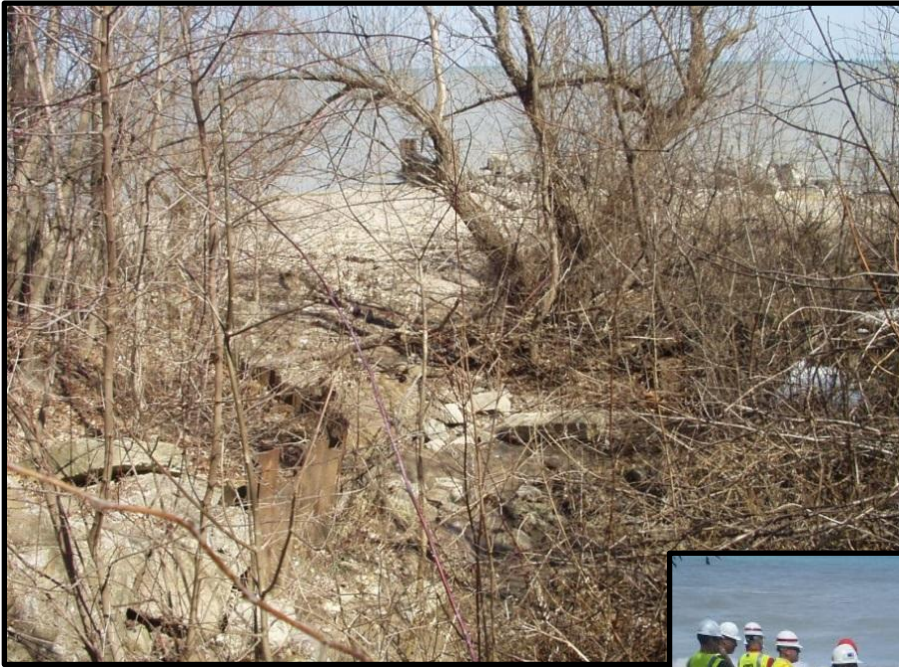




## Armored Step-Up Pool/ Ravine Toe (After) Last Pile of Brush for Prescribed Burning







Ravine 8 Obstructed  
Shoreline Outfall  
(Before)

Ravine 8 - Opened  
Shoreline Plunge Pool  
(After)





## Step Up Pools/Riffles

### Habitat in play !





## Ravine 8 - Opened Shoreline Plunge Pool (After)





## Step Pools





## Opened Shoreline Plunge Pool (Bluff Dune Planting Inspection)





# Step Pools

(View from Lake Michigan)





# Project Costs

- ▶ \$1.6 Million
- ▶ City \$600K
- ▶ ACOE \$1 Million





# Ravine 8 Completed North Bluff/Sand Dunes (After)





# Project Contacts

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**Director of Public Works:**

**Ramesh Kanapareddy, P.E, CFM**

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Questions?





# Questions?

