

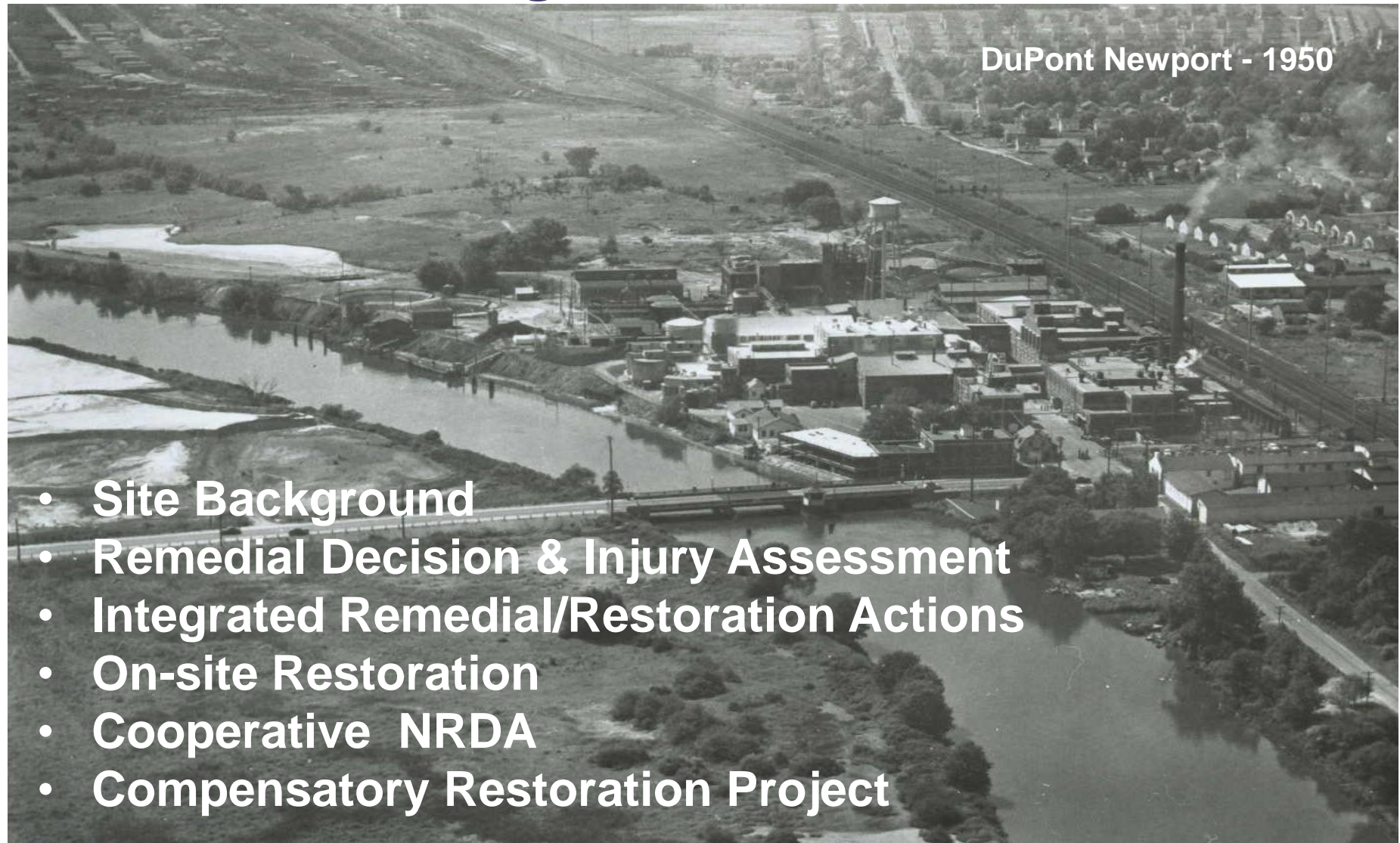
# Cooperative NRDA and Restoration at the Newport, DE Superfund Site.

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Albert Rizzo (USFWS); Karissa Hendershot (DNREC);  
Peter Knight (NOAA); Ron Gouguet (Windward);  
Bruce Bayne (URS)**



*The miracles of science™*

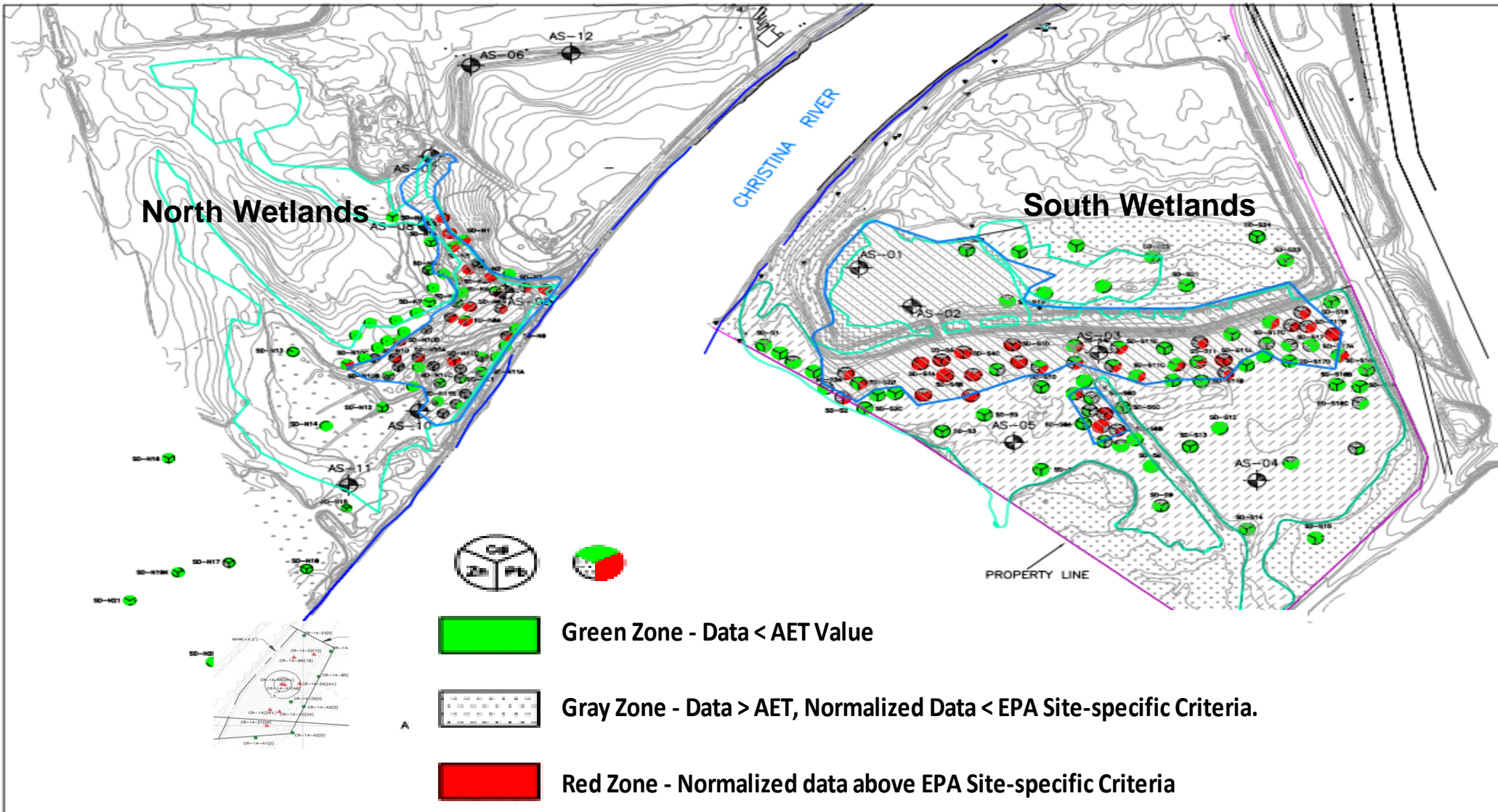
# Presentation Agenda



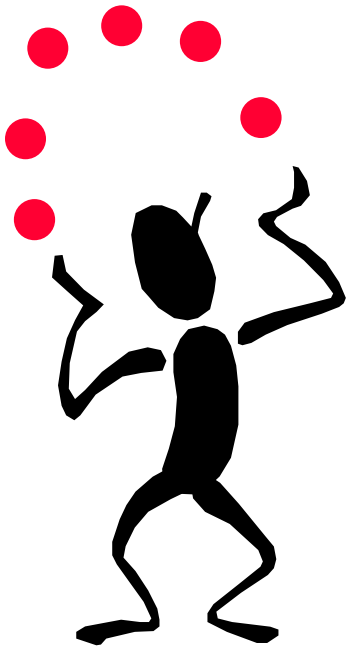
## Site Background

- ❑ **Krebs ownership (1902-1929).**
- ❑ **DuPont pigments facility from 1929 to 1984.**
- ❑ **Sold to Ciba Geigy in 1984.**
- ❑ **Site = uplands, wetlands, and manufacturing areas.**
- ❑ **Superfund regulatory activities began in the late 1980s.**
- ❑ **Investigations conducted from late 1980s until 1992.**
- ❑ **Record of decision signed by the USEPA in 1993.**
- ❑ **Additional pre-remediation investigation conducted 1994-2000.**
- ❑ **Remediation of soils and sediments from 1995 to 2002.**
  - Improve remedy and incorporate restoration into the plans.
  - Coordinated effort among DuPont and agencies.
- ❑ **Restoration monitoring continues into 2011**

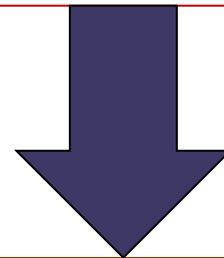
# Remedial Decision and Injury Assessment: Wetlands & River



# Risk Management: Final Remedial Approach & Record of Decision



**2.7 ac Compared to < 1 ac in ROD**  
**9,500 cy Compared to ~1,000 cy in ROD**



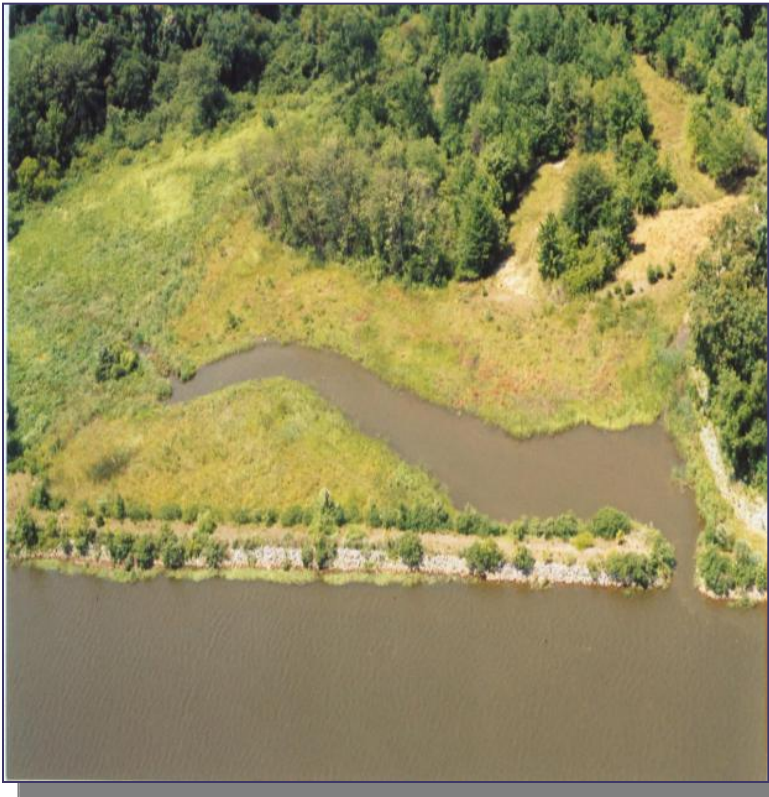
ppm	<b>ROD<sup>1</sup></b>	<b>Final<sup>2</sup></b>
<b>Zinc</b>	5,600	<b>1,600</b>
<b>Lead</b>	1,200	<b>660</b>
<b>Cadmium</b>	60	<b>9.6</b>

# Integrated Remediation and Restoration - North Wetlands: Construction Phase



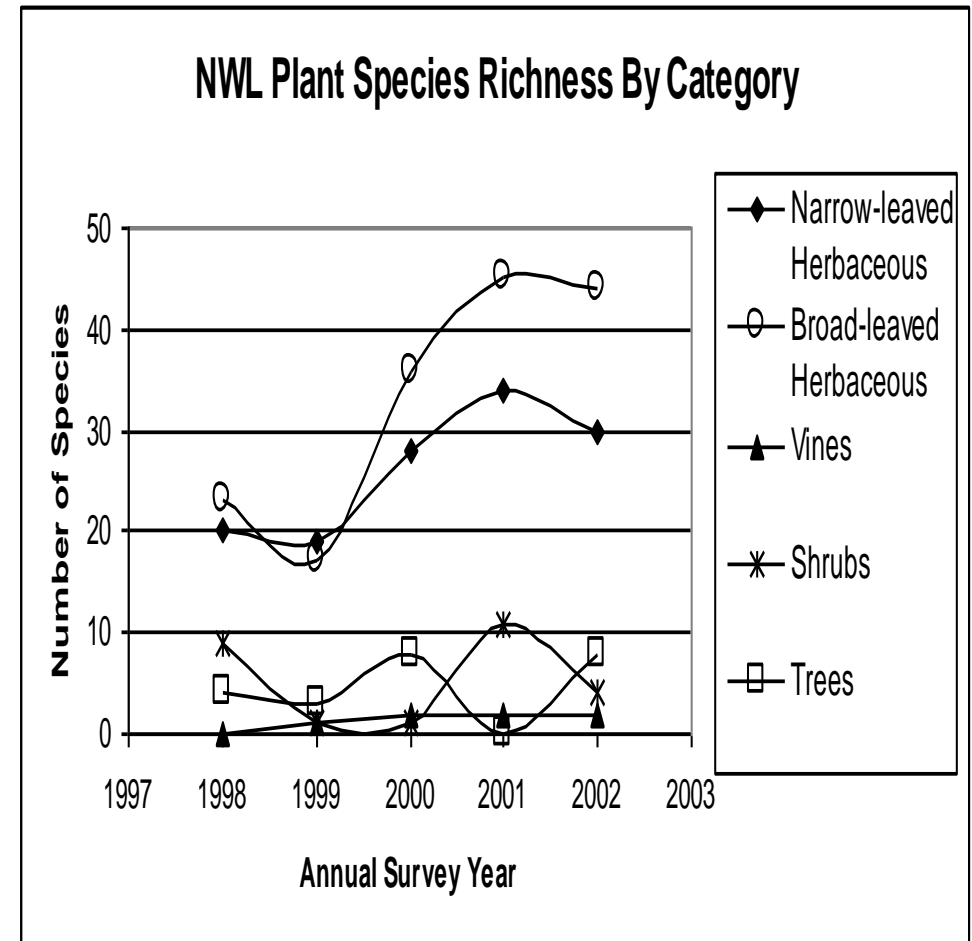
*Good example of combining remediation and restoration to achieve greater risk reduction and improved habitat functions cost effectively. Illustrated the value of working with USEPA and Trustees in an open, cooperative forum.*

# Integrated Remediation and Restoration - North Wetlands: Post-Construction Restoration



# North Wetlands - Restoration

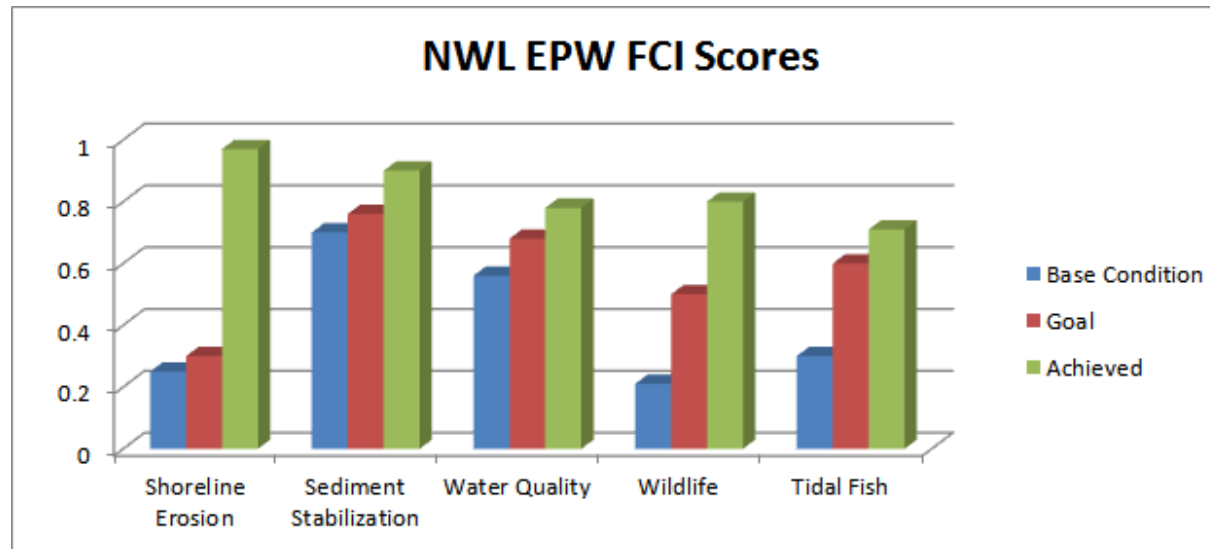
Tidal and Non-Tidal Wetland Habitats,  
High & Low Marsh, Tidal Open Water  
9-Fold Gain in Plant Species Richness (Yr 5)  
Fine Grained Sediment Accumulation &  
Viable Algal Community (Yr 1)  
83% Cover in Non-Tidal (Yr 5)  
98.5% Cover in Tidal (Yr 5)  
Loosestrife Observed (Yr 1)  
Loss of 0.21 Acres of Wetlands





# Pre- and Post-Remediation and Restoration Metrics

North Wetlands	Pre-Remediation (Base Condition)			ROD Required (Goal)			Post-Remediation/Restoration (Achieved 2002)		
	FCI	Area	FCU	FCI	Area	FCU	FCI	Area	FCU
Function									
Shoreline Erosion	0.25	0.34	0.09	0.30	0.34	0.10	0.97	0.77	0.75
Sediment Stabilization	0.70	2.70	1.89	0.76	2.70	2.05	0.90	2.70	2.43
Water Quality	0.56	2.70	1.51	0.68	2.70	1.84	0.78	2.70	2.11
Wildlife	0.21	2.70	0.57	0.50	2.70	1.35	0.80	2.70	2.16
Tidal Fish	0.30	2.00	0.60	0.60	2.00	1.20	0.71	2.00	1.42
Total			4.65			6.54			8.86
<b>Functional Ratio (FCU/Max. Potential FCU)</b>			<b>0.446</b>			<b>0.626</b>			<b>0.815</b>



# Natural Resource Damage Assessment

## Cooperative Natural Resource Damage Assessment

- Restoration Based Strategy
- Sharing of Data and Resources
- Accounting for On-site Restoration Beyond ROD

## Injury Assessment

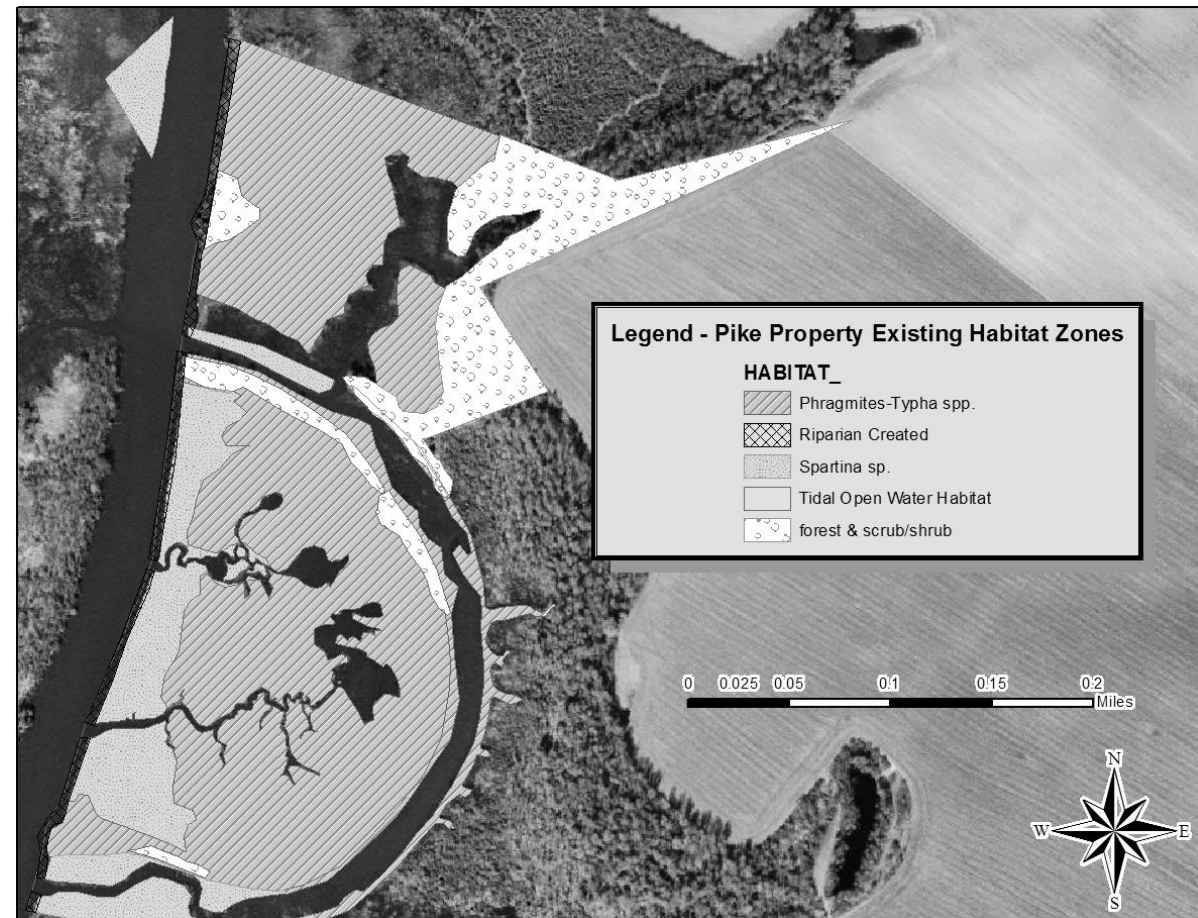
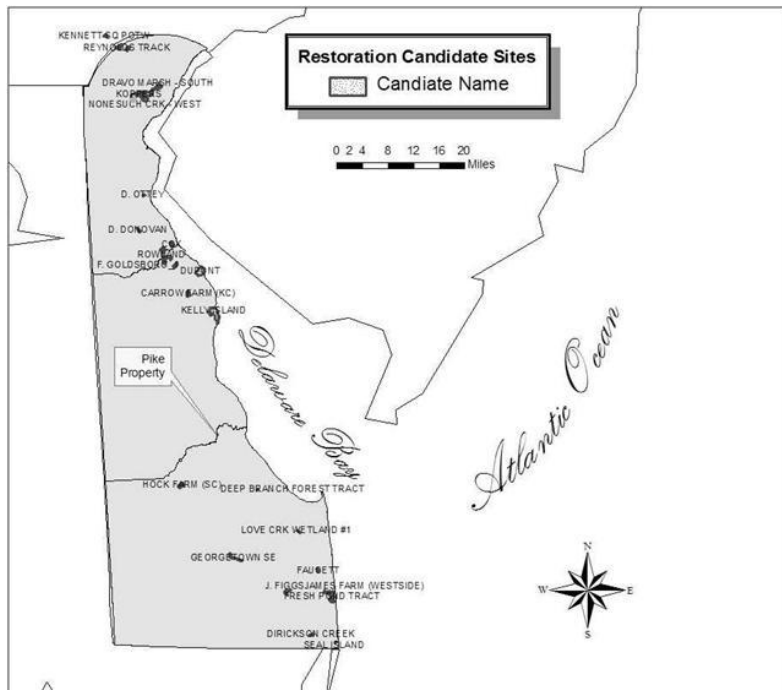
- Reasonably Conservative Injury Evaluation (RCIE) + Habitat Equivalency Analysis (HEA)
- Injury to Benthos – Reflective of Service Losses
- Focus Habitats – Pre-Post Wetlands, Open Water, Riparian, and Riverine

## Injury Quantification

- Use of Predicted Probability of Toxicity Based on Site-specific Sediment Chemistry
- Logistic Regression P-Max Scores (Field et al, 2002)
- Predicted Mortality as Measure of Injury
- Total Area-weighted Average Loss Per Habitat

# NRD – Restoration Project

- 40 Alternatives Evaluated
- Tidal Marsh Enhancement / Preservation Project Selected



# NRD – Restoration Project



# Damage Assessment and Restoration Plan / Environmental Assessment

## **RESTORATION CREDIT (Remedial Site):**

**115 DSAYs for Primary Restoration Beyond ROD Goals + 40%**

**TOTAL LOSS = 303 EqDSAYs + 43 Riparian habitat DSAYs = 346 DSAYs**

## **RESTORATION GAIN**

<b><i>Enhancement Area</i></b>	<b><i>Increase in Service Flow</i></b>	<b><i>Acres</i></b>	<b><i>DSAYs</i></b>
• Riparian Enhancement	10%	6.7	22
• Riparian Creation	100%	0.9	22
• Phragmites dominated converted to Spartina marsh	35%	24.7	284
• Enhancement of existing Spartina marsh	10%	6.6	21
• Enhancement of Open water habitat (oxbow)	5%	9.0	4
<b>TOTAL GAIN</b>			<b>353 DSAYs</b>

## Summary

**COOPERATION = GREATER UPLIFT** - Working in a cooperative assessment and restoration process can save time and money while leading to greater risk reduction and increased natural resource service flows.

**CHALLENGES CAN BE OVERCOME** - Not all of the process went smoothly – the assessment and restoration team had to overcome technical and other issues to stay on track.

**FLEXIBILITY IS KEY** - The ability of the Trustees to be flexible in the assessment and restoration scaling process proved to be a significant factor in the successful outcome.

**INTEGRATE EFFORTS** - In this case combining restoration with the remedial action (excavation) streamlined the overall effort and lead to risk reduction greater than that which would have been accomplished through the ROD.