



***Impact of Oil Spill Removal on a Freshwater Wetland***

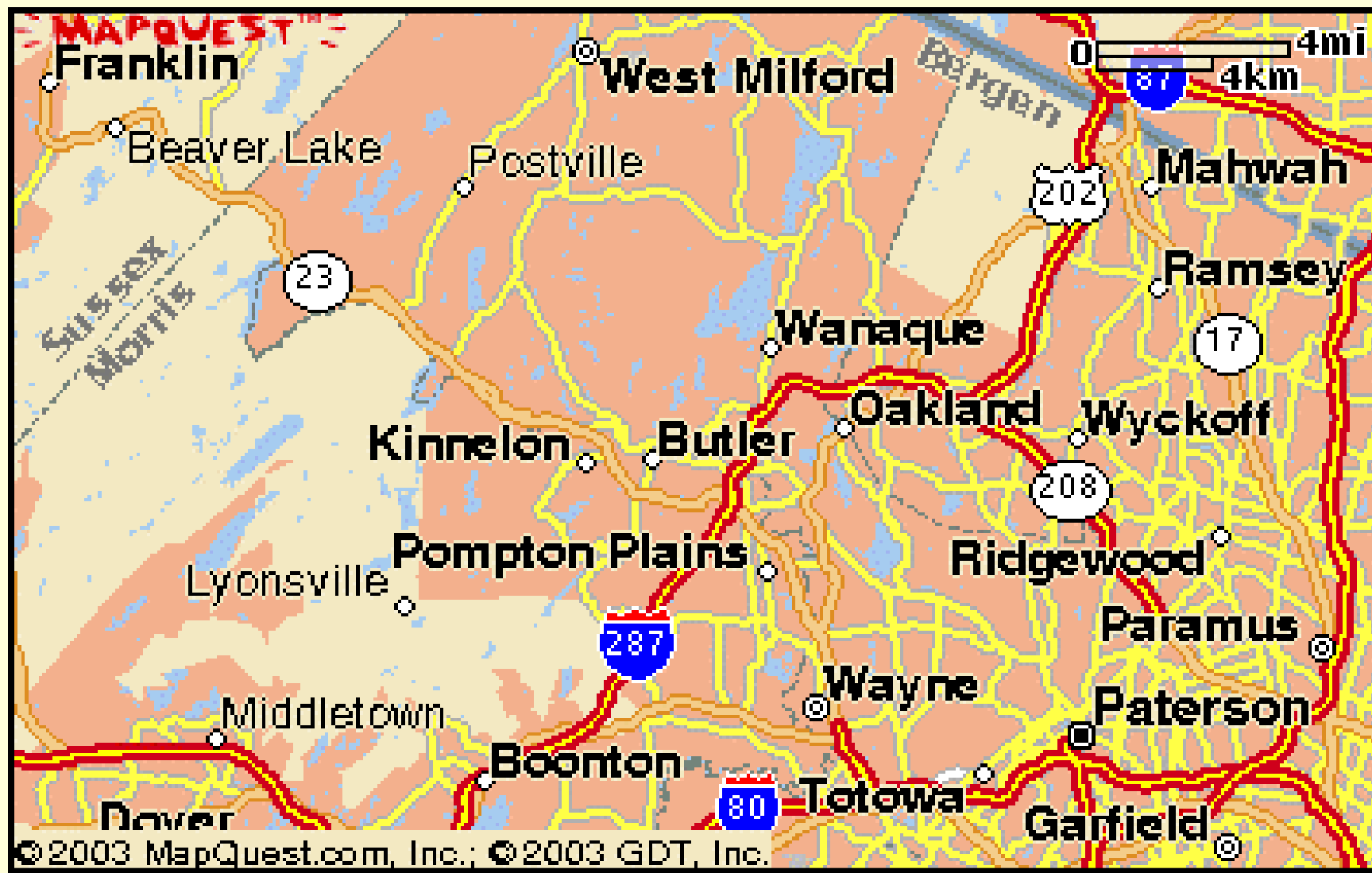
***Michael F. Solecki, OSC  
USEPA Region II Removal Program  
Edison, New Jersey***

***and***

***Royal J. Nadeau, PhD  
The Eco-Strategies Group  
Allamuchy, New Jersey***

***Fifth Biennial Freshwater Spills Symposium 2004***

## *Impact of Oil Spill Removal on a Freshwater Wetland*



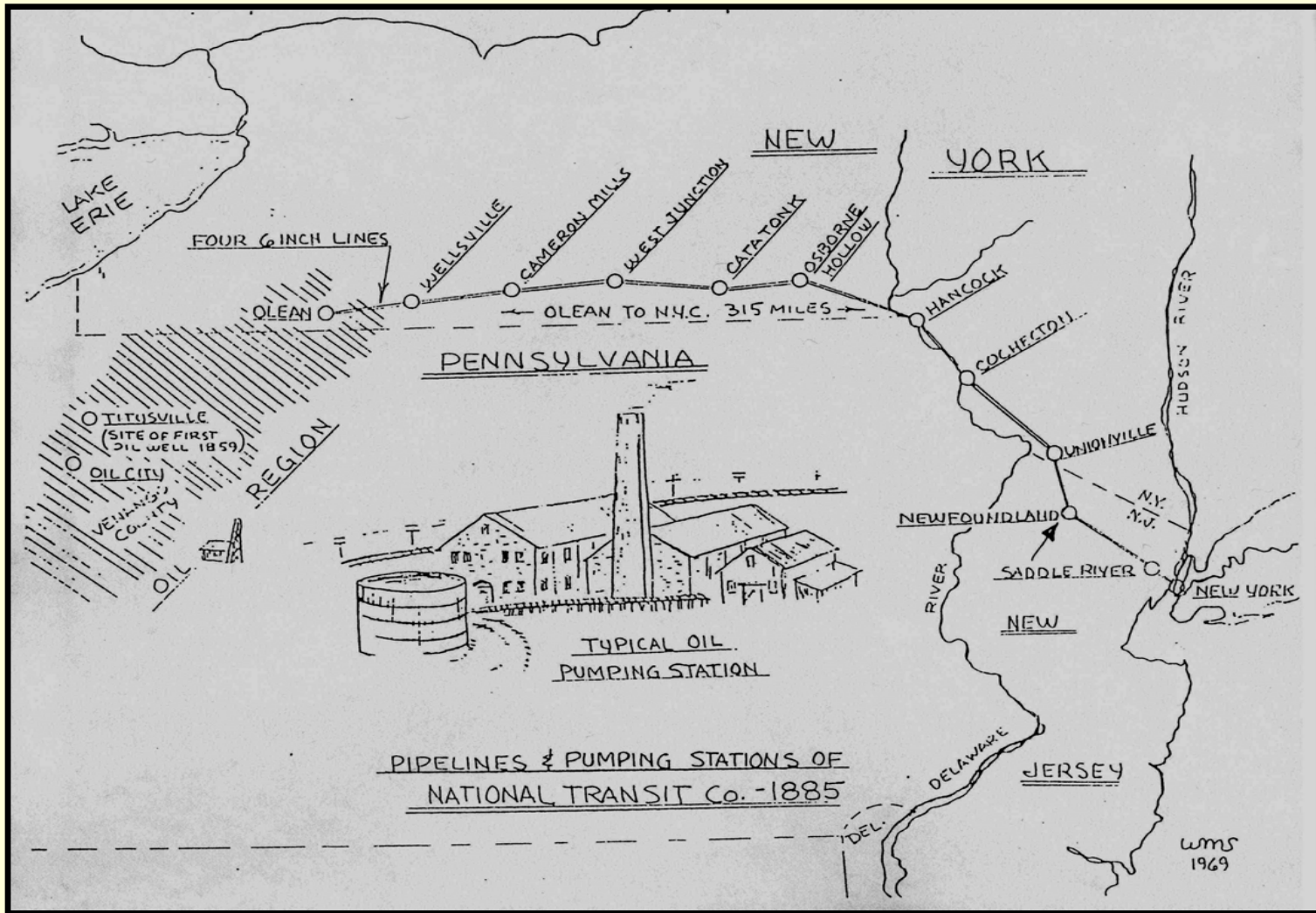
## ***Impact of Oil Spill Removal on a Freshwater Wetland***

***The wilderness core of the NJ Highlands, and its largest unprotected forest tract, holds enormous biological value and is home to hundreds of bear, native trout, bobcat and rare interior forest bird species.***

***Much of the watershed has been held by the City of Newark since the early 20th century to safeguard its water supply.***

***Highlands forests supply and protect clean drinking water for over 15 million people, including over half of New Jersey's population, and protect major water supply watersheds for New York City.***

# Impact of Oil Spill Removal on a Freshwater Wetland



## *Impact of Oil Spill Removal on a Freshwater Wetland*

***Relict Pumping Station at Unionville, New York similar to Newfoundland Pumping Station***

***+ Eleven stations, 28 miles apart, over a 315 mile distance with 4 six inch diameter pipelines***

***+ Maximum capacity of 50K barrels a day (2.1 million gallons).***

***+ Operation period: 1881-1920.***



## *Impact of Oil Spill Removal on a Freshwater Wetland*



## *Impact of Oil Spill Removal on a Freshwater Wetland*



*February 1996 Initial Response*

## *Impact of Oil Spill Removal on a Freshwater Wetland*



*Interceptor Trench installed before soil removal*



# Impact of Oil Spill Removal on a Freshwater Wetland

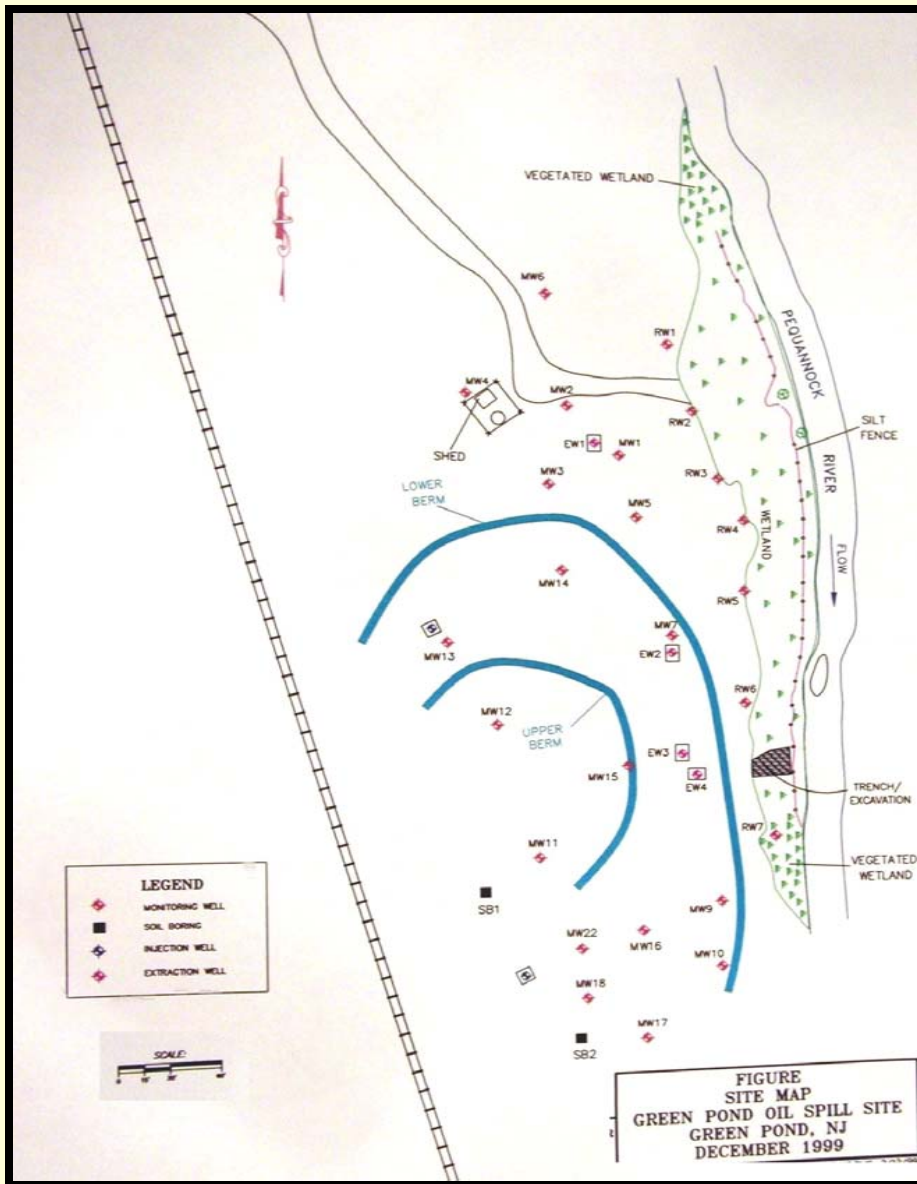


FIGURE  
SITE MAP  
GREEN POND OIL SPILL SITE  
GREEN POND, NJ  
DECEMBER 1999

## *Impact of Oil Spill Removal on a Freshwater Wetland*



*28 July 1998 Before Oil Contaminated Soil Removal.*

## *Impact of Oil Spill Removal on a Freshwater Wetland*

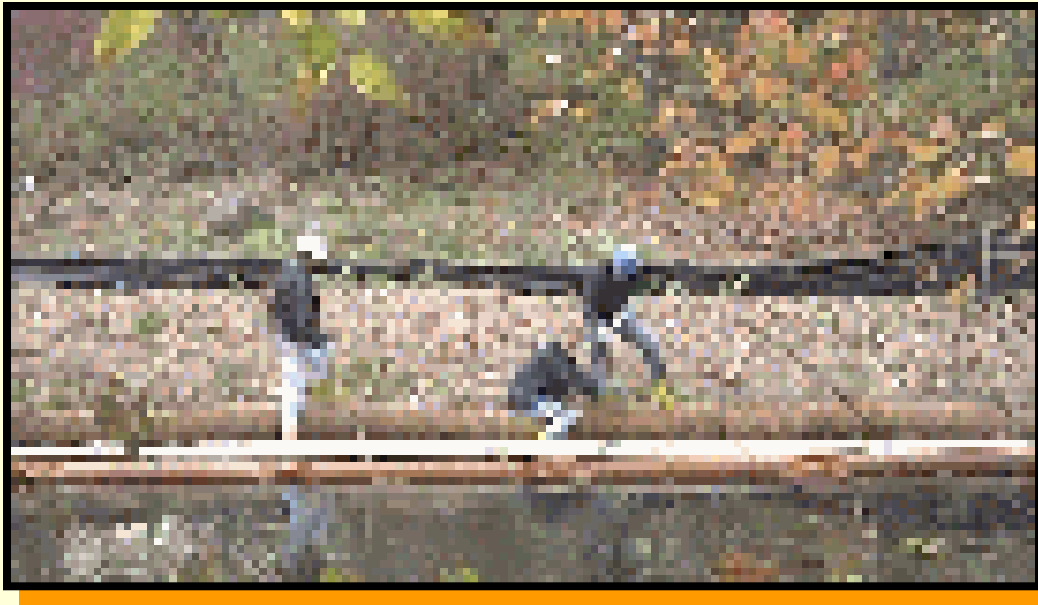


**July 1998**

## *Impact of Oil Spill Removal on a Freshwater Wetland*



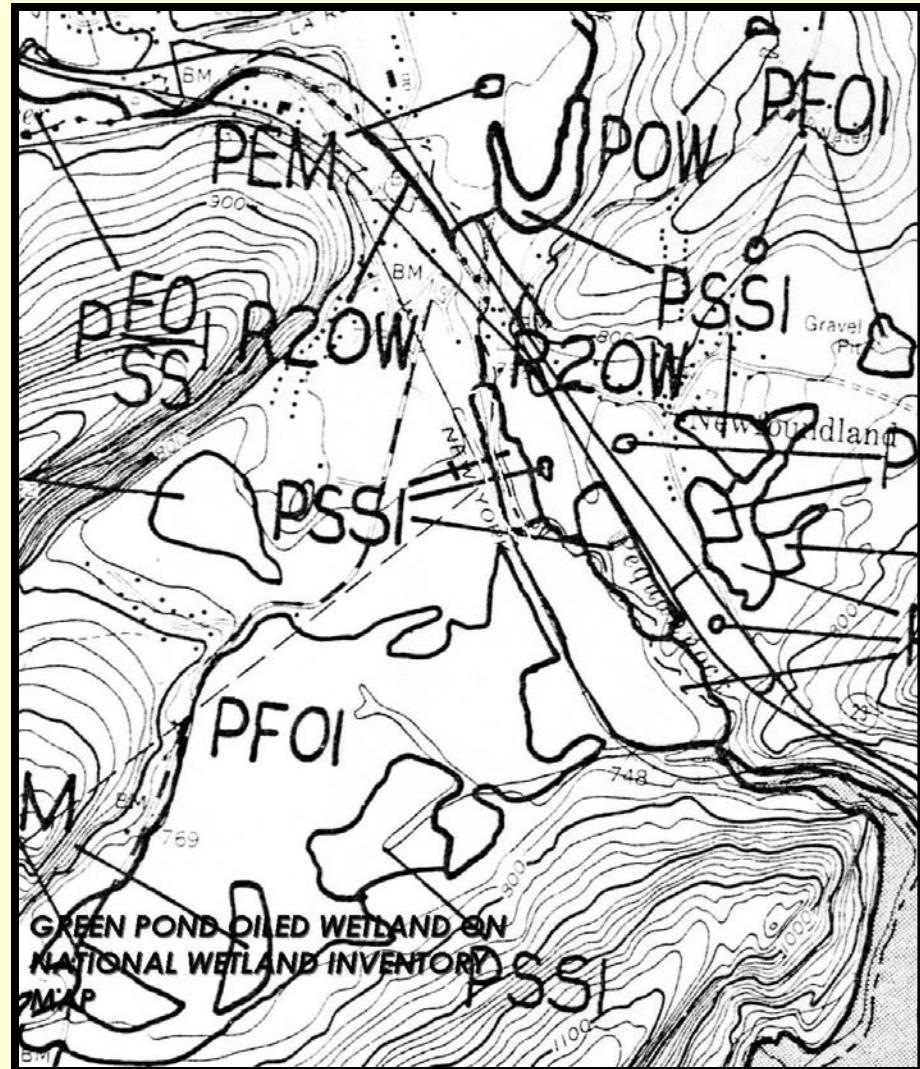
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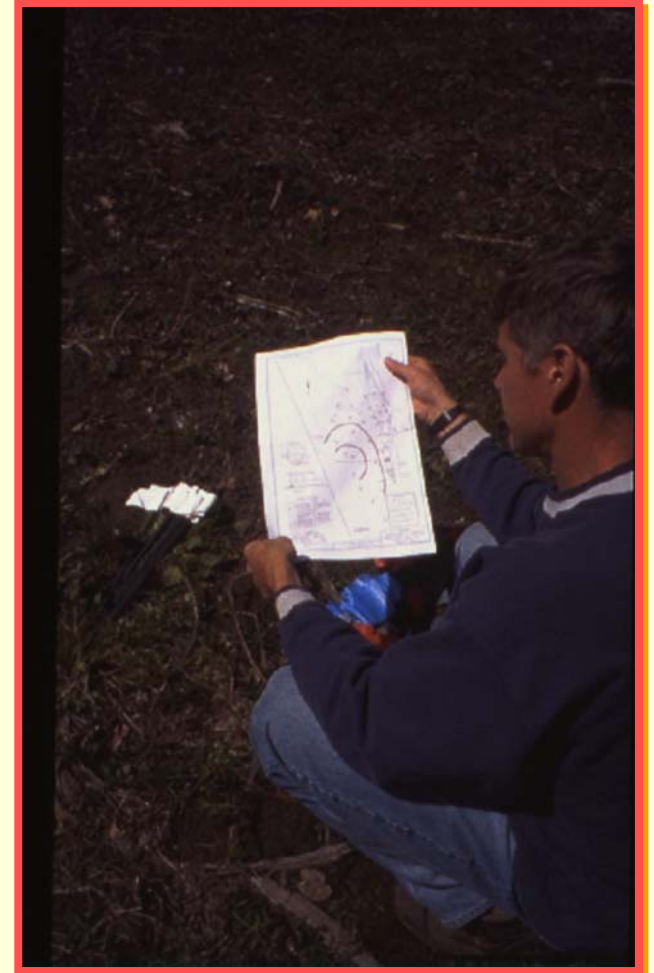
*Autumn 1998*

## *Impact of Oil Spill Removal on a Freshwater Wetland*

**PSS1 = Palustrine  
Scrub Shrub Broad  
leaved Deciduous e.g.  
Red Maple swamp**



## *Impact of Oil Spill Removal on a Freshwater Wetland*



*April 1999 Earth Day at Green Pond  
Oil Spill Site*

## *Impact of Oil Spill Removal on a Freshwater Wetland*





## *Impact of Oil Spill Removal on a Freshwater Wetland*

• <u>Species</u>	<u>Number Live</u>		<u>Differential</u>
	<b>1999</b>	<b>2002</b>	
• <i>V. dentatum</i>	21	12	-9
• <i>Aronia</i>	55	21	-34
• <i>Alnus</i>	59	52	-7
• <i>Cornus sericea</i>	15	46	+31
• <i>Cornus amomum</i>	69	93	+24
• <i>Sambucus</i>	26	18	-8
• <i>Ilex</i>	18	21	-3
• <i>Salix discolor</i>	52	37	-15
• <i>Salix nigra</i>	<u>19</u>	<u>17</u>	<u>-2</u>
• <b>Total</b>	<b>334</b>	<b>311</b>	<b>Net -23</b>

# *Impact of Oil Spill Removal on a Freshwater Wetland*

10 April 2003



29 April 2003



9 May 2003



6 June 2003



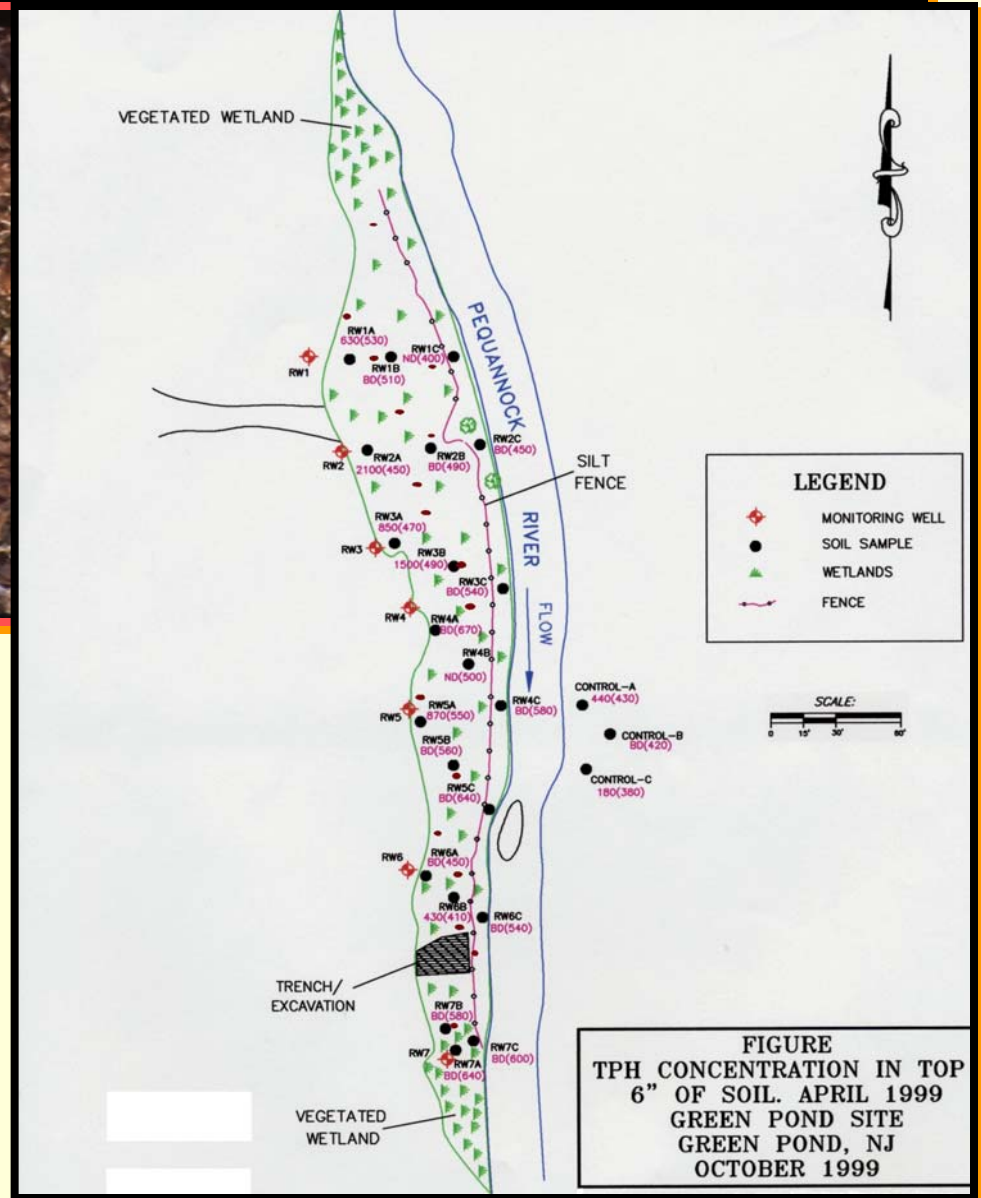
02 July 2003



17 July 2003



# Impact of Oil Spill Removal on a Freshwater Wetland



# Impact of Oil Spill Removal on a Freshwater Wetland

TABLE 1. Total Petroleum Hydrocarbon (TPH) levels in Wetland Soils at Green Pond Oil Spill Site  
in mg/Kg (dry weight)

<u>Location</u>	<u>Apr-99</u>		<u>Location</u>	<u>May-00</u>		<u>Location</u>	<u>Jun-01</u>		<u>Jun-02</u>		<u>May-03</u>	
	<u>Conc</u>	<u>MDL</u>		<u>Conc.</u>	<u>MDL</u>		<u>Conc.</u>	<u>MDL</u>	<u>Conc..MDL</u>		<u>Conc.</u>	<u>MDL</u>
RW1-A	630	530				Near Rock	220	44	370	41	150	60
RW1-C	ND	400				Close to RW1-C	110	40	100	42	97	46
						Near "Spoooge"	120	39			2100	630
						Near "Spoooge"	1800	520	7700	510	8600	540
RW2-B	83J	490				Close to RW2-B	2100	520	1900	490	270	55
			Between RW2&3	2300	510	Between RW2&3	560	220	1300	520	730	490
			Close to Above	1300	550	Close to Above	1500	510	1700	480	460	280
RW3-B	1500	490	Close to RW3-B	4400	630	Close to RW3-B	110	49	1400	500	210	61
RW5-A	870	550	Close to RW5-A	960	550	Close to RW5-A	200	62	1900	540	410	85
RW6-C	210J	540	Close to RW6-C	1300	550	Close to RW6-C	230	40	580	210	200	52
RW7-B	300J	580				Close to RW7-B	300	66	470	59	220	61
Across River -A	440	430										
Across River -B	260J	420										
Across River -C	180J	380										

J = estimated value below the detection limit

MDL = Method Detection Limit

## ***Impact of Oil Spill Removal on a Freshwater Wetland***

### ***Wetland Plant Species Indicator Categories\****

#### ***OBL = Obligate Wetland***

***Occur almost always (>99% Probability) under natural conditions in wetlands.***

#### ***FACW = Facultative Wetland***

***Usually occur in wetlands (67–99% Probability), but occasionally found in non-wetlands.***

#### ***FAC = Facultative***

***Equally likely to occur in wetlands or non-wetlands (34-66% Probability).***

#### ***FACU = Facultative Upland***

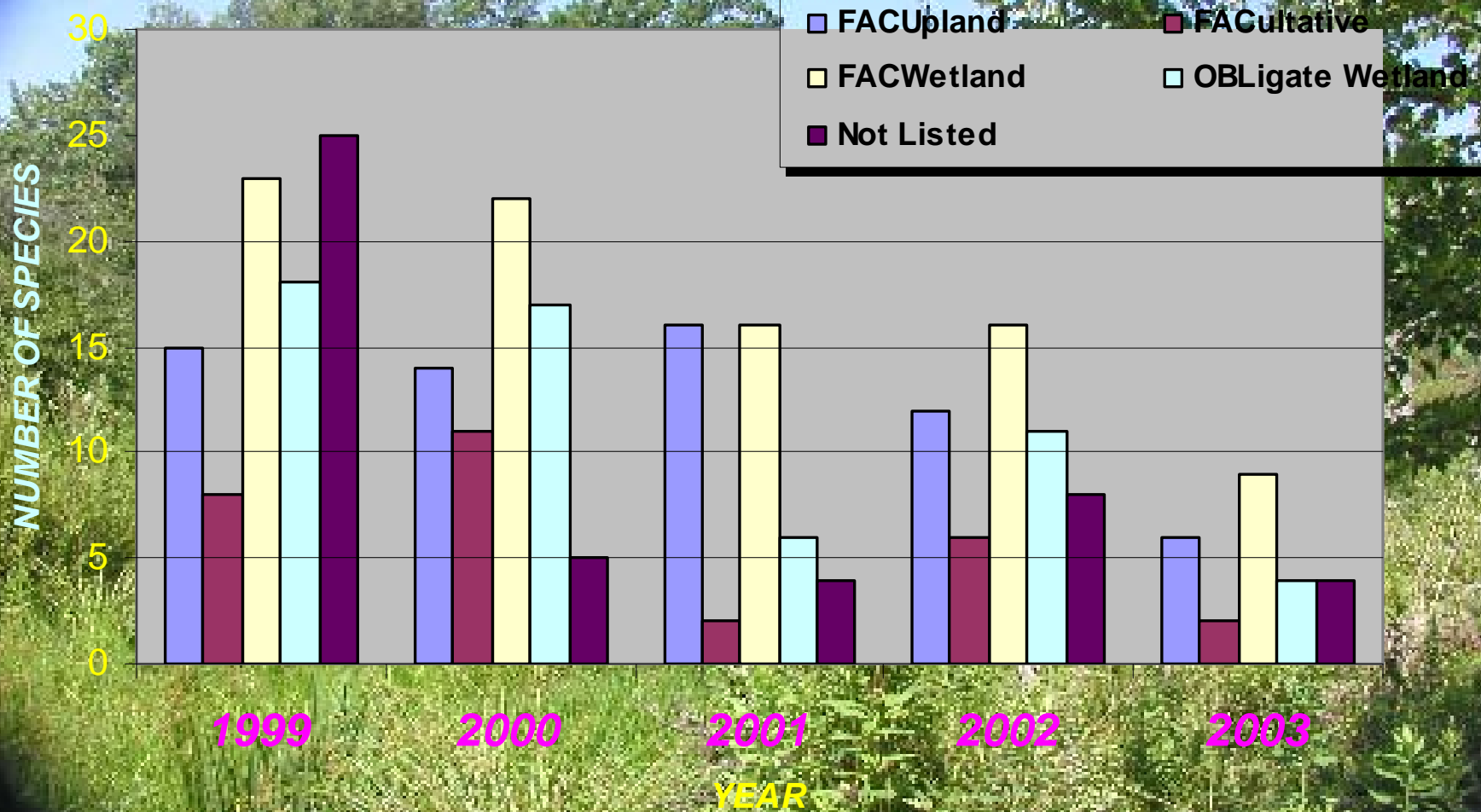
***Usually occurs in non-wetland (67-99% Probability). But occasionally found in wetlands (1-33% Probability).***

***\*National list of Plant Species that occur in Wetlands: Northeast Region (Region 1)***

***USF&W Biological Report 88(26.1) MAY 1988***

# Impact of Oil Spill Removal on a Freshwater Wetland

## CHANGE IN GREEN POND WETLAND CHARACTER

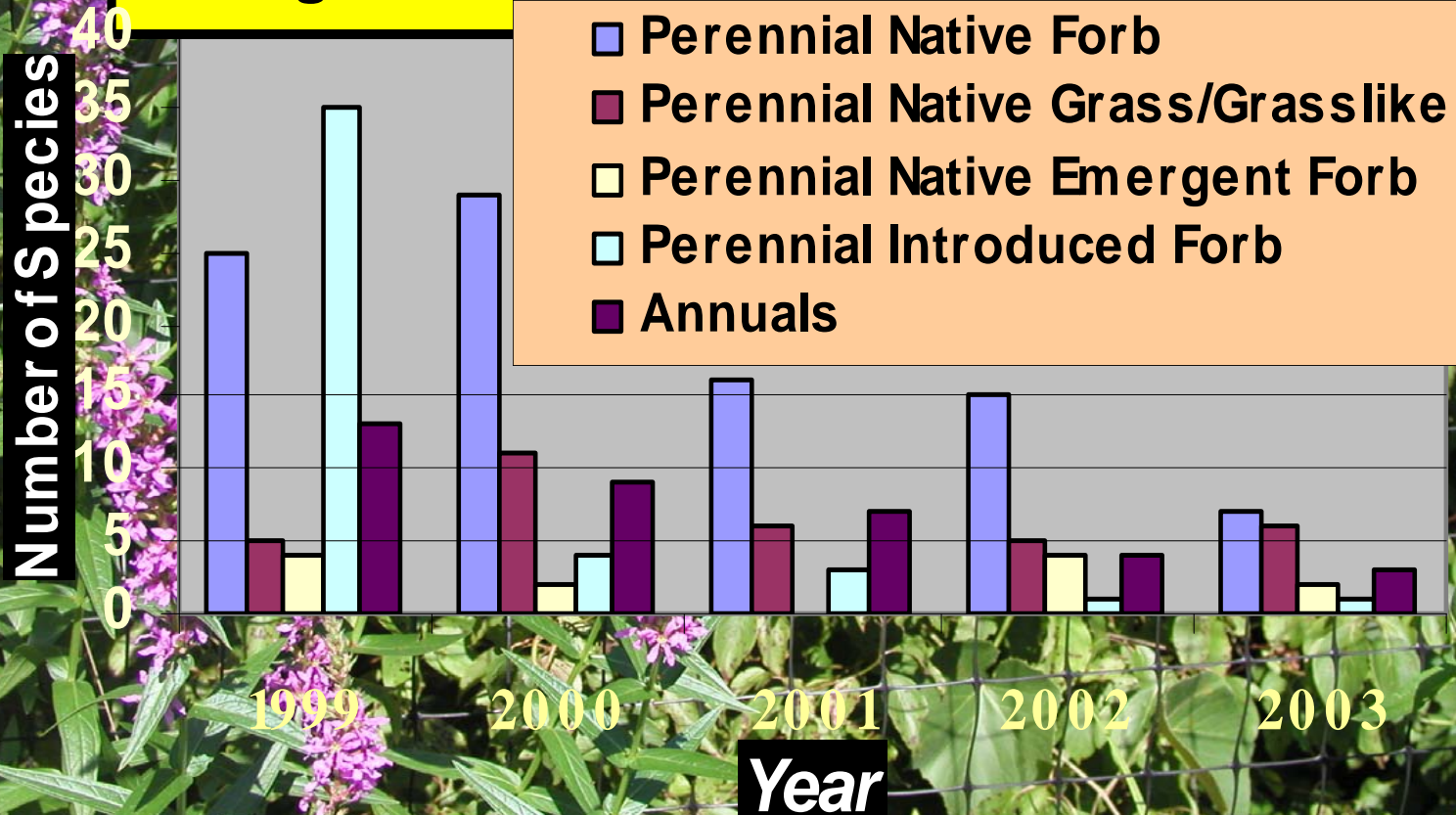


## *Impact of Oil Spill Removal on a Freshwater Wetland*

- Explanation of Habitat Symbols
  - P=perennial (comes back every year)
  - I=introduced (not native, would include invasives)
  - N=native (indigenous to Northeast US)
  - G=grass(like those found along roads and lawns)
  - Gl=grasslike(rushes, sedges)
  - F=forb( flowering non-woody like goldenrods,etc)
  - B=biennial(two year growing cycle)
  - S=shrub(woody plants usually < 20 ft in height)
  - A=annual(one growing season, that's it)
  - E=emergent (grows out of water e.g. cattails)

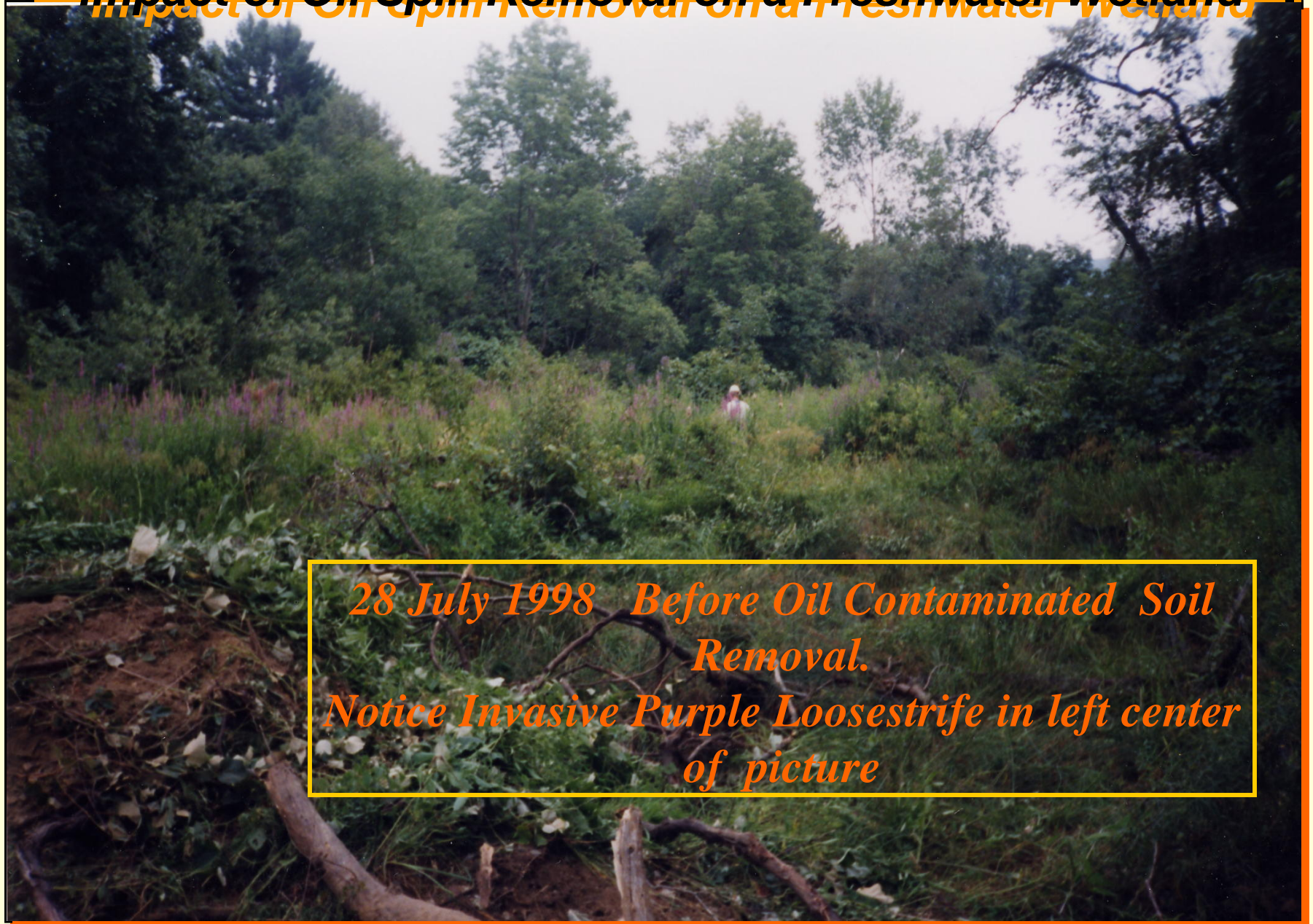
## Impact of Oil Spill Removal on a Freshwater Wetland

### Change in Wetland Plant Community





## ***Impact of Oil Spill Removal on a Freshwater Wetland***



*28 July 1998 Before Oil Contaminated Soil  
Removal.  
Notice Invasive Purple Loosestrife in left center  
of picture*

## *Impact of Oil Spill Removal on a Freshwater Wetland*



***Invasive Species  
Management for Purple  
Loosestrife 2000***



## ***Impact of Oil Spill Removal on a Freshwater Wetland***

### ***Invasive Species Management for Purple Loosestrife 2001, 2002 & 2003***



***Biological Control with Galerucella beetles***

***Invasive Species Management  
for Purple Loosestrife 2001, 2002  
& 2003      Galerucella spp.  
(calmariensis and pusilla)***

***Life Stages: Eggs laid in May,  
June , August and hatch in ten  
days. Larvae feed on young  
buds, leaves and stems up to 14  
days. Pupation occurs in soil  
lasting about seven days.***

***Adults over winter and emerge in  
May and June. First generation  
adults emerge in July and August  
and relocate to new areas  
(hopefully).***

***Freshwater Wetland***



## ***Impact of Oil Spill Removal on a Freshwater Wetland***

***Invasive Species Management for Purple Loosestrife 2002 & 2003 also included :***

- End of season whole Plant extrication***
- Seed head clipping in Spring.***
- Clipping Flowering structures in late summer before seed maturation***

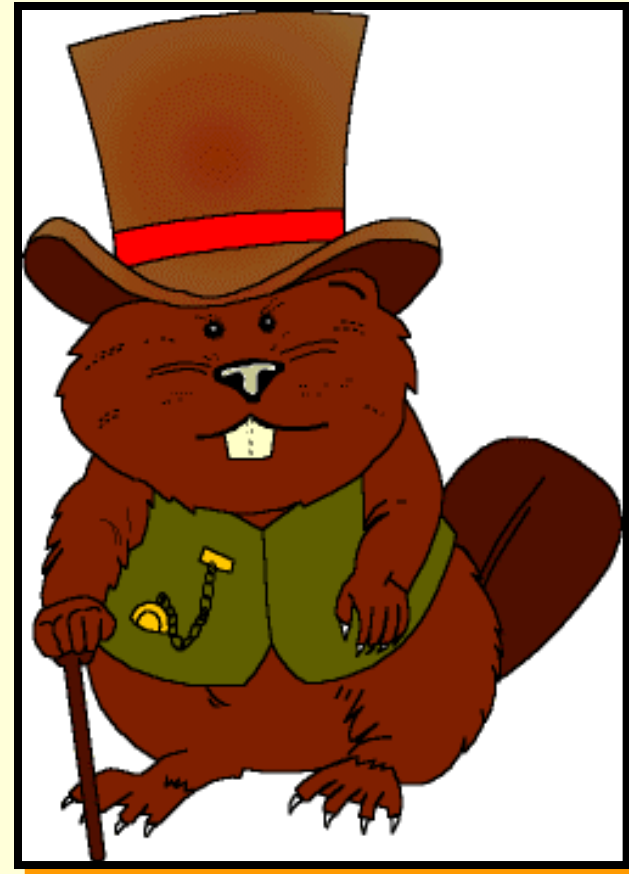


***A single Loosestrife seed head with tiny seeds in lower left hand corner. One plant can produce 2 million or more seeds.***



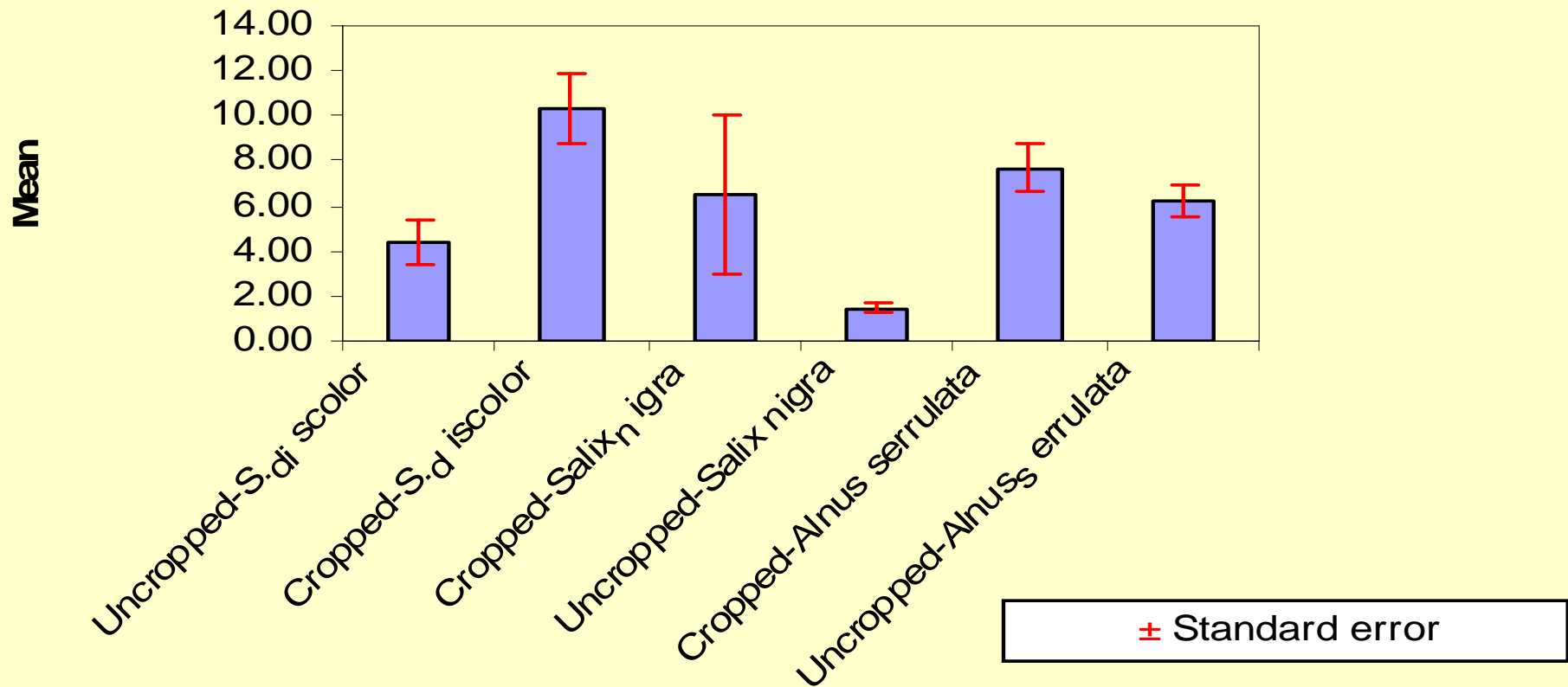
# *Impact of Oil Spill Removal on a Freshwater Wetland*

## ***Herbivory Issues Winter 2002 - Shrubs***



# Impact of Oil Spill Removal on a Freshwater Wetland

## Cropped vs Uncropped Stem Count Means



# *Impact of Oil Spill Removal on a Freshwater Wetland*

**Spring 2002**

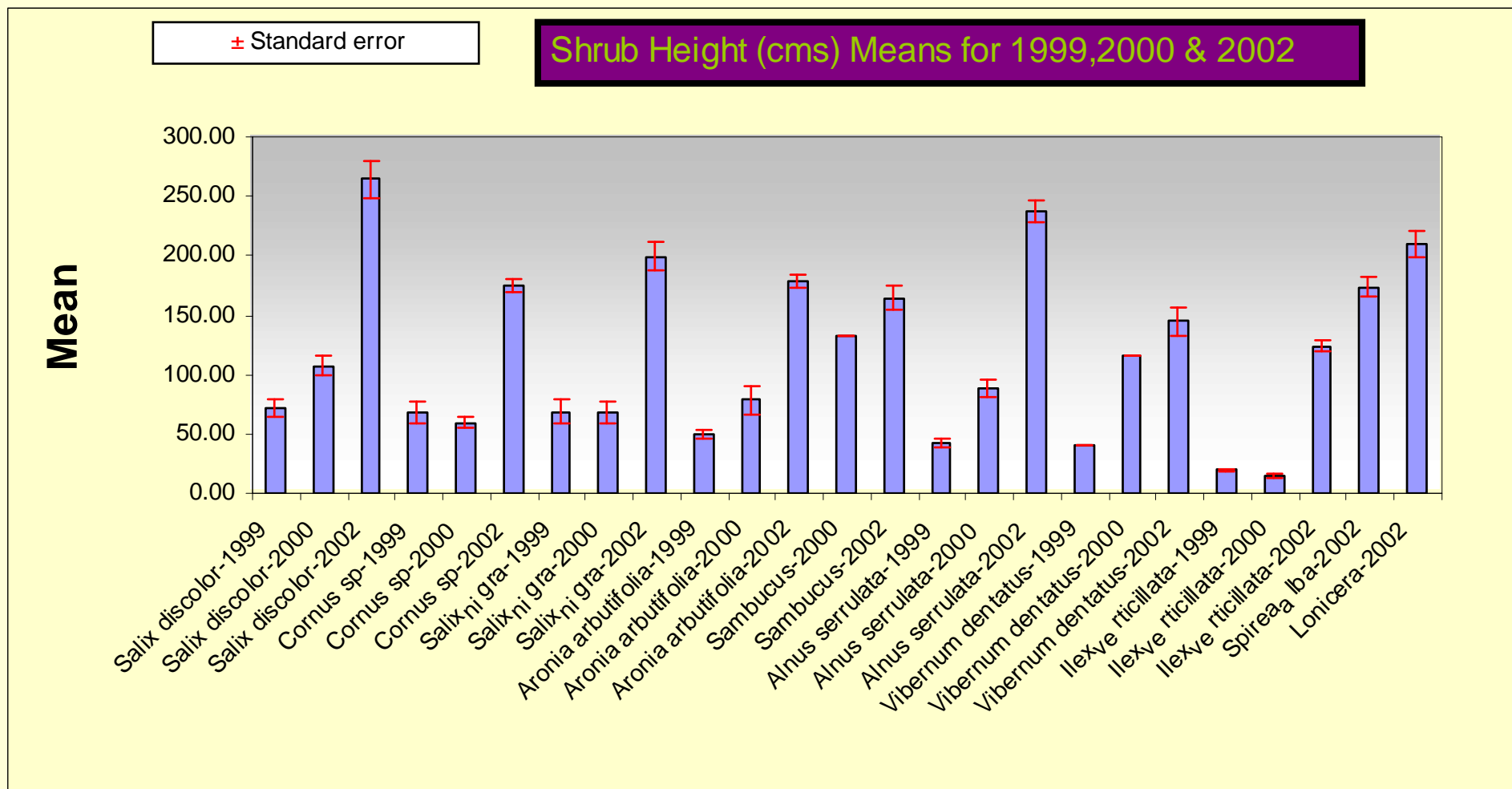


**Fall 2002**





# Impact of Oil Spill Removal on a Freshwater Wetland



# *Impact of Oil Spill Removal on a Freshwater Wetland*

## *Herbivory Issues Winter 2022*



## ***Impact of Oil Spill Removal on a Freshwater Wetland***

- What have we learned so far..
  - The herbaceous plant community in a wet meadow stripped of surface soil (4-6inches) will recover providing root systems remain intact.
  - Low level soil TPH levels do not adversely affect potted shrub survival.
  - Occasional oil “spooges” do not affect the plant community as a whole.
  - Although the number of plant species has decreased the plant community has maintained its wet meadow characteristics with sedges, rushes and forbs.
  - Invasive species management is a “must do” activity in a revegetation/restoration project.
- ***WATCH OUT FOR THE BEAVERS AND BEARS, OH MY!***

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## ***Impact of Oil Spill Removal on a Freshwater Wetland***

