

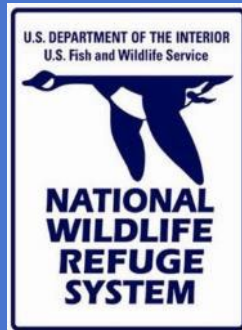
# Herbicide & Mechanical Management of *Phragmites*

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Coastal Delaware NWR Complex



# Coastal Delaware National Wildlife Refuge Complex

- ❖ Managed by the U.S. Fish & Wildlife Service
- ❖ Over 560 in NWR system
- ❖ Bombay Hook NWR
  - ~16,000 acres
  - ~13,000 acres tidal marsh
  - ~1100 acres impoundments
- ❖ Prime Hook NWR
  - ~10,000 acres
  - ~2300 acres of tidal marsh
  - ~4200 acres of impounded marsh



# Bombay Hook NWR



# Prime Hook NWR



# Refuge Biology and Habitat Management

We manage habitat on our National Wildlife Refuges to maximize benefits to wildlife species, especially migratory birds.

*Phragmites*, when occurring as a large monotypic stand, detracts from habitat quality in both freshwater and brackish wetlands.

Where our refuge lands are adjacent to private lands, it can also pose a fire hazard concern for neighbors.



# *Phragmites* Management the “old fashioned” way!

- ❖ “Spray – **Burn** – Spray”
- ❖ “Spray – **Mow** – Spray”
- ❖ What about just one or the other? Why both?
- ❖ Pros and Cons
- ❖ Best Practices
- ❖ Challenges and Lessons Learned



# Herbicide Treatment

## WHO?

There are two primary herbicides (active ingredients) used for *Phragmites* treatment

- Glyphosate (Rodeo, AquaNeat, etc)
- Imazapyr (e.g., Habitat) – more effective, more risk
- The two chemicals can be mixed

## WHAT?

These non-selective herbicides disrupt plant metabolic processes, leading to plant death



# Herbicide Treatment

## WHEN?

- Chemical treatments should be conducted after the plant has flowered, so that it will draw the chemical down into the root system
- Generally, at least late July, but before first frost
- Treating too early – plant may be top-killed or injured, but will resprout later
- Treating too late – plant may have started to senesce, and the chemical won't be drawn into the roots





# Herbicide Treatment

## WHERE?

- Herbicides can be used in just about any habitat or setting, if the right one is chosen
- Treatments in a wetland setting (which would be the case for most *Phragmites*) must use aquatic-safe formulations
- Consider the surrounding vegetation and management objectives, in case of collateral loss
- Imazapyr can move in the soil and affect nearby plants, and have residual effect over time – it can be very effective, or “too much of a good thing.”



# Herbicide Treatment

## HOW?

- Herbicides can be applied with a handheld or backpack sprayer, or a UTV or tractor mounted sprayer for smaller accessible areas
- Can be applied aerially, usually with a helicopter, for large areas
- Imazapyr and glyphosate can be mixed



# Herbicide Treatment

## Best practices for herbicide treatments

- Follow label instructions for rate, based on application method
- Use an approved surfactant
- To be most effective, herbicide treatments should be done across multiple years, and ensure treatment is thorough
- To be even more effective, it should be done in combination with a physical treatment



# Physical Treatment

Mowing or Burning to physically remove sprayed canes will expose the treated area so that desirable plants can get established (burning more so than mowing)

It will make it easier to spot treat or do a follow-up treatment with herbicide, as surviving plants start to germinate.



# Physical Treatment

Burning will be discussed in more detail in another presentation; it is perhaps the best way to remove dead treated material



Drowning is another physical treatment, such as mowing below the water line

Spraying alone, without follow-up treatment, can be effective short-term, but the *Phragmites* will come back.

Ask me how we know!



# Mowing Treatment

## Best practices for mowing treatments

- Mow down *Phragmites* at least two weeks after a chemical treatment
- Mow no lower than about 4 inches, to reduce disturbance to small animals and native plants
- In wetland settings, wait for the ground to be frozen to minimize soil disturbance
- Always clean equipment after mowing to reduce spread to new areas



# Mowing Treatment

*Pros –*

Less expensive and less dependent on weather, logistics, and large staff (vs burning)

More flexibility for implementation

No special permit (such as for air quality)



# Mowing Treatment

## *Cons –*

Does not entirely remove the dead biomass, making it harder for new plants to germinate, and harder to reach re-sprouts for follow-up treatment

It takes a pretty robust machine to mow larger areas

Mowing alone is not a reliable treatment, because it can stimulate regrowth from rhizomes





# Spray – Mow – Spray

*Easy, right?*

Common challenges to this approach:

- Spraying large areas of *Phragmites* is expensive
- Accessing *Phragmites* in the “nooks and crannies” to spray it can be difficult – but if it’s left behind, it promotes reinfestation
- Even worse, could be creating resistant populations if follow-up treatment isn’t done
- Mowing large areas is also not easy, often requires specialized equipment and training



# Treatment History at DE NWRs

We have many years of herbicide treatment, often in successive years, at both refuges.

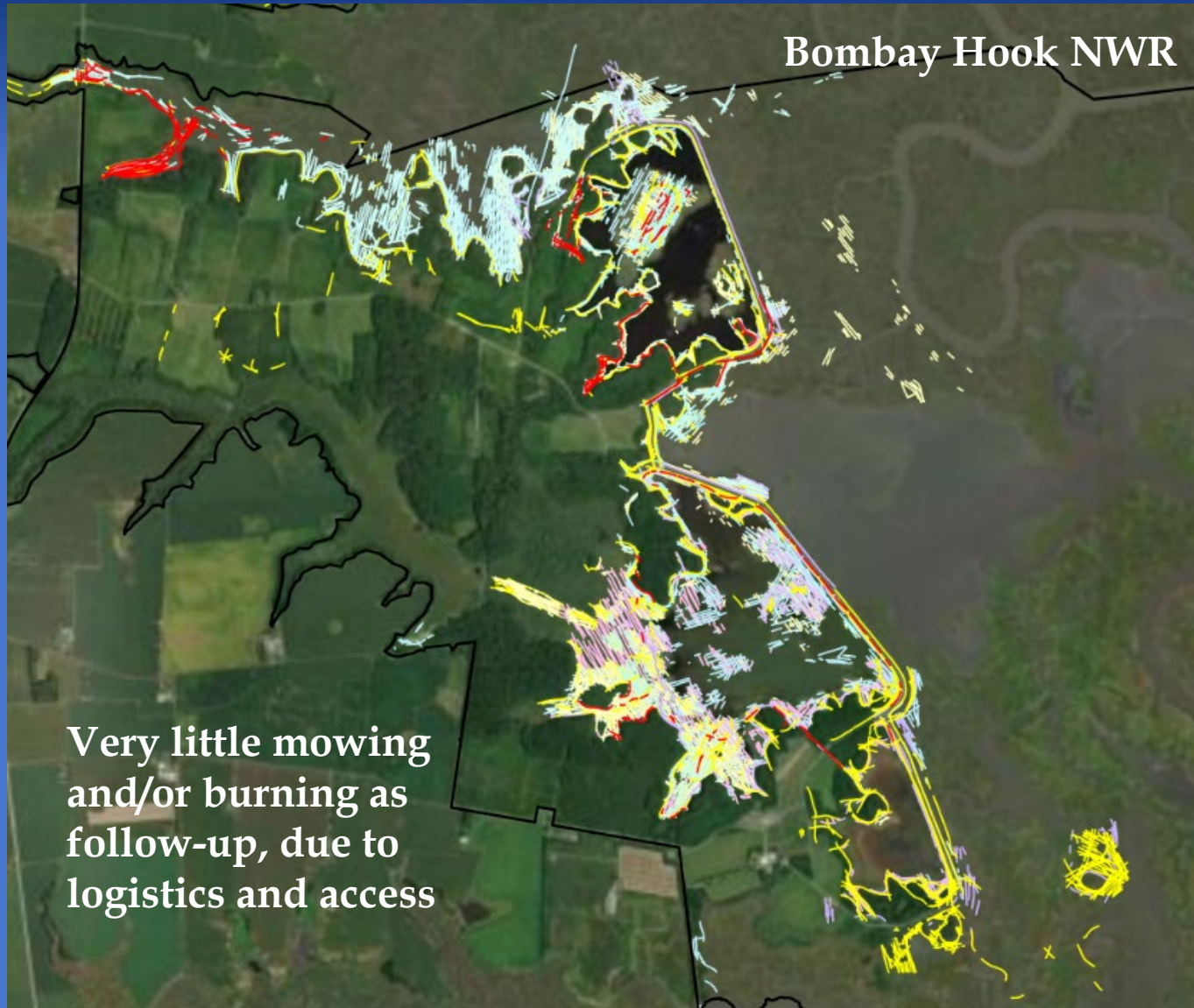
Our ability to burn and/or mow has been inconsistent

CHALLENGES... Funding, logistics of organizing fire crews, equipment availability for large scale mowing

These are the problems many agencies and landowners face in *Phragmites* management



# Treatment History at DE NWRs



Herbicide spraying, mostly aerial

2005

2006

2007

2008

2013

2014

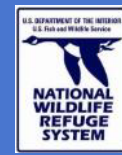
2015

2018

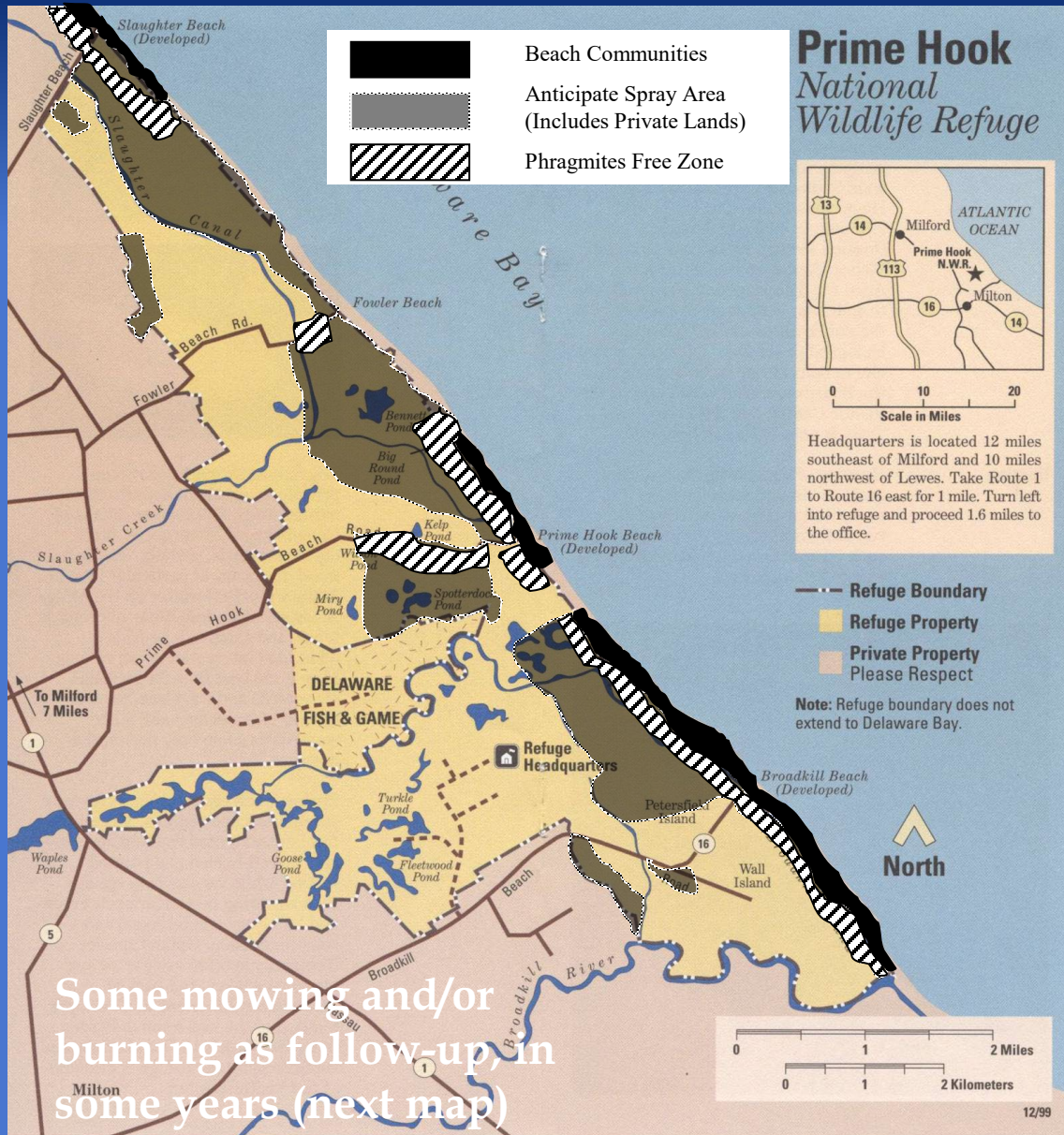
2019

2020

2022



# Treatment History at DE NWRs



## Prime Hook NWR Wildlife Urban Interface (WUI) Project

2002 - Sprayed 4000 acres of marsh with Rodeo

2003 - Rx burning on 2100 acres after spray

2003 - Repeat 4000 acres of marsh sprayed

2004 - Follow up Rx burning on 700 acres

Long-term control?



# Treatment History at DE NWRs



Prime Hook NWR

Herbicide spraying,  
mostly aerial

2008

2010

2014

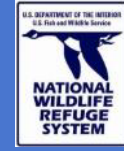
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# Treatment History at DE NWRs



# Treatment History at DE NWRs

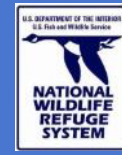
## Worst-case scenario...

It is *\*possible\** (*not studied, or confirmed, just speculation*) that the rigorous *Phragmites* treatment in the impounded marshes at Prime Hook NWR contributed to the vulnerability that led to this...



# Treatment History at DE NWRs

2009 Nor'easters, subsequent storms, and ultimately Hurricane Sandy, breached the shoreline and devastated the wetlands





# Tidal Marsh Restoration

- ❖ Largest tidal marsh restoration project in the east at ~4000 acres
- ❖ Restoration of 8900 ft of shoreline, dune, and back barrier platform
- ❖ Dredged ~25 miles of interior tidal channels in Unit II and Unit III
- ❖ Remove WCS, DelDOT bridge
- ❖ Thin layer deposition on site



# Tidal Marsh Restoration

- ❖ *Phragmites* has begun to spread in our restored wetland areas
- ❖ It could hinder native marsh recovery, especially desired high marsh



# *Phragmites* Management the “new fashioned” way?

- ❖ Better mapping to set priorities for treatment
- ❖ Consider that some areas can be left untreated
- ❖ Drones for spraying in mid-sized marsh units?
- ❖ What else? Tell me more.

