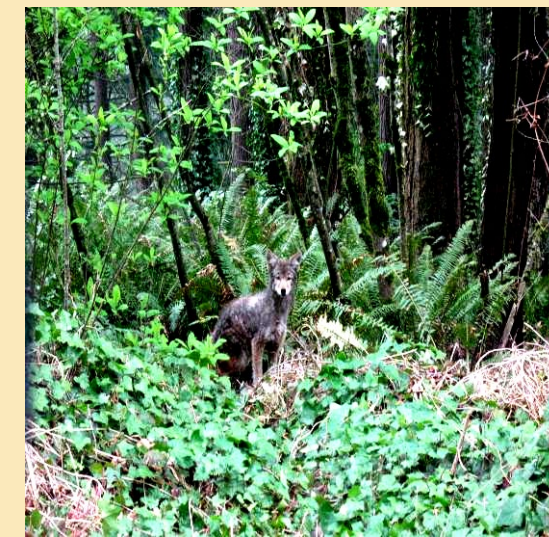


Protect the Best Invasive Vegetation Management Program

Steve Lower, Natural Resource Ecologist
Portland Parks and Recreation, City Nature



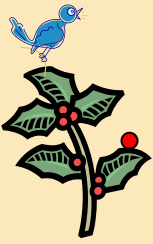
PORTLAND PARKS & RECREATION
Healthy Parks, Healthy Portland





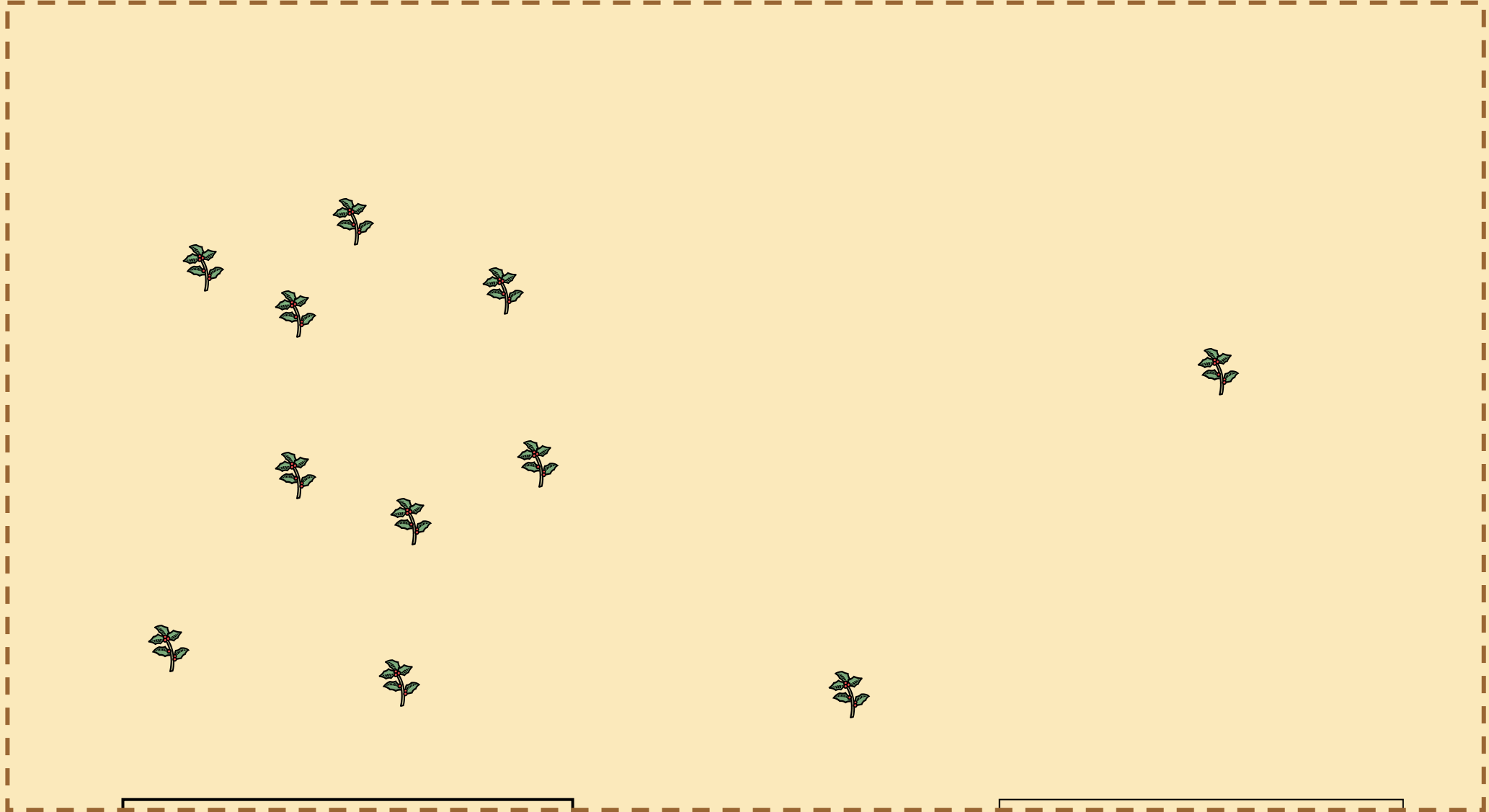
Protect the Best Invasive Management Program

- PTB is a Portland Parks and Recreation Program started in 2007
- Funding from BES Grey to Green Program and PPR
- Four-person crew uses chainsaws, applies herbicides to remove invasive trees and forbs
- Strategy: Remove invasive species in PP&R's healthiest natural areas. We focus on removing invasives before they have a chance to become a large problem.



Invasive species establishing and spreading in a natural area

Natural Area



Ecologically Degraded
Invasives ↑
Natives ↓

Ecologically Healthy
Invasives ↓
Natives ↑



Wildlife, people and wind/water can move seeds

Natural Area



Ecologically Degraded

Invasives ↑

Natives ↓

Ecologically Healthy

Invasives ↓

Natives ↑



Invasive species grow and reproduce, edging out native species



Natural Area



Ecologically Degraded
Invasives ↑
Natives ↓

Ecologically Healthy
Invasives ↓
Natives ↑

Entire habitat over-run by invasive species



Natural Area



Ecologically Degraded

Invasives ↑

Natives ↓

Formerly Ecologically Healthy

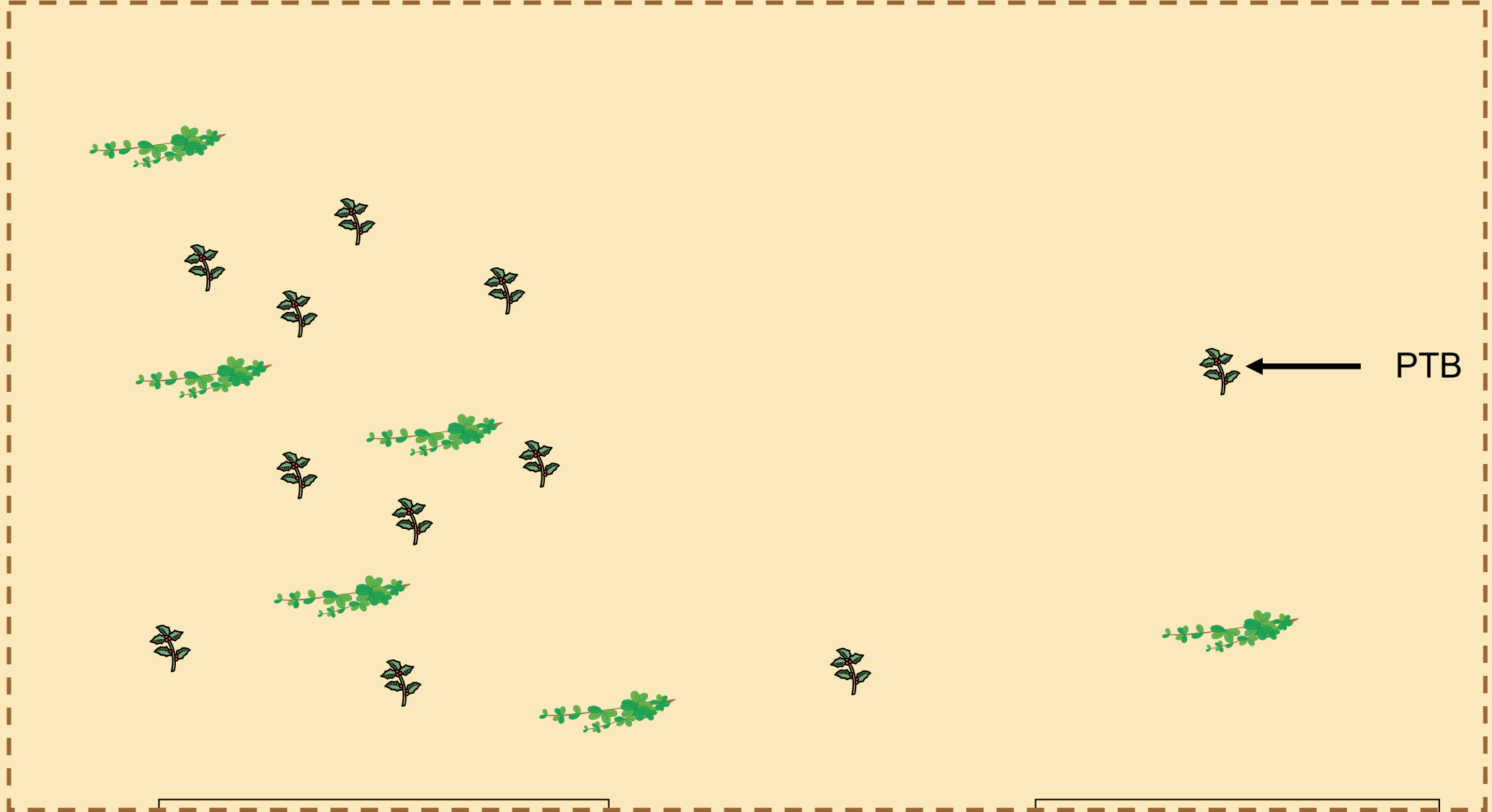
Invasives ↓

Natives ↑



Targeting small infestations in healthy area first, allows workers to cover a lot of ground quickly, with small impact to native species

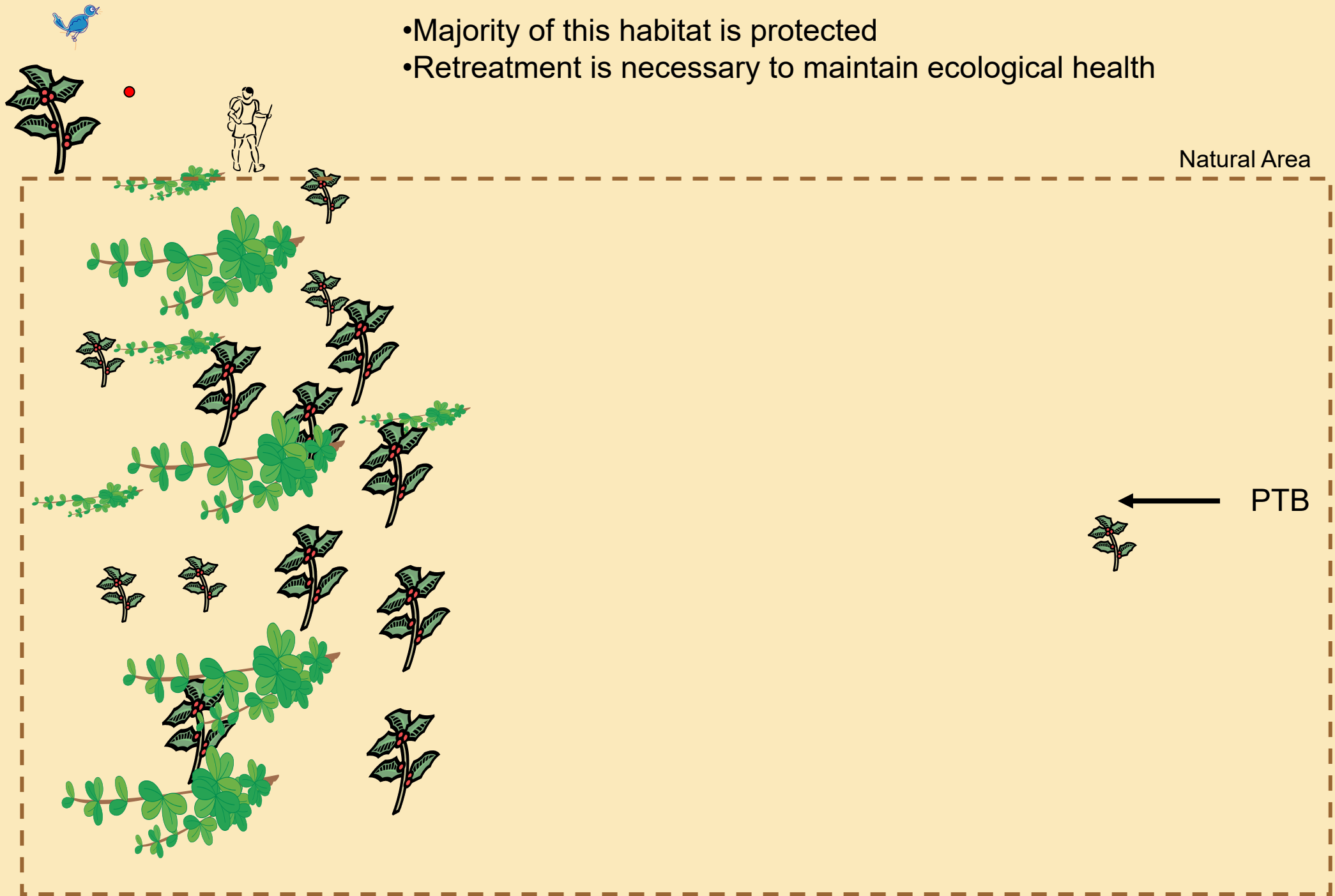
Natural Area



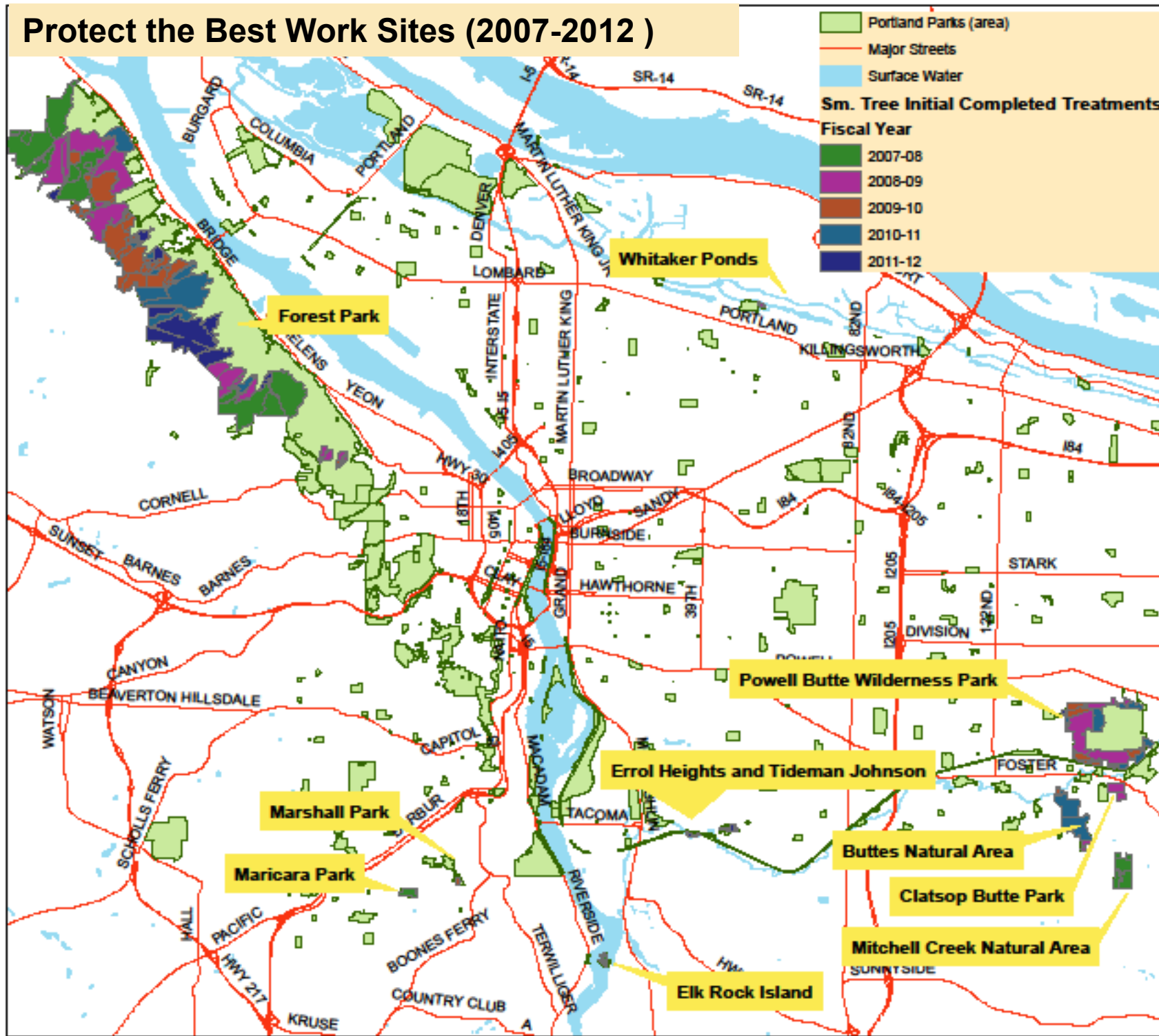
Ecologically Degraded
Invasives ↑
Natives ↓

Ecologically Healthy
Invasives ↓
Natives ↑

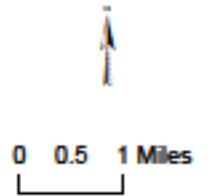
- Majority of this habitat is protected
- Retreatment is necessary to maintain ecological health



Protect the Best Work Sites (2007-2012)



Completed Initial Treatments



English Holly (*Ilex aquifolium*) In Forest Park

PTB removes invasive species from remote locations



English Holly After Removal

- A potential invasive seed source has been removed
- Now there is space for the natives to re-establish



Two holly treatments with triclopyr products

- Cut Stump – 50% Element 3a
- Basal Bark Treatments – 25% Garlon 4 Ultra (in methylated seed oil)

Element 3a



Garlon 4 ultra



Element 3a Cut Stump Treatments

Field Gear



Hard Hat

2-way Radio

1st Aid Kit

Chainsaw Gas & Oil

Chainsaw Chaps

Steel toe boots

Element 3a Cut Stump Treatments: Tactics



- Crew spreads out along treatment areas and walks in lines
- Members are typically 50' apart
- Remove all invasive trees and small patches of invasive forbs and vines

Element 3A Cut Stump Treatment – Forest Park, before treatment



Main Trunks

Small Stems & Runners

Element 3A Cut Stump Treatment
•Cutting access with a chainsaw



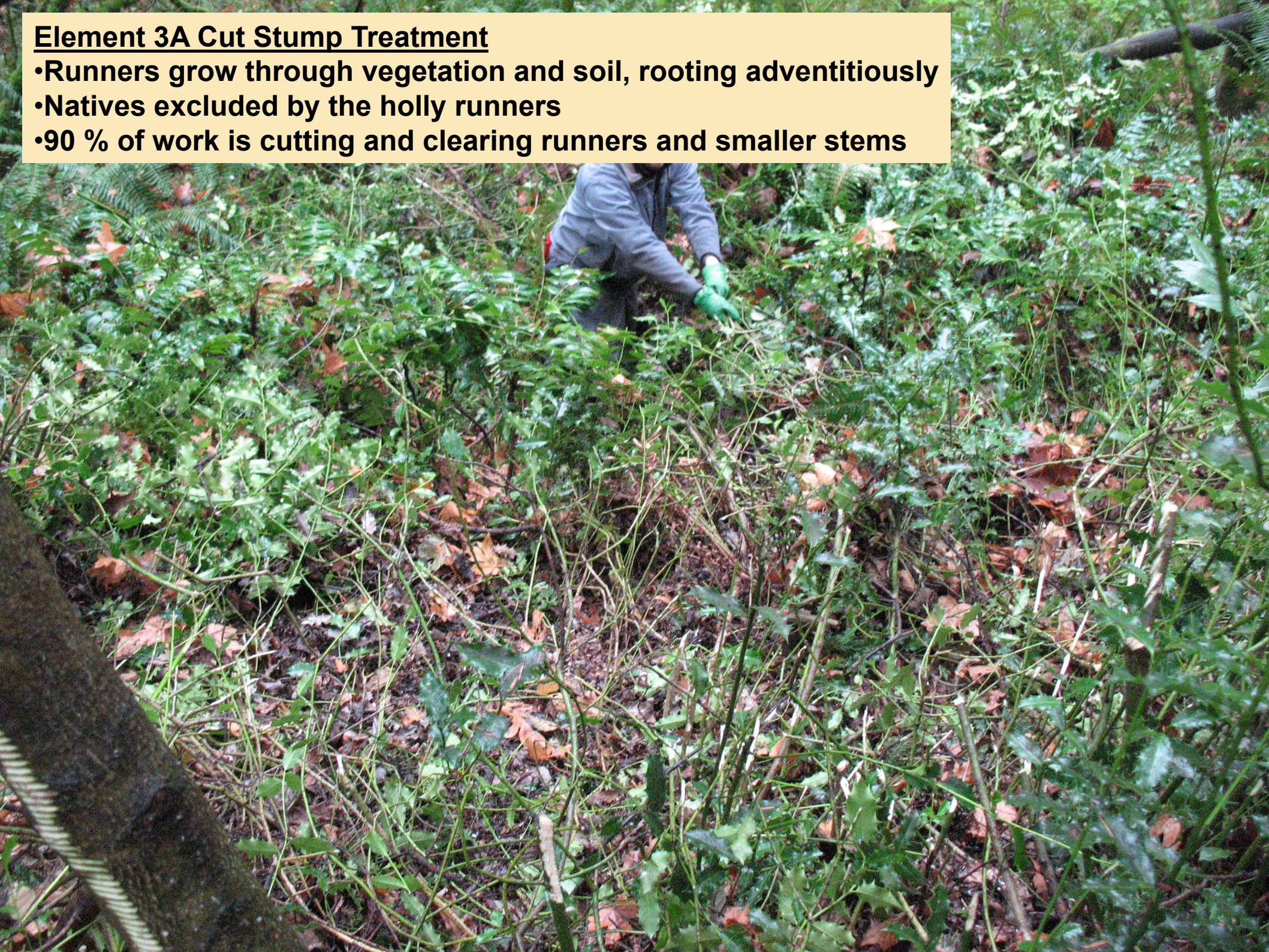
Element 3A Cut Stump Treatment

- Cutting small stems
- Example of stem that has re-rooted into the ground



Element 3A Cut Stump Treatment

- Runners grow through vegetation and soil, rooting adventitiously
- Natives excluded by the holly runners
- 90 % of work is cutting and clearing runners and smaller stems



Element 3A Cut Stump Treatment

- Hand clipping runners
- Removing duff



English Holly Treatment
•Spraying cut runners



Element 3A Cut Stump Treatment

•Cutting Trunk



English Holly Treatment

•Spraying cut stump



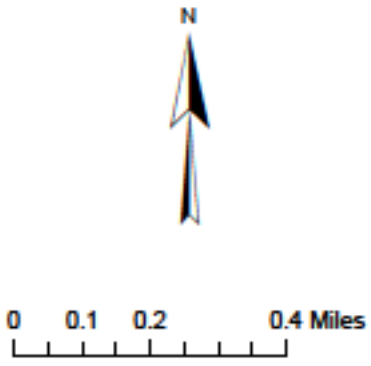
English Holly Treatment

- Taking GPS Point
- This is a record of the treatment that will be used to find this tree in 2 years



Element 3A Cut Stump Treatment
•Completed Cut and Spray





Invasive Plants

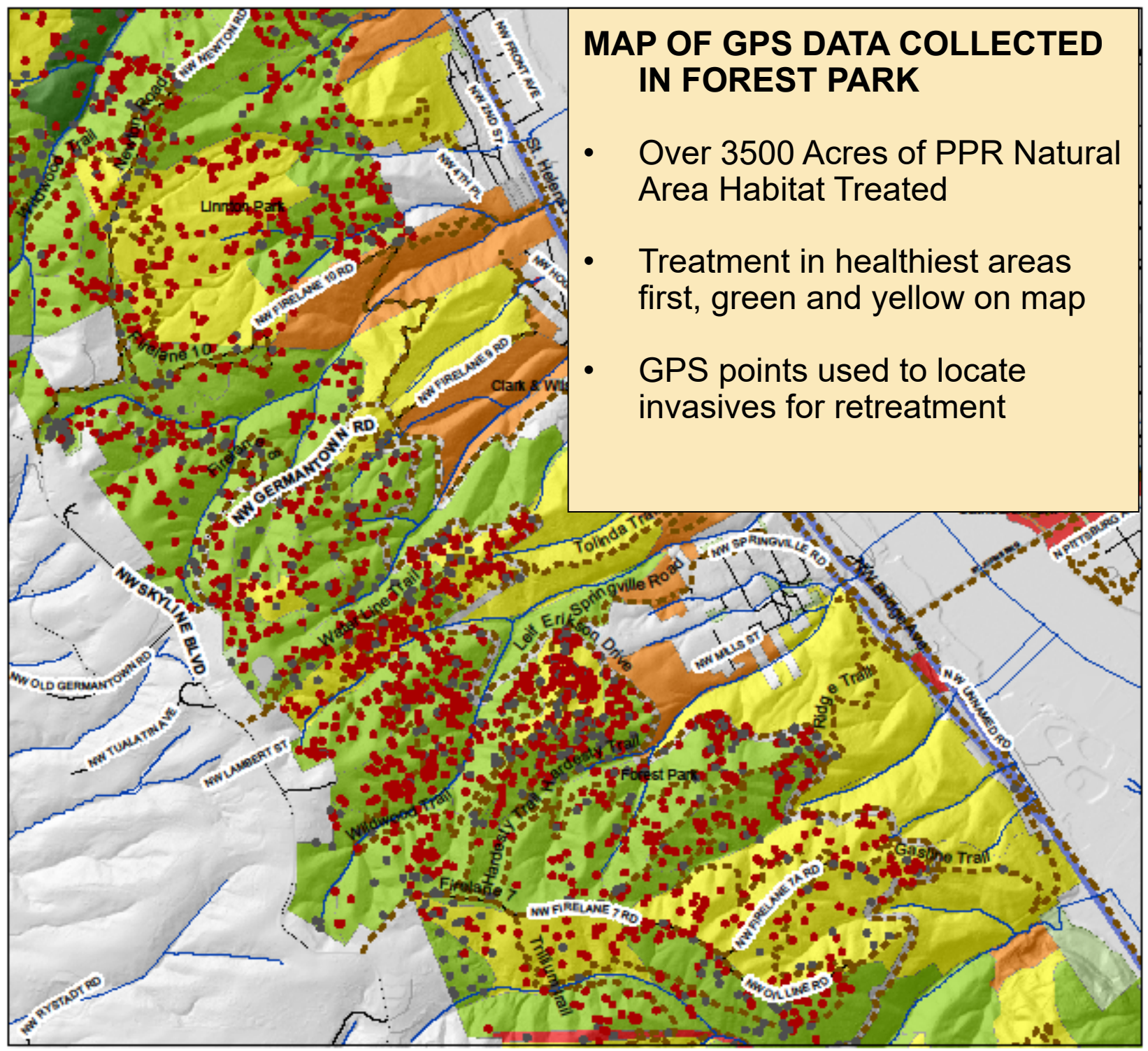
- <all other values>

Species

- Ilex aquifolium
- stream_line_pdx

EcoHealth Rating

- not surveyed
- Healthy
- Good
- Fair
- Poor
- Degraded

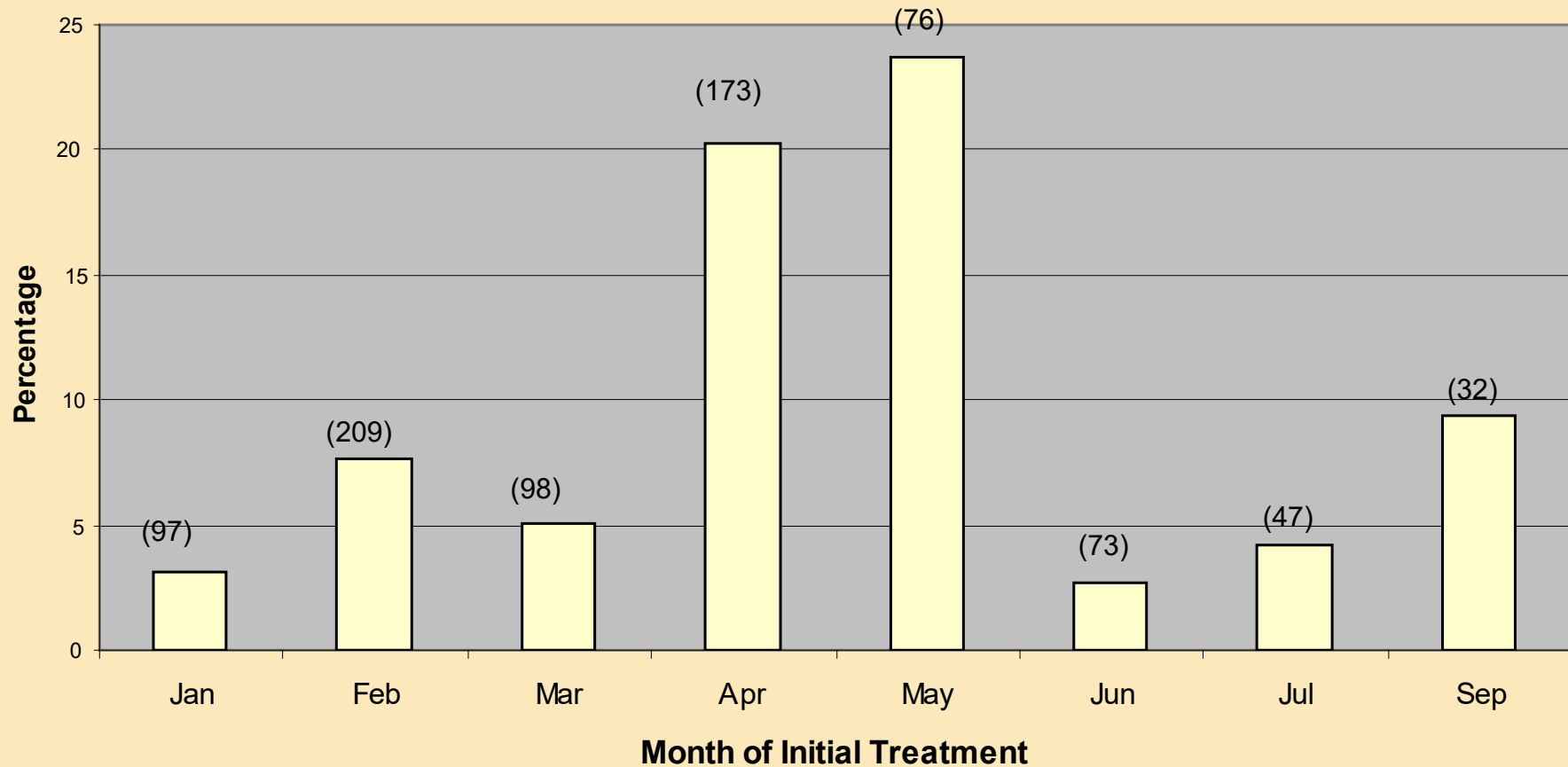


MAP OF GPS DATA COLLECTED IN FOREST PARK

- Over 3500 Acres of PPR Natural Area Habitat Treated
- Treatment in healthiest areas first, green and yellow on map
- GPS points used to locate invasives for retreatment

Regrowth two years later on large stems (>3" dia.) was generally low, but 3x as high in April and May

Percentage of Cut Holly Trunks with Regrowth



•Sap pushing up in the spring may be responsible for higher regrowth in April and May

Element 3a Cut Stump Treatments: PPE/Safety

- “Danger” label
- Hazard to eyes requires enclosed goggles
- Other PPE: 14 mil gloves (not surgical), long sleeve shirt, pants, closed toed shoes
- 15 Minute Eyewash Station



Garlon 4 Ultra Basal Bark Treatments – English Holly



- Ester formulation of trichlopyr
- 25% Garlon 4 Ultra + 75% MSO
- Apply up to 18" high ring on stems as large as 6" diameter
- Cover entire root crown



Lesions caused by Garlon 4 Ultra one month after application

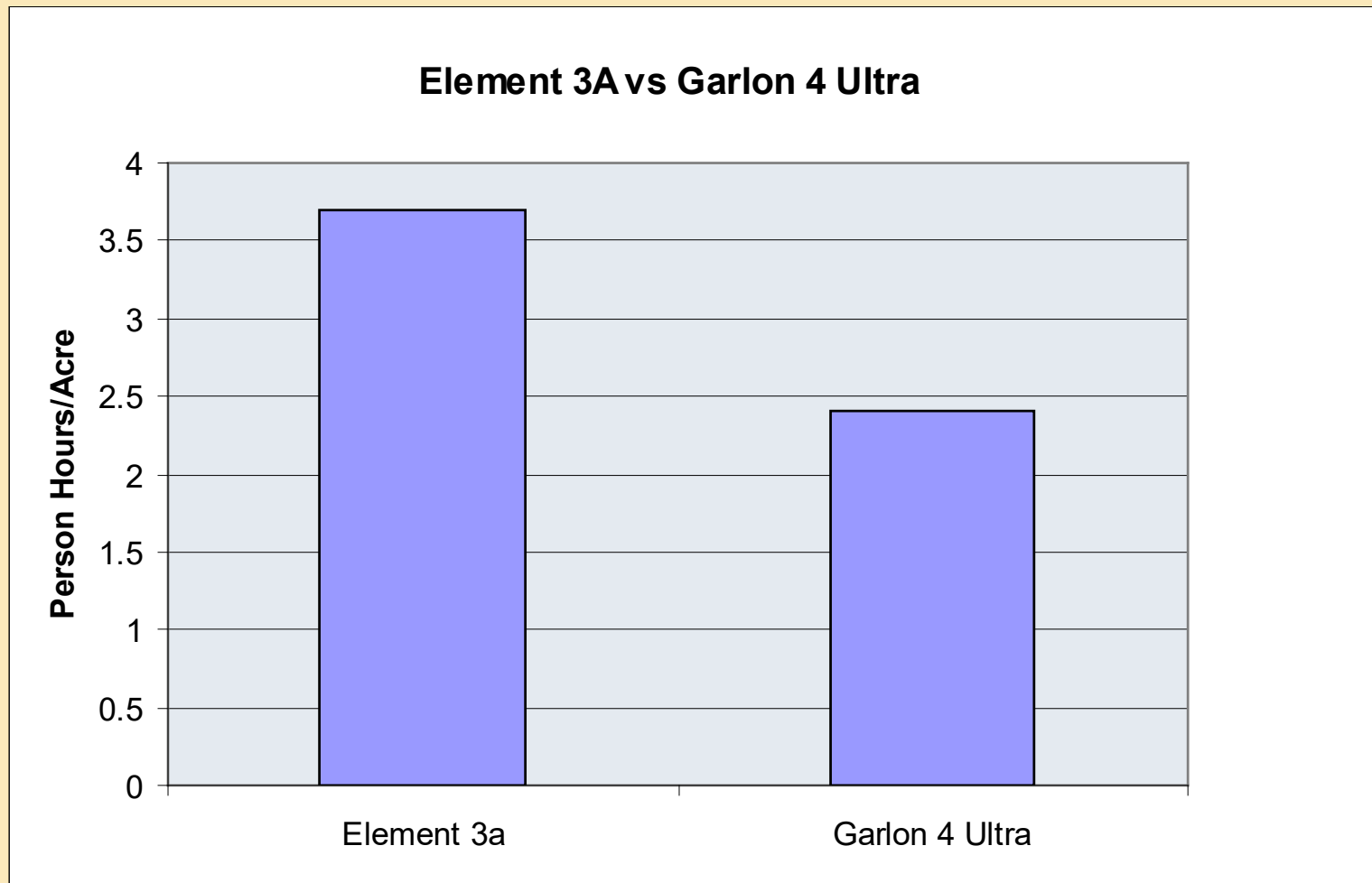


6 Months After Treatment



Garlon 4 Treatments are Fast

- Garlon 4 Ultra– 70% more acres for equal work time



Garlon 4 Basal Bark Treatments: PPE & Safety

- Garlon 4 ultra: Caution label
- Major path of entry is dermal
- PPE: 14 mil glove, long sleeve shirt, closed toed shoes



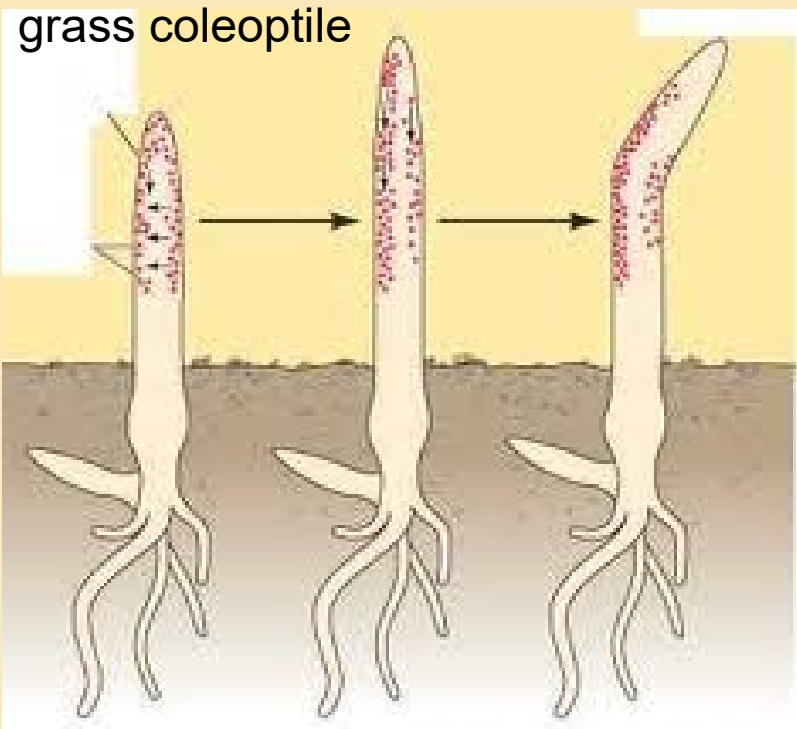
Triclopyr toxicity and half-life

- Triclopyr is chemically similar to the plant growth hormone auxin
- Generally low toxicity to animals
- Half-life of 30d or less in soil
- Half-life in water 1-10 d

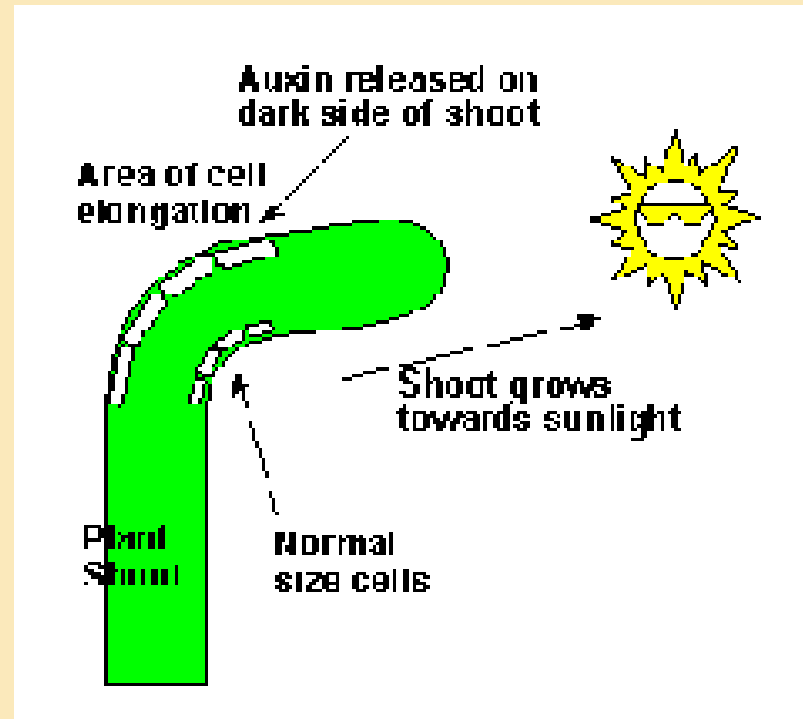
(NPIC general fact sheet, 2002)

Auxin accumulation causes plant cell expansion

Auxin accumulates on left side, expanding cells and bending to the right



Coleoptile responds to sunlight by accumulating auxin on dark side, expanding those cells and growing toward light



Auxin disregulation and plant growth

- “Twisted” growth forms often precede plant death when auxin mimics like Triclopyr and 2,4 D are applied

White Pine (Triclopyr)



Tomato (2,4 D)





Acknowledgements

Lynn Barlow – City Nature Natural
Areas Supervisor
City Nature Staff
Josh Darling, PPR GIS Specialist
Bureau of Environmental Services:
Grey to Green Initiative

Element 3a Cut-Stump Mix

- Herbicide Mix: 75% Element 3A, 0.5% Phase surfactant, & blue indicator dye
- Applied to the surface of cut stems
- Applications within 25' of surface water
Phase surfactant is not used



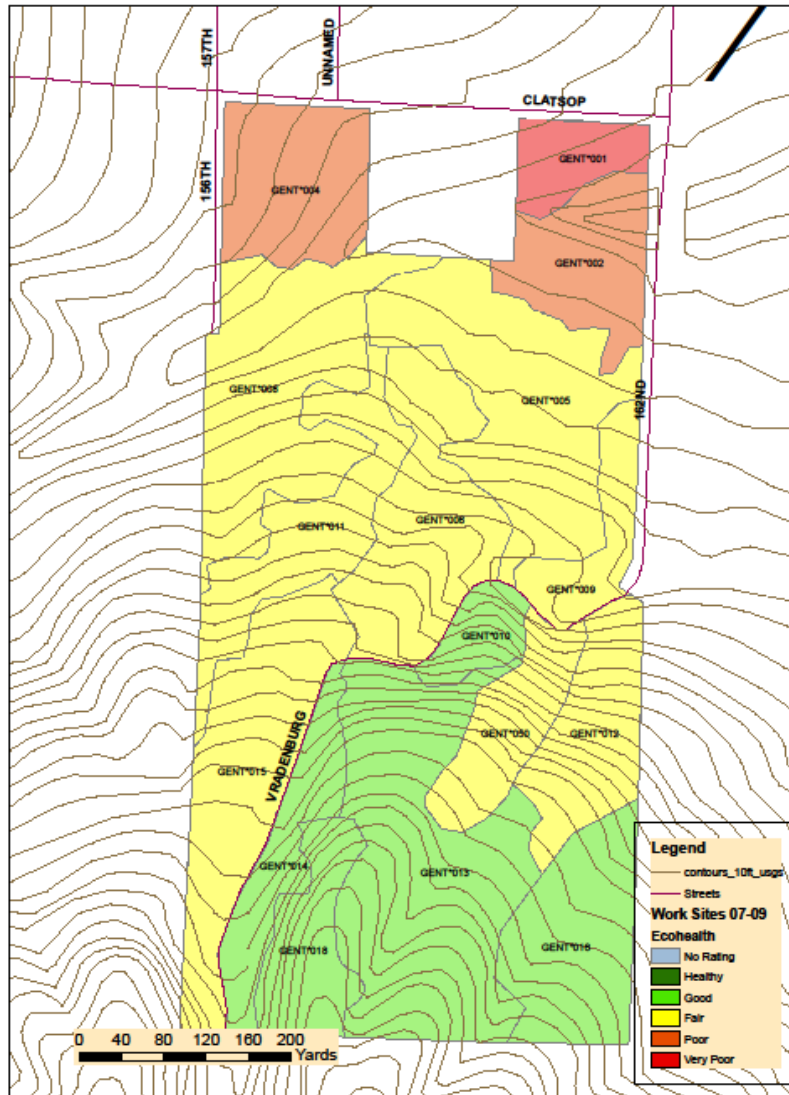
Element 3a Cut Stump Treatments

- Spray Master, Zepp and Sprays-all



Ecological Health of PPR Natural Area Parks

Vegetation Survey 2003-2004



Defining Ecological Health

Healthy (Dark Green) to Severely Degraded (Red)

- Native Vegetation
Canopy, sub-canopy, shrubs, forbs, snags, downed wood
- Non-Native, Invasive Vegetation
- Other Impacts
Erosion, road grades, compacted soil, refuse
- Total of 8100 acres of Natural Area
- Acre Ratings:
 - 100 Healthy
 - 2600 Good
 - 3100 Fair

Criteria for Choosing Work Sites

1. **Ecohealth Rating**
2. **Dispersed Throughout Portland**
3. **Unique Habitat**
 - e.g., oak-madrone forest at Elk Rock Island
4. **Previous Restoration Work**
 - Including the work of PP&R staff, volunteers, BES Re-Veg., and other groups



Oak-Madone Habitat at Elk Rock Island

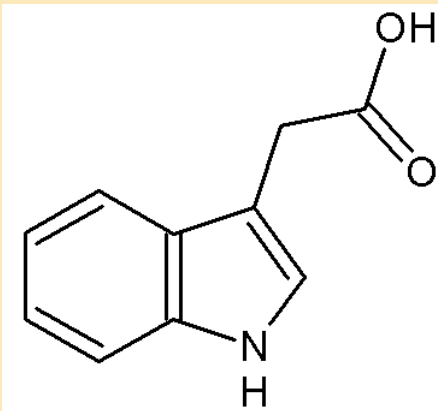
Garlon 4 Ultra Basal Bark Applications

- Marketed in garden shops and hardware stores as Turflon Ester®.
- Ester formulation of Triclopyr
- Oil-based product that penetrates thin-barked trees
- Tank Mix: 25 % Garlon 4 Ultra in Methylated Seed Oil (Loveland) + blue oil-based dye
- Applied around entire root collar of stems as large as 6" (label); reliable results on 3" or less holly
- Acts as a chemical girdle

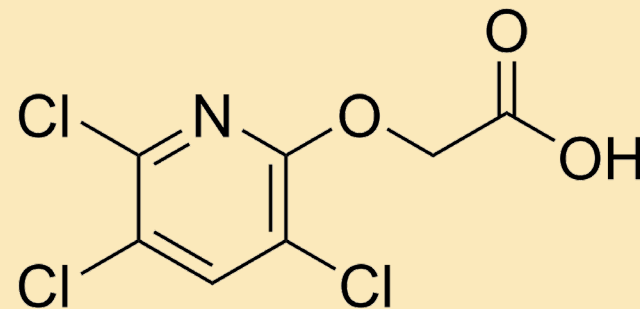
Uncontrolled plant growth caused by triclopyr

- Triclopyr (auxin mimic) → uncontrolled cell growth, death
- High concentrations of triclopyr can have the opposite effect of inhibiting cell division and growth
- Translocated systemically

Auxin



Triclopyr



Mix: 25% Garlon 4 Ultra in MSO + oil based dye

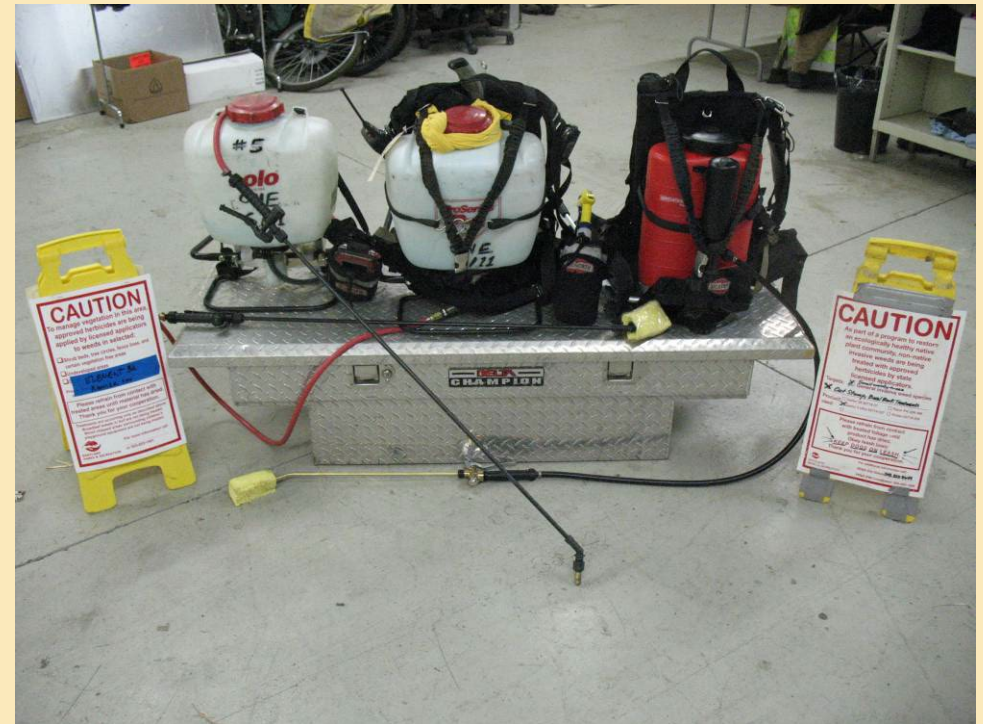


PTB has tested a number of backpack sprayers

Solo mounted on chainsaw backpack



Line-up: Solo, Solo with backpack, Birchmeier with backpack



14 Mil Nitrile Glove



Garlon 4 Ultra can be applied in mild rain



Garlon 4 Ultra

- PTB treats stems < 3" with Garlon 4 ultra



Sawyer cutting in prep for Garlon 4 Ultra



Garlon 4 Ultra: spraying runners and small stems



If you mix water and Garlon 4 ultra/MSO...



1 month after treatment



Treated Runners 6 Months after Application

Neighboring vegetation intact



Large holly with cut runners



Standing holly make retreatment easier

6 Months after application



G3-G4 comparison

Element 3a

- Aqueous, amine form
- Non-volatile
- All season application
- Less regrowth
- Long treatment time
- Warning label (damaging to eyes)
- Sprayer seals last longer

Garlon 4 Ultra

- Oil-based, ester form
- Volatile above 60°F
- Application in fall, winter and early spring
- More regrowth
- Short treatment time
- Caution label
- Sprayers seals corroded

PTB uses Element 3A (triclopyr) to treat a variety of species

- 50% Element 3A used to treat woody species: cherry, laurel, **holly**, hawthorn
- 75% Element 3A used to treat large cherry, girdle
- 2% Element 3A foliar application to Himalayan blackberry, garlic mustard, Canada thistle
- 2% Element 3A + 2% RangerPro (glyphosate) for English ivy

Holly Re-treatment



Holly Retreatment:GPS



Waterproof Otterbox case
for GPS equipment

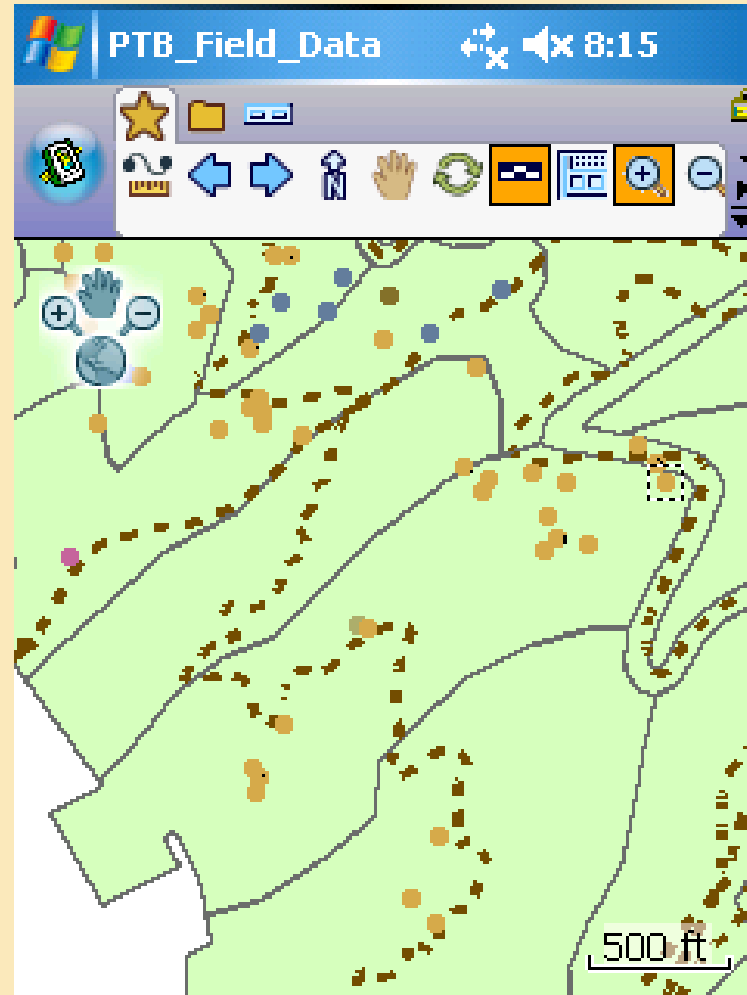
Blue tooth GPS receiver

HP iPAQ handheld
computer

Water-tight GPS unit

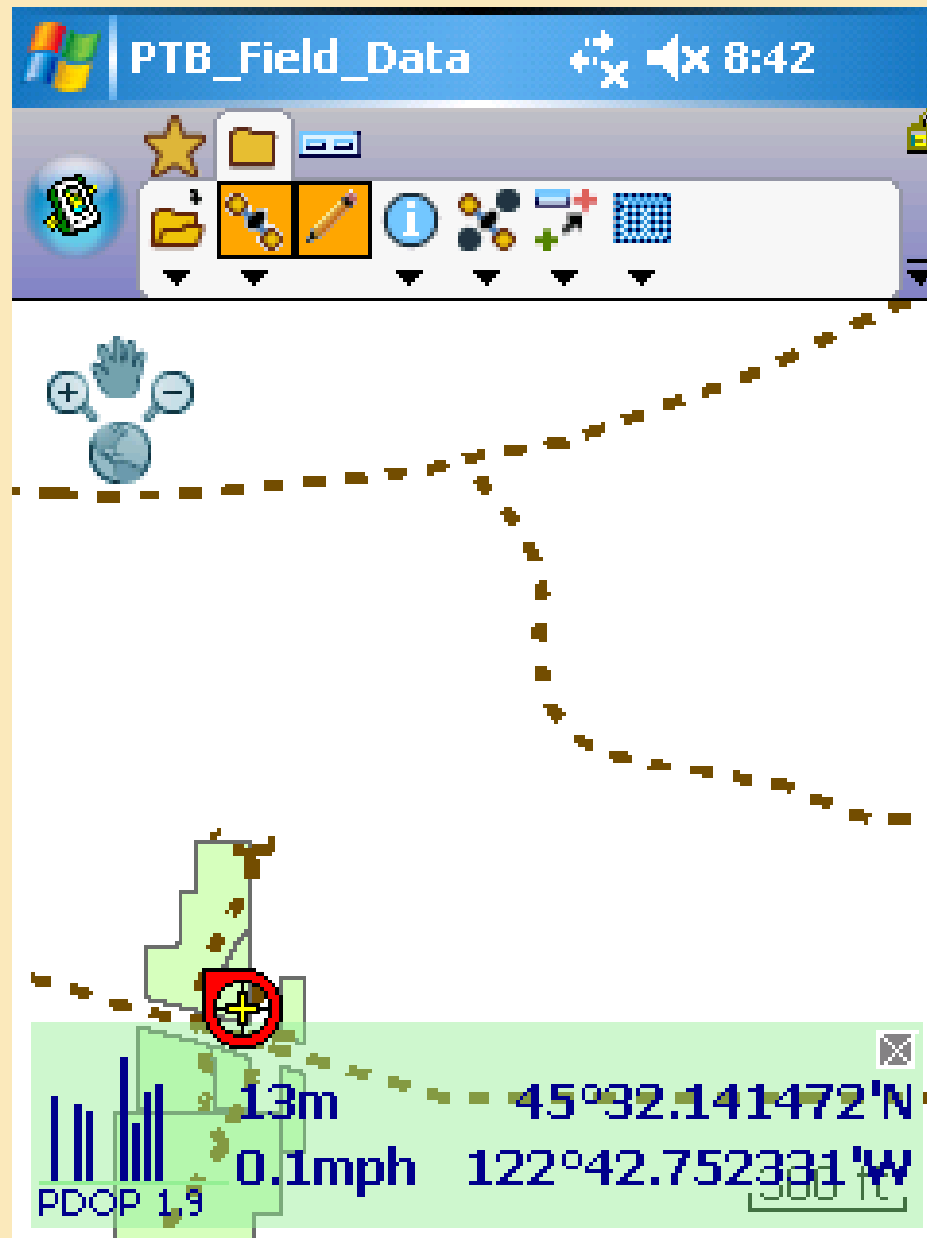


PDA screen with toolbar and map



- Yellow points are Ilex Aquifolium.
- Gray lines divide parks property into vegetation units
- Dashed lines are trails and services roads

Red cursor indicates map position



Data entry page

The screenshot shows a Windows-style application window titled "PTB_Field_Data". The window has a blue title bar with the Windows logo, the title text, and standard window controls (minimize, maximize, close). Below the title bar, the text "PTB Weed Points" is displayed in blue. The main content area contains a form with several fields, each with a dropdown arrow on the right:

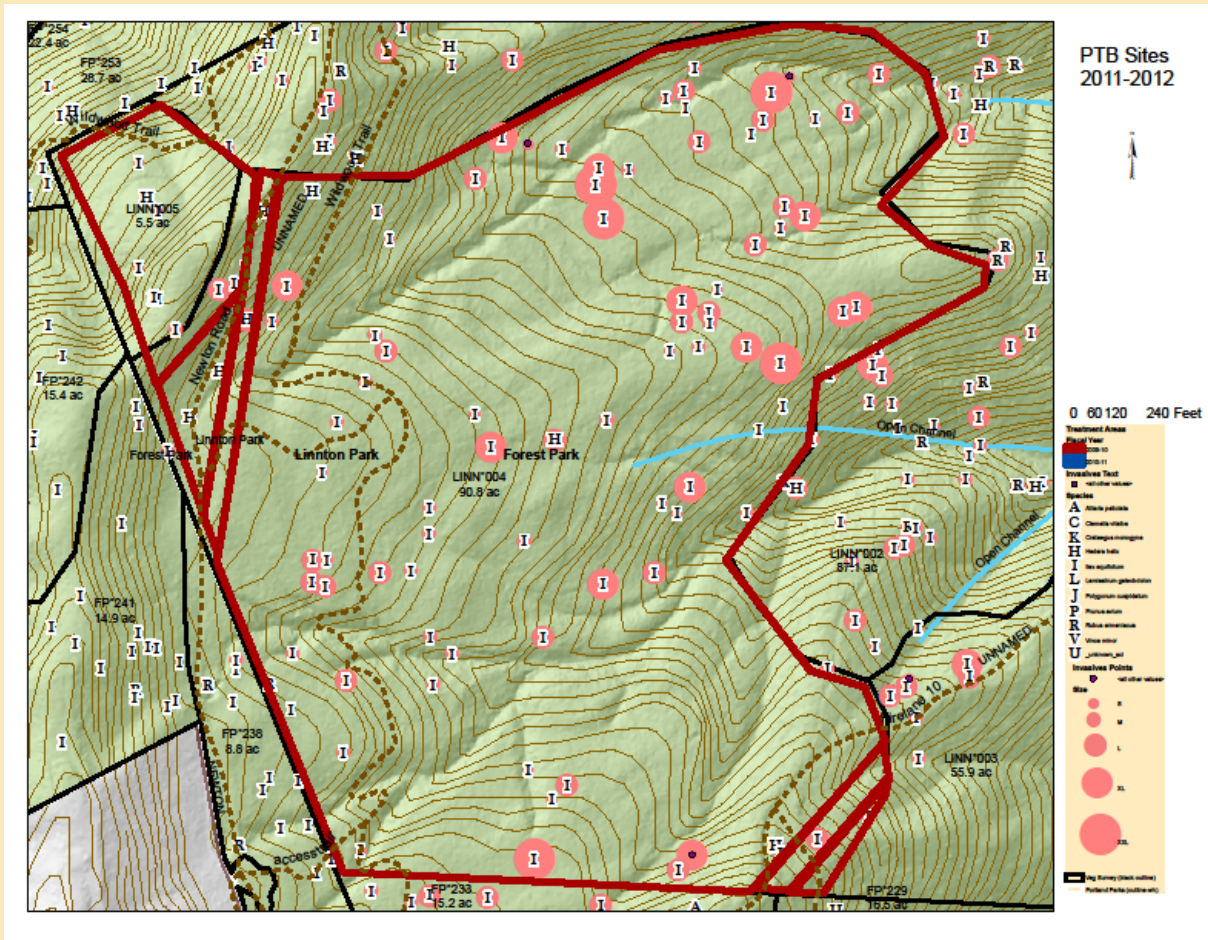
- Species: *Alex aquifolium*
- Size: <Null>
- Treatment: Chemical
- Date: 11/25/09
- Precipitation: <Null>
- Temp (F): (empty)

At the bottom of the window, there is a navigation bar with three buttons: "Data" (with a calendar icon), "Reference" (with a book icon), and "Geography" (with a globe icon). Below the navigation bar is a status bar containing an "ok" button (green circle with white text), a red "X" button, a keyboard icon, and a small upward-pointing arrow.

Holly Re-treatment

- Points taken for initial treatments are used to locate stumps
- Any shoots that have **re-sprouted** are cut and sprayed using 75% Element 3A herbicide mixture
- Any trees that were **missed** during initial treatment are treated at this time and GPS data is recorded

Holly Retreatment



- Sample map used for locating invasives that have been treated

- Points are invasive treatments, relative size indicated by size of the point

- Letters indicates species, e.g., I=Ilex aquifolium & H=Hedera helix

- Red lines are retreatment area boundaries

- Black lines are vegetation unit boundaries

Holly Retreatment

- Holly re-treatments occur two years after initial treatments
- Individual stumps are located using GPS units
- Any re-growth is treated using Element 3a

Regrowth on a cut stump that did not receive herbicide treatment

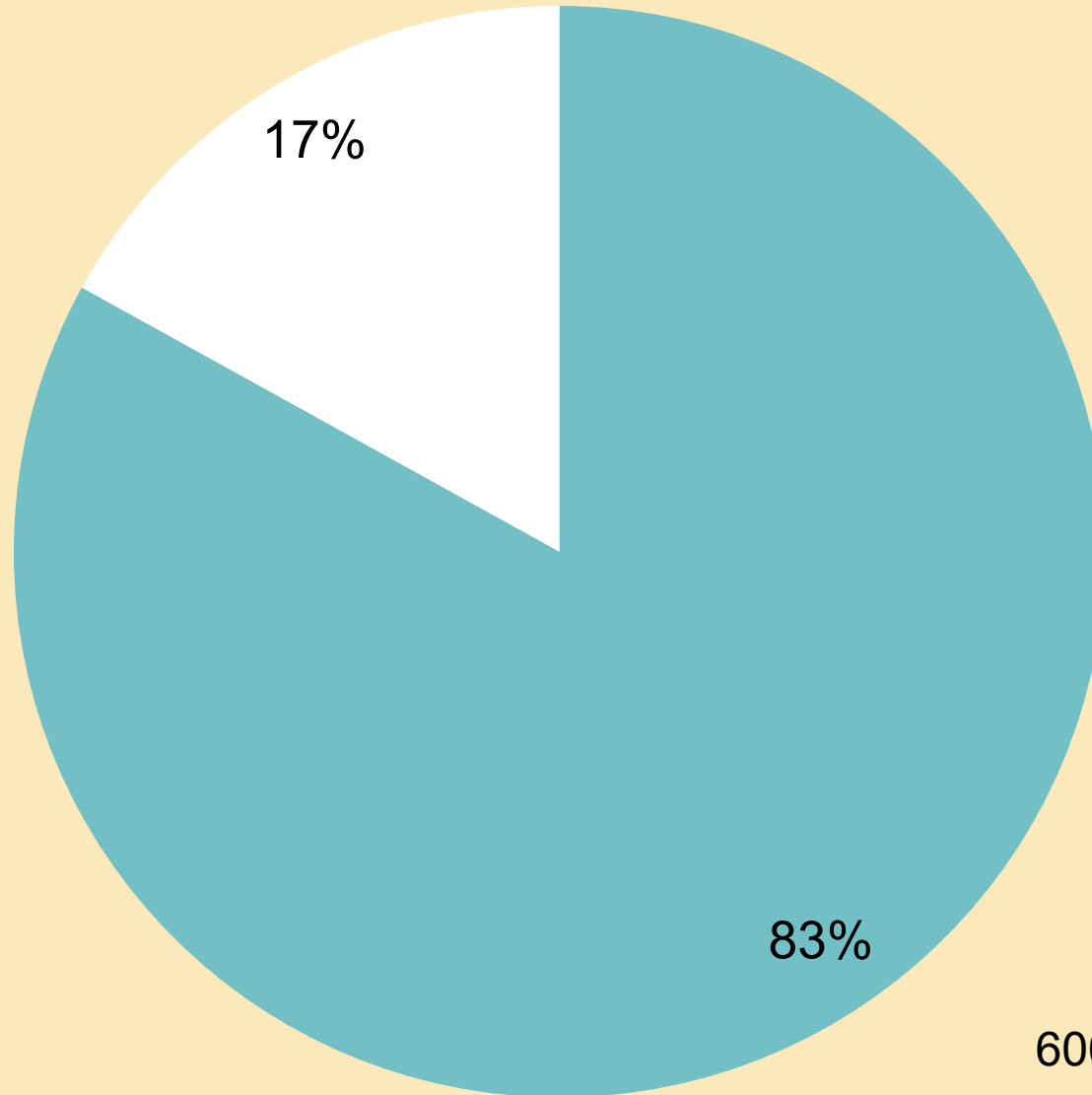


Holly Monitoring: Treatment Efficacy

- **How many holly had regrowth?** (we counted the number of holly with regrowth and comparing with total number visited to get a percentage)
- **Monitoring Data collection is concurrent with re-treatment**
- **At least one year after initial treatment**

Stump Search Success

■ Tree Found ■ Tree Not Found



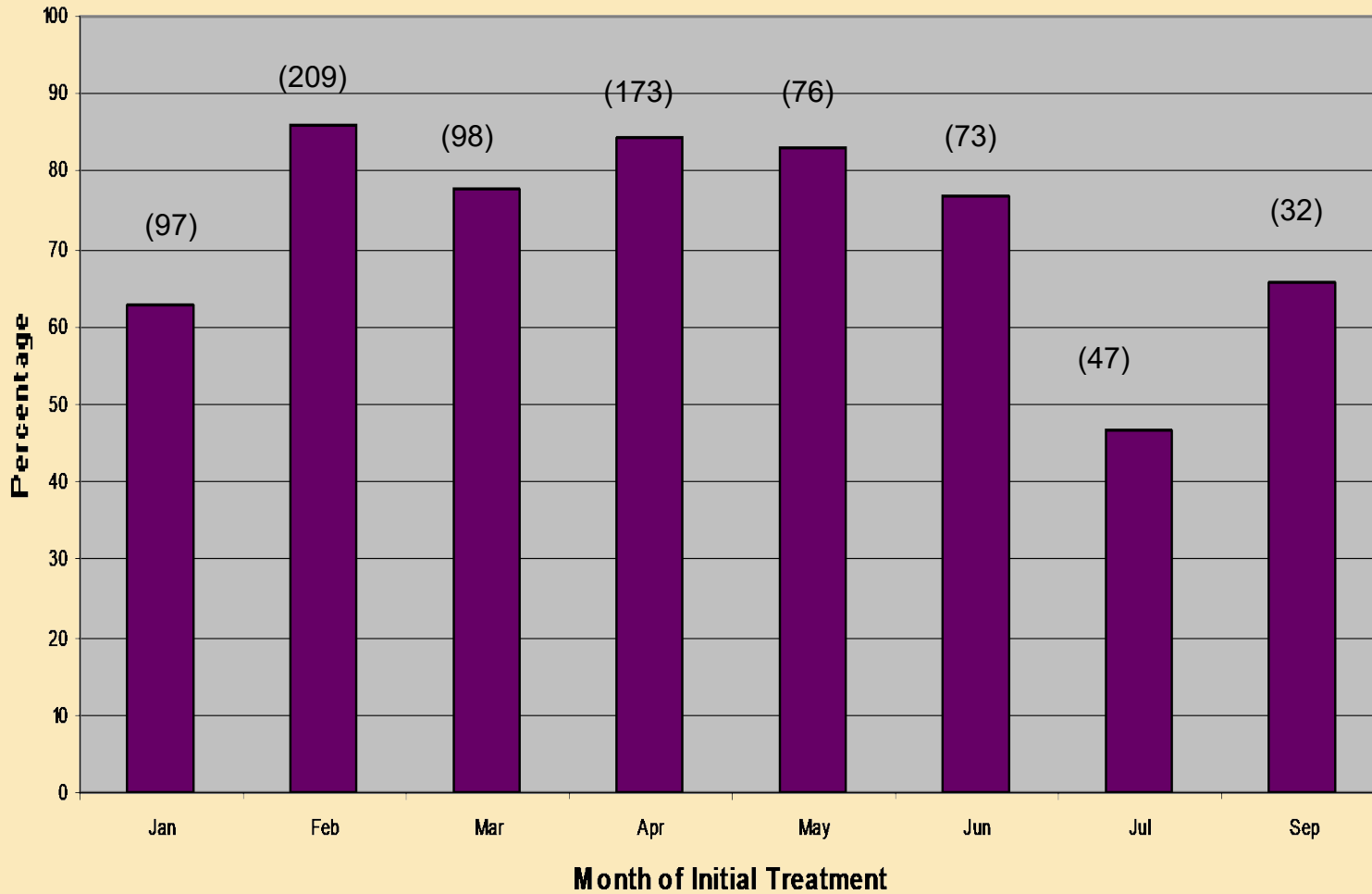
600 acres YTD

Cut holly 2 years later (1" dia.)



The majority of treated holly have regrowth that requires retreatment

Percent Treated Holly With Regrowth



- 50-85 % of treated holly had regrowth

- No clear monthly pattern to treatment success

- Majority of regrowth was runners

- Major reason for regrowth appeared to be missed runners

It is difficult to treat all runners



Monitoring of retreated holly

- How much regrowth one year after Retreatment 1 (Monitoring 2)?
- More follow-up monitoring needed but initial results suggest 95% of holly successfully removed

