Exotic Plant Inventory for Yellowstone National Park Northern Range

Principle Investigators:

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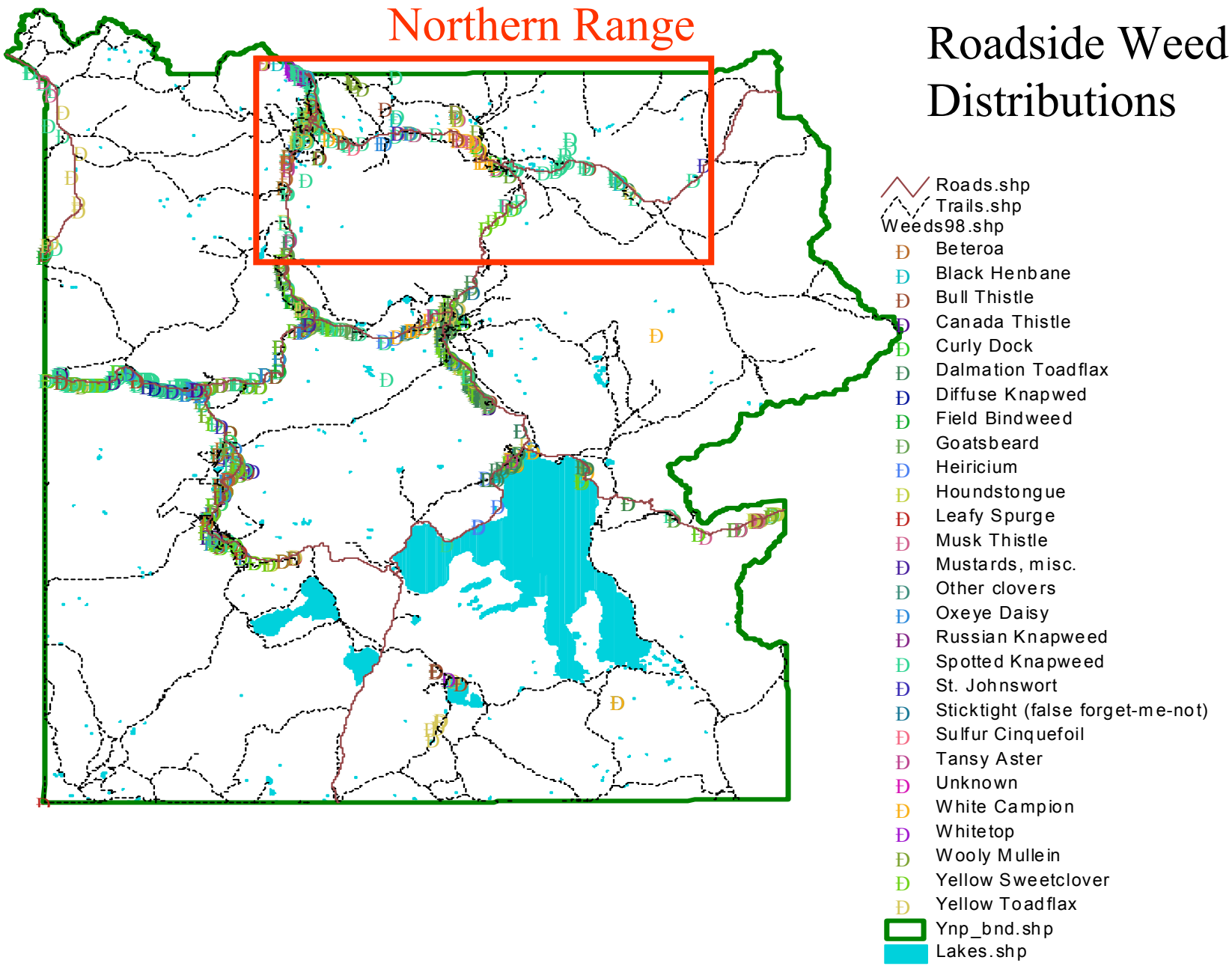
Objectives:

- Conduct a preliminary study to determine the most efficient means to inventory the exotic plant species in the Northern Range of Yellowstone National Park.
  - Develop an ARC-View based model that determines the most efficient sampling scheme for a range of assumed weed distributions and infestation sizes.
  - Conduct field sampling to verify likely weed distributions.
  - Input field sampling information into the model to determine the best method to inventory

Model Development

- Assumed weed distributions:
  - Random
  - Associated with veg. habitat types (association determined using previous roadside weed control data)
  - Declining weed frequency with distance from roads and trails (human activity)
- Assumed weed patch size distribution:
  - $< 2m^2$
  - $2\ m^2 – 5\ m^2$ patches
  - $5\ m^2 – 10\ m^2$ patches
  - $5\ m^2 – 100\ m^2$ patches
- Simulated sampling methods in model:
  - Random points
  - Points on $1\ km^2$ grid
  - Continuous transects 1, 2 & 5 km in length

Yellowstone National Park



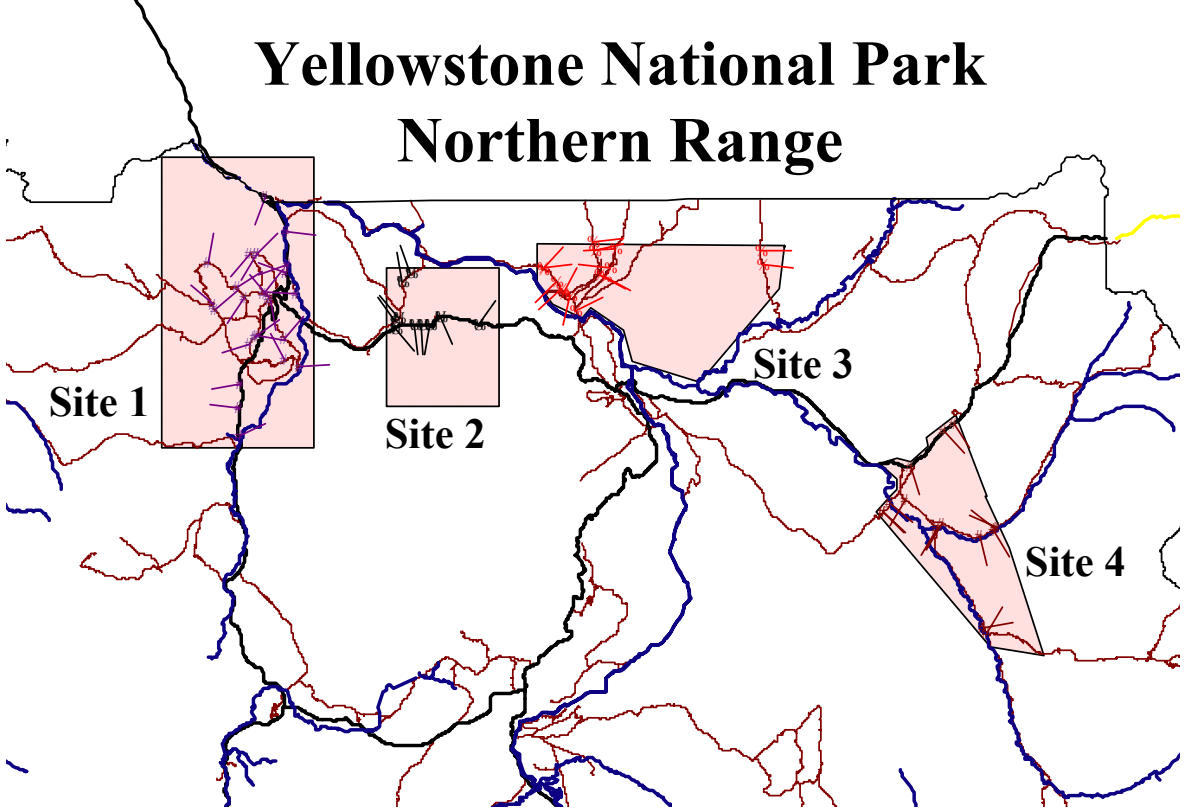
Model Simulation Results

- For a wide range of weed distributions and patch sizes and consideration for sampling efficiency, 2 km long transects perpendicular to roads were most effective for an inventory of the exotic plant species.

Field Methods:

- 4 sites selected (Mammoth, Blacktail, Tower/Slough and Lamar)
- 2 km long sampling transects were identified with the model by randomly selecting points along roads and trails and drawing the transect at 90° to the road or trail at the starting point.
- 2 person teams located the starting point with a GPS and walked along the continuous transect on the given azimuth recording weed locations and vegetation habitat type changes.

Yellowstone National Park
Northern Range



2001 Study Sites

- Boundary
- Trans4.shp
- Trans4a.shp
- Randpt4a.shp
- Randpt4.shp
- Trans2.shp
- Trans2a.shp
- Randpt2a.shp
- Randpt2.shp
- Trans1c.shp
- Randpt1c.shp
- Trans1b.shp
- Randpt1b.shp
- Trans1a.shp
- Randpt1a.shp
- Trans3.shp
- Randpt3.shp
- Roads_comb.shp
- Hydro_perennial.shp
- Roads.shp
- Trails.shp
- Sites2001.shp

All transects were set perpendicular to roads and trails from randomly selected points and are 2 k long and 8 m wide.

Site 1 = 25 transects
Site 2 = 10 transects
Site 3 = 15 transects
Site 4 = 15 transects

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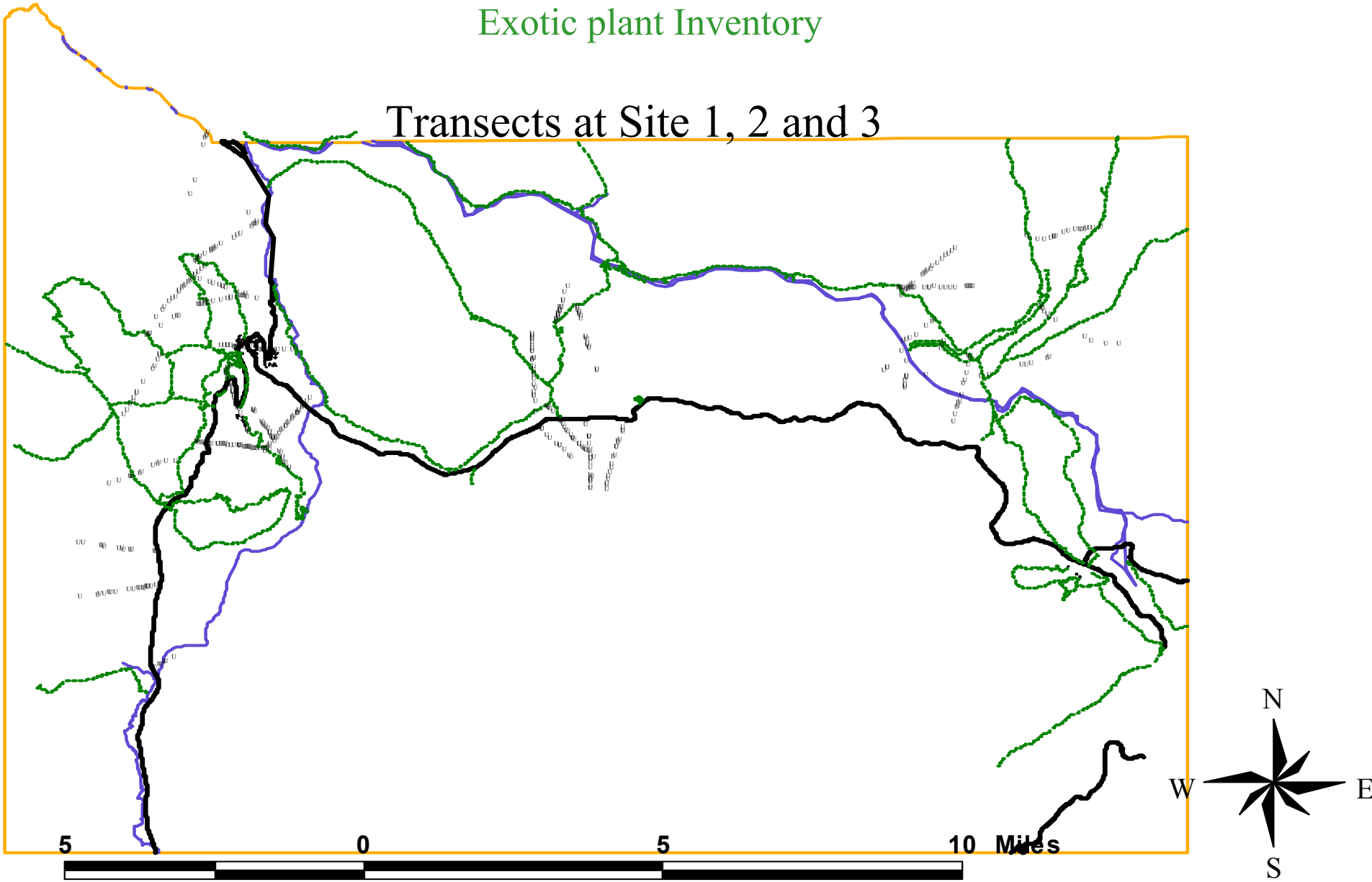
Reduced exotic plant species list for preliminary sample:

- Selection of indicator species was based on ability to see the plants in the field, their growth habit, restricted habitats, etc.
- 10 species:
  - Dalmatian toadflax - Timothy
  - Hound's tongue - Smooth brome
  - Spotted knapweed - Downey brome
  - Canada Thistle - Yellow sweetclover
  - Oxeye daisy - Leafy spurge

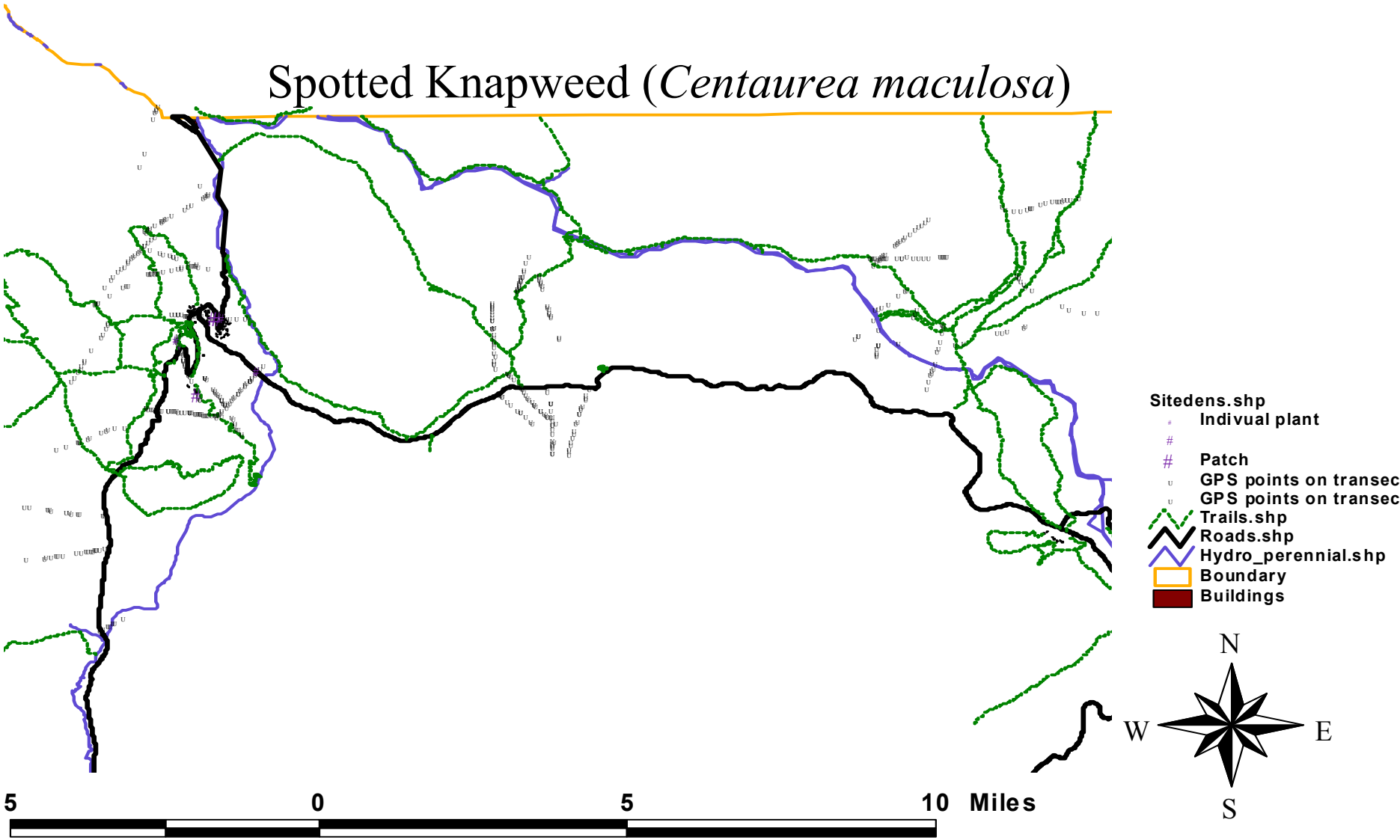
Yellowstone National Park Northern Range

Exotic plant Inventory



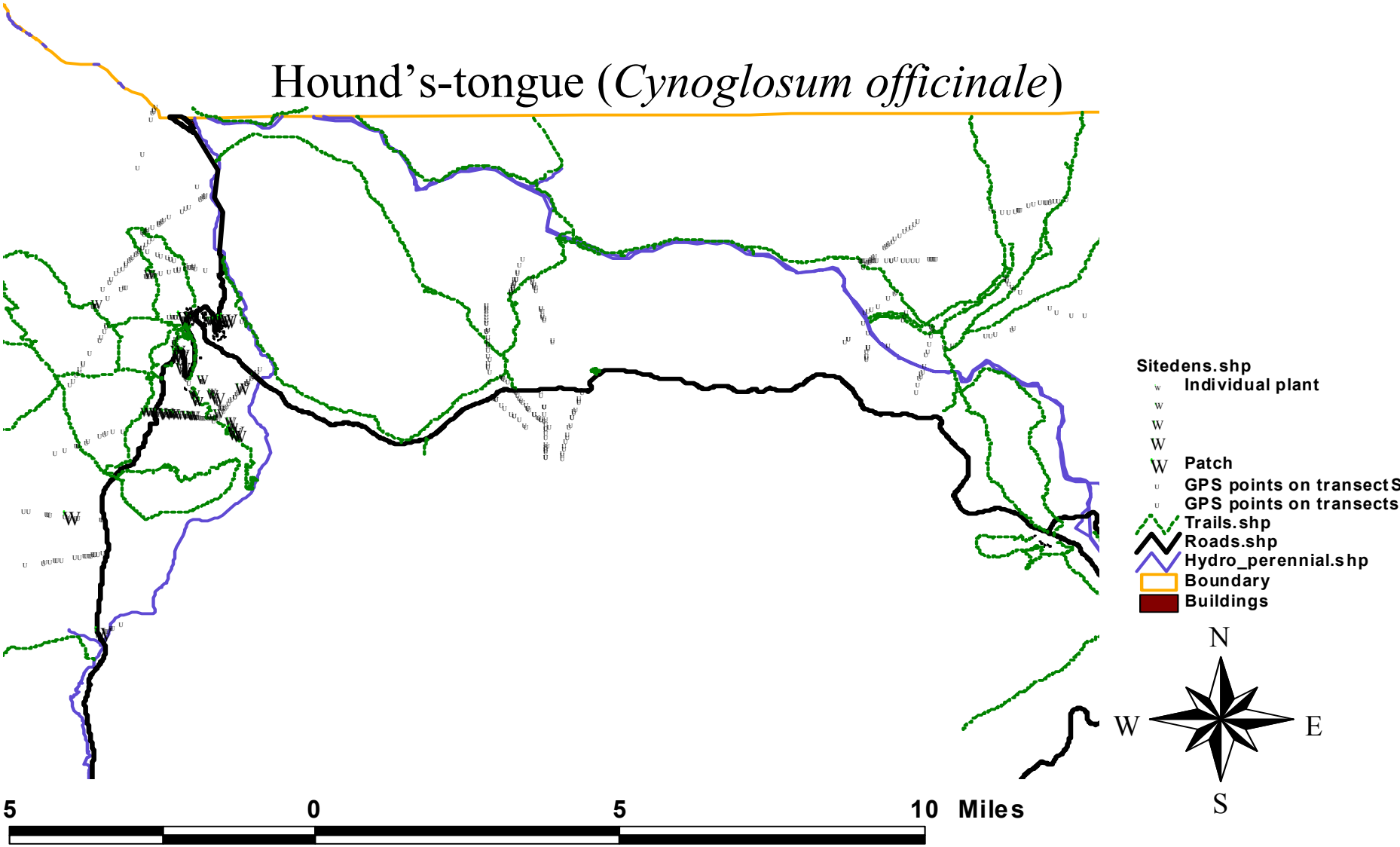
Yellowstone National Park Northern Range

Exotic plant Inventory



Yellowstone National Park Northern Range

Exotic plant Inventory



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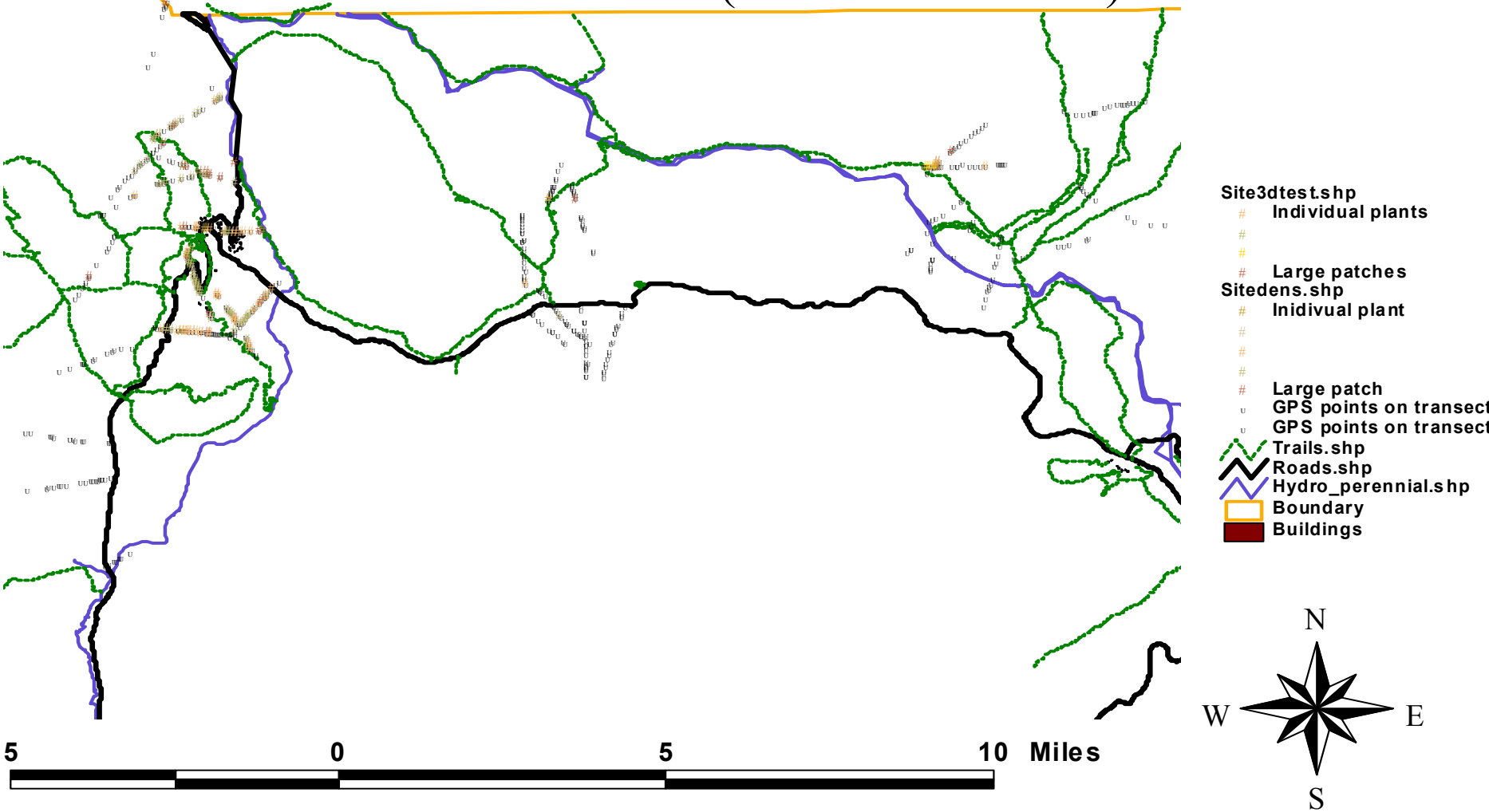
Exotic plant Inventory

Dalmation Toadfalx (*Linaria dalmatica*)



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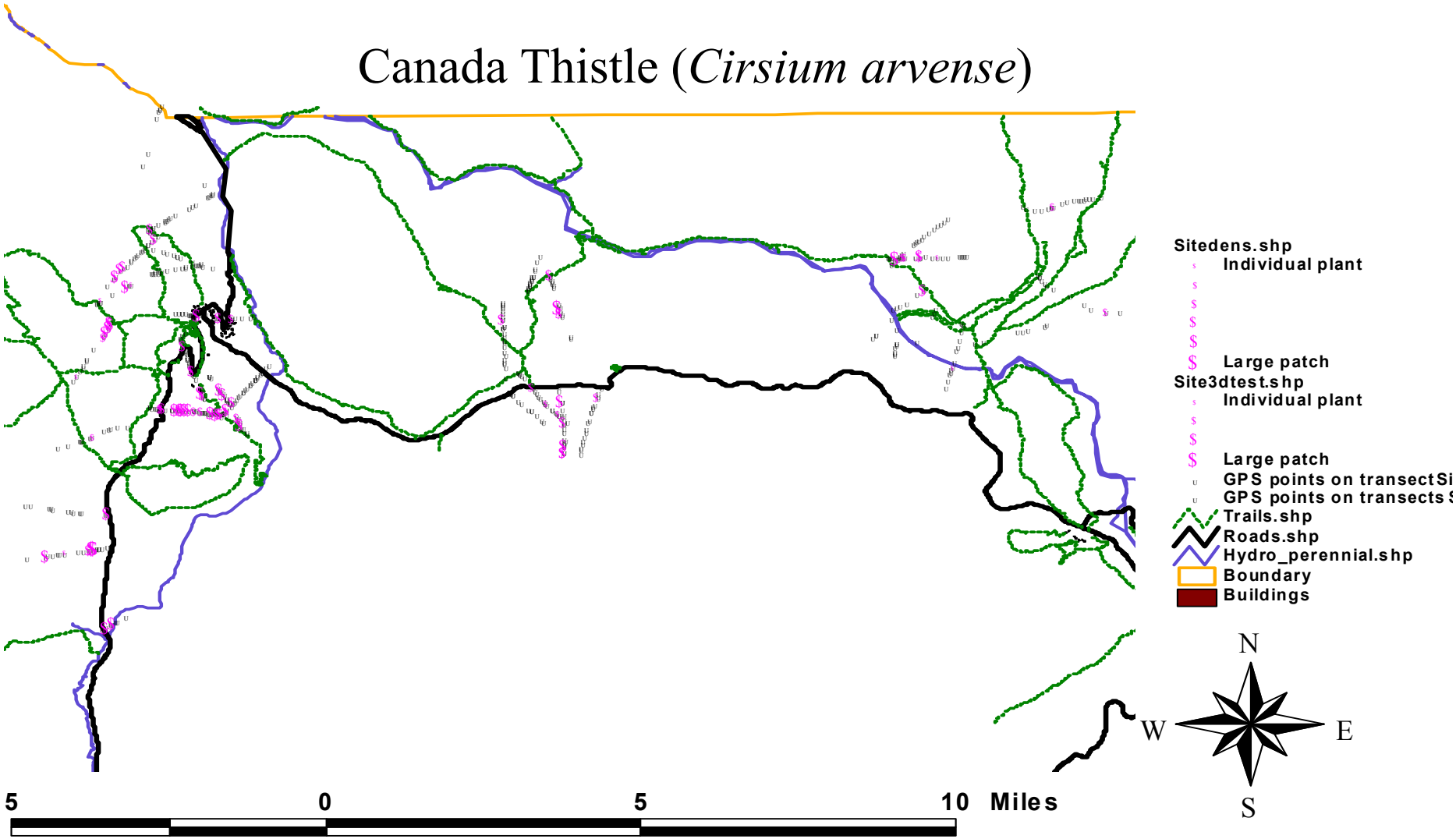

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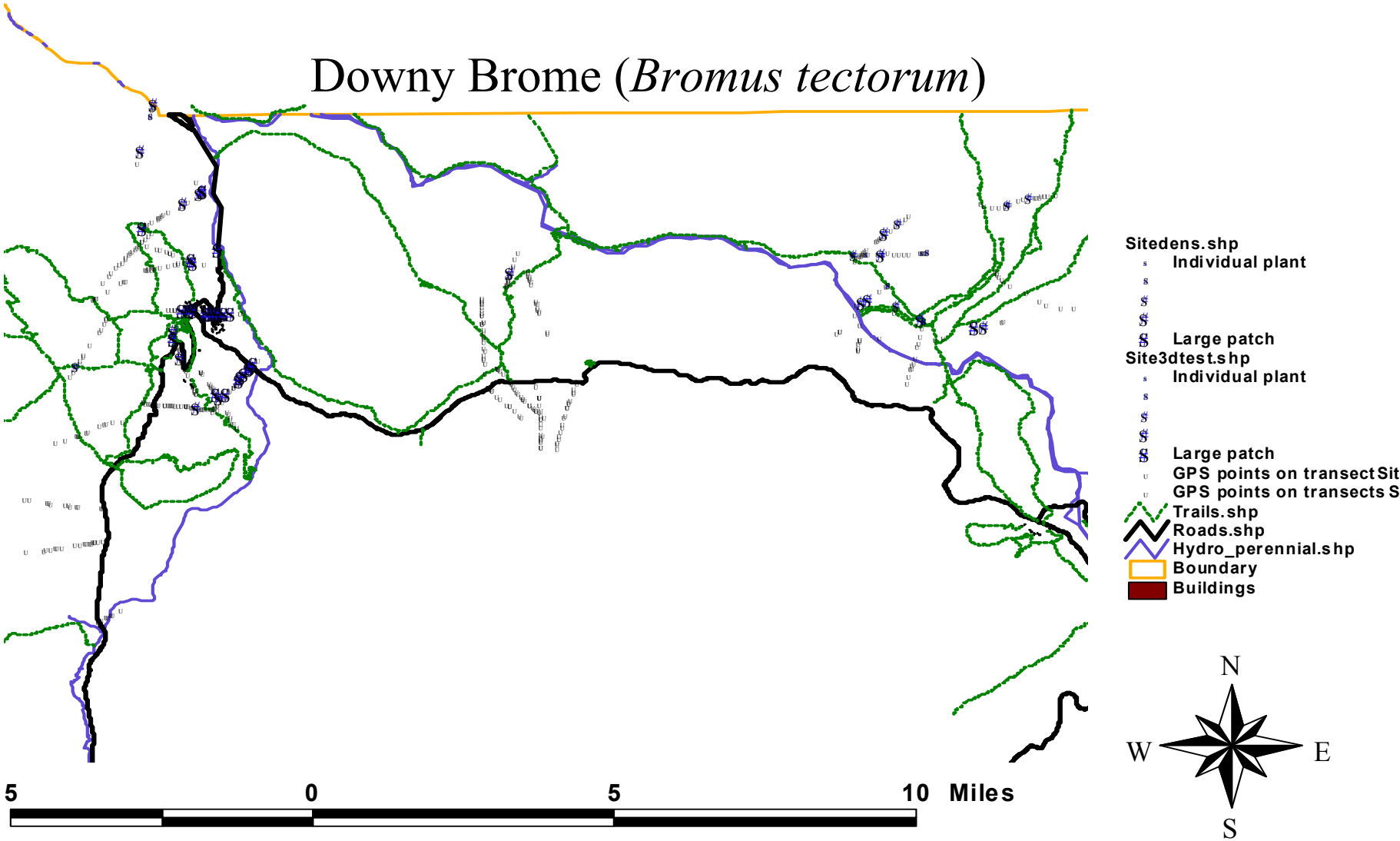
Exotic plant Inventory



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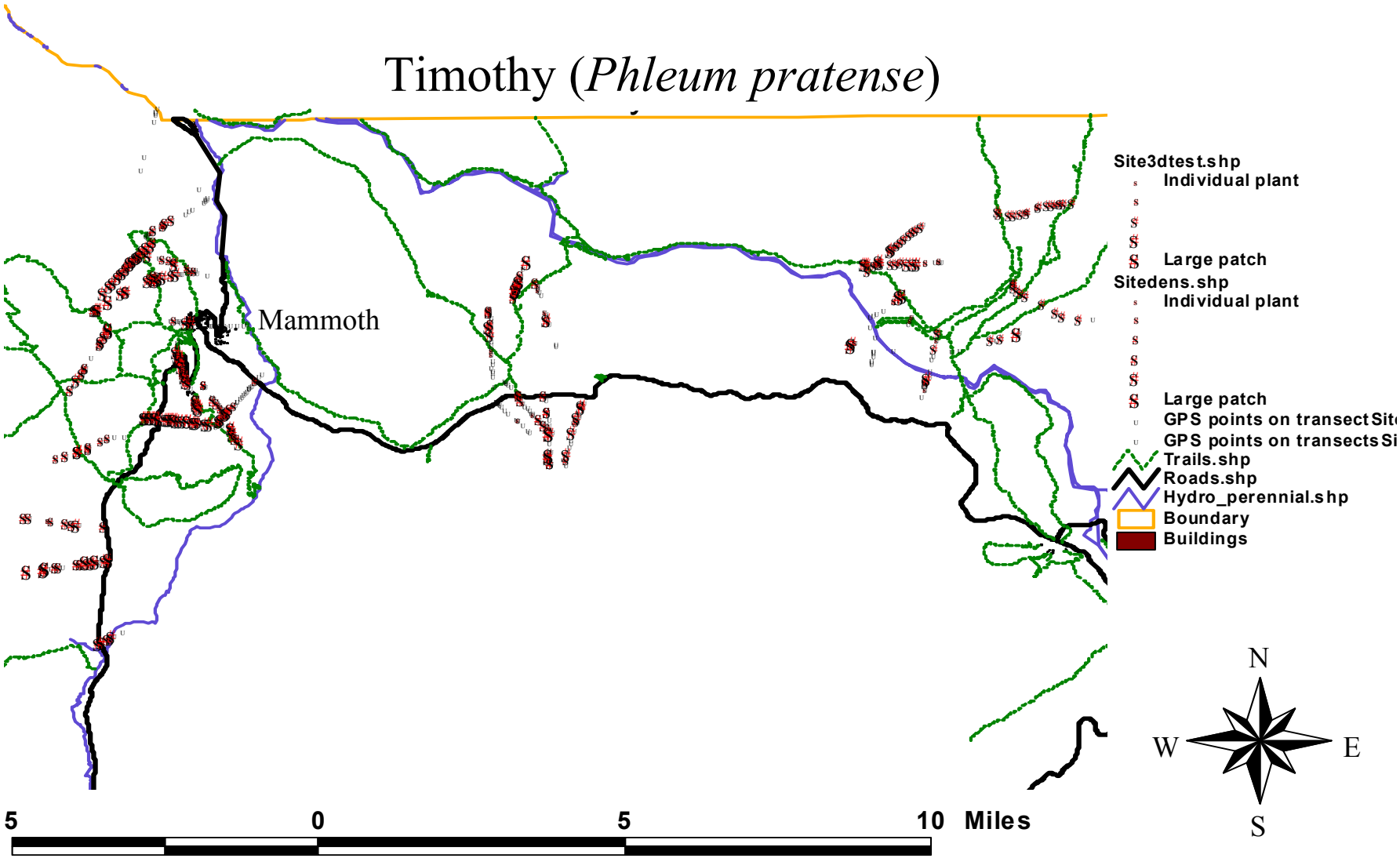
Exotic plant Inventory

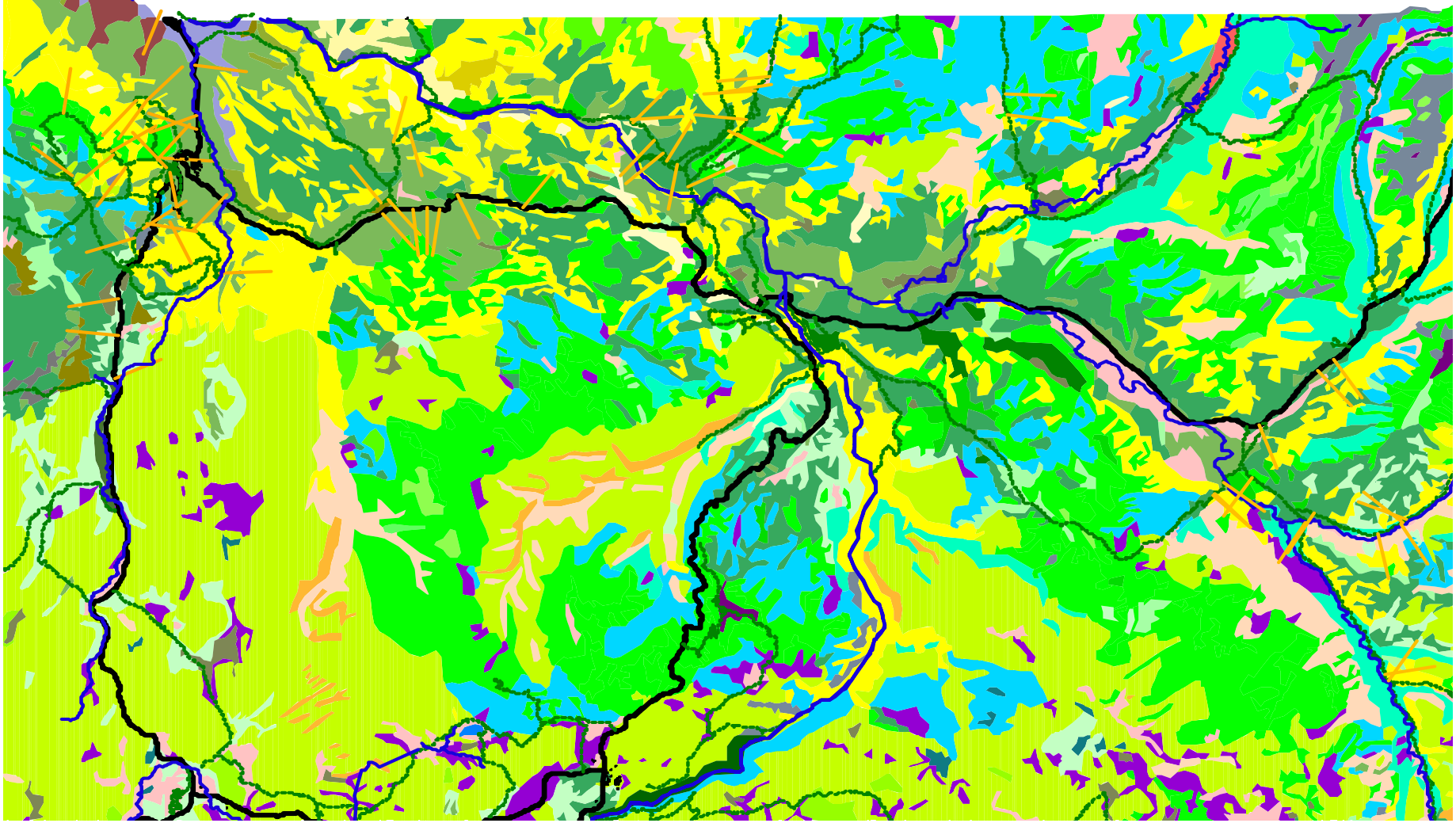
Timothy (*Phleum pratense*)



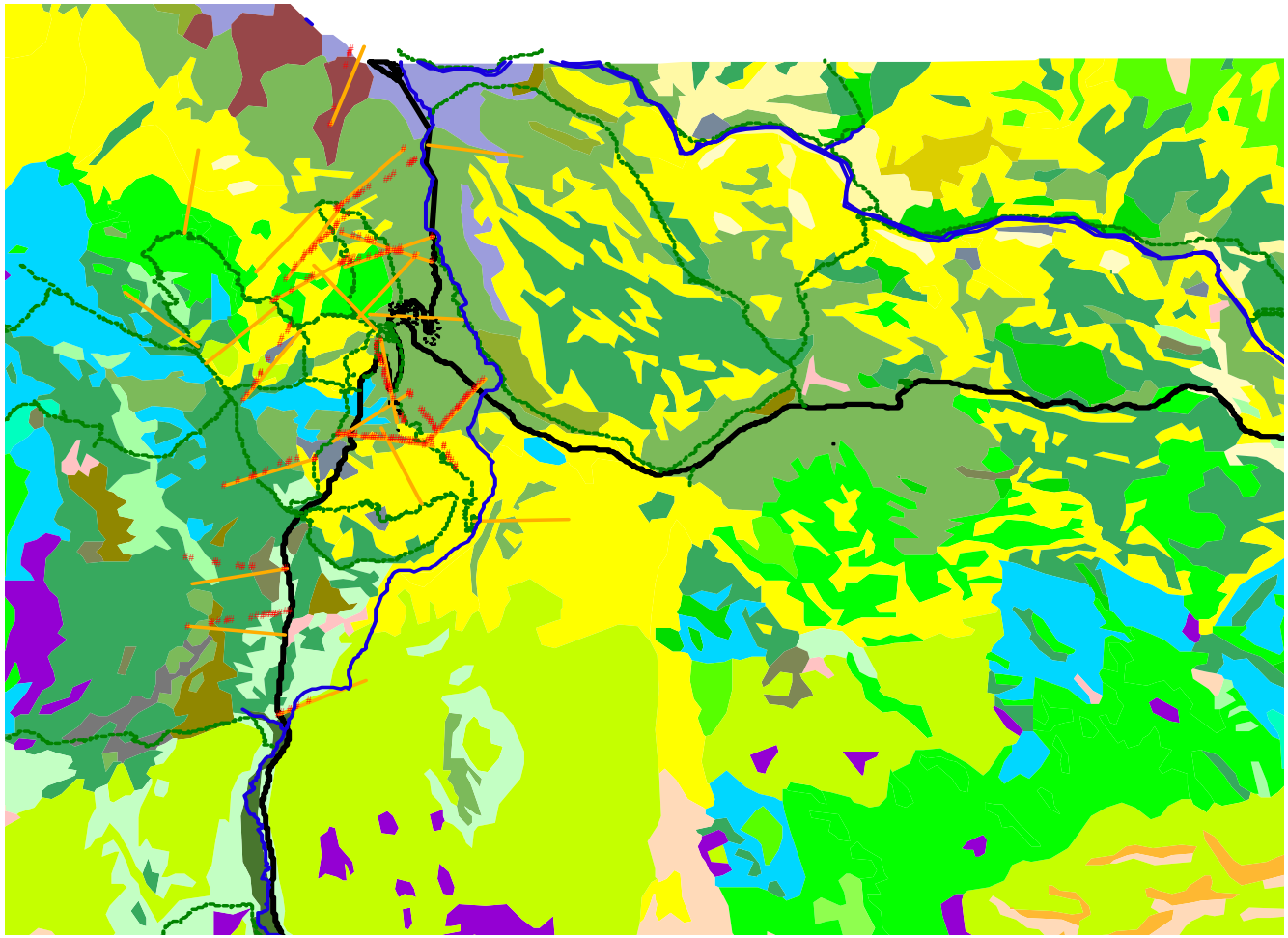
Yellowstone National Park Northern Range

Exotic plant Inventory

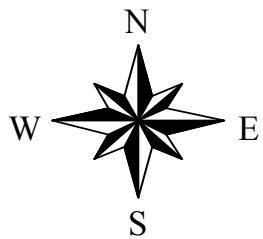
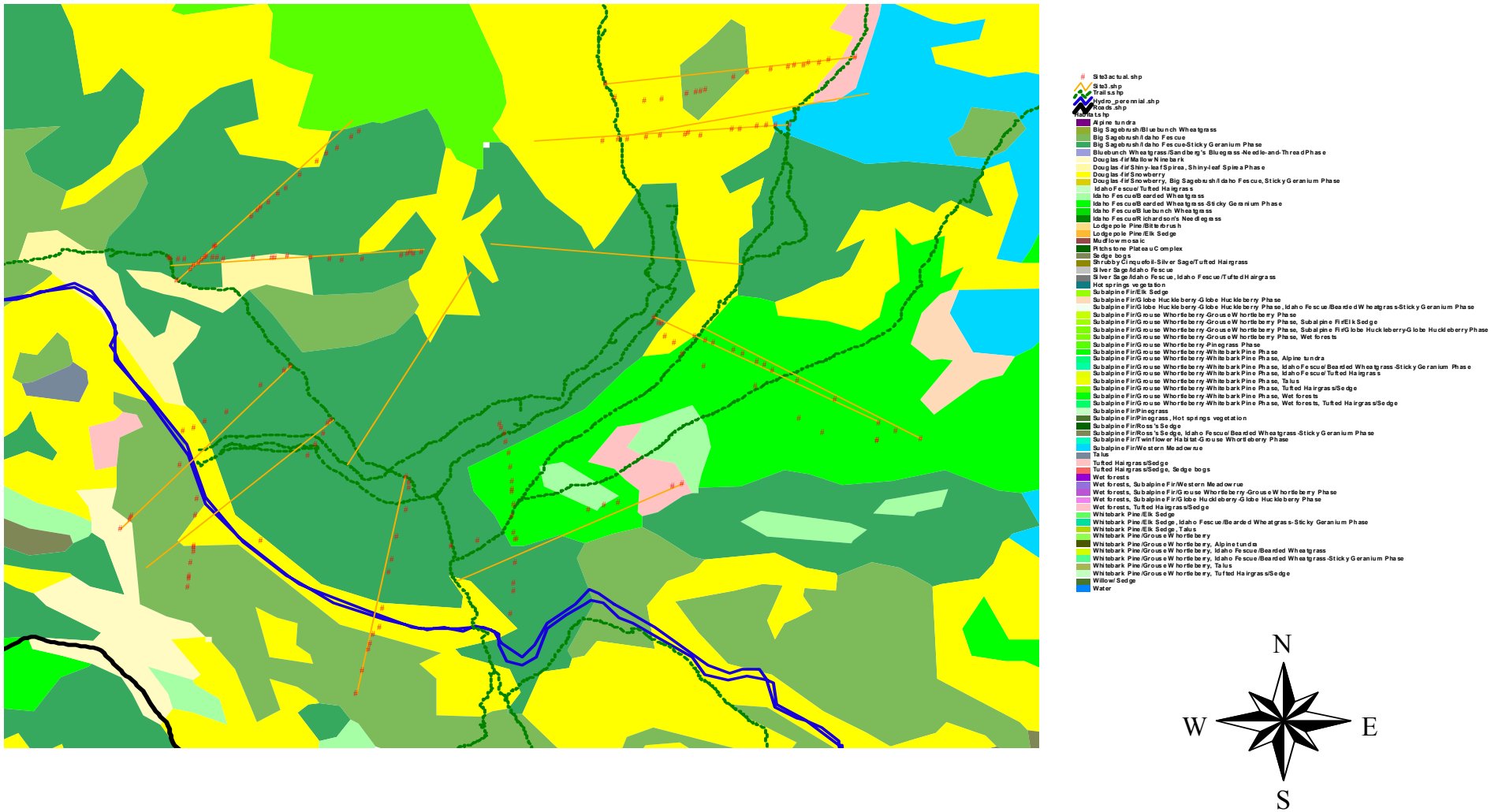
Vegetation Habitat Types and Proposed 2001 Transects



Vegetation Habitat Types and Site 1 Transects



Buildings
Hydro_perennial.shp
GPS HT points Site1actuals.shp
Proposed transects Site1.shp
Trails.shp
Roads.shp
Habitats.shp
Alpine tundra
Big Sagebrush/Bluebunch Wheatgrass
Big Sagebrush/Idaho Fescue
Big Sagebrush/Idaho Fescue-Sticky Geranium Phase
Bluebunch Wheatgrass/Sandberg's Bluegrass-Needle-and-Thread Phase
Douglas-fir/Mallow Ninebark
Douglas-fir/Shiny-leaf Spirea, Shiny-leaf Spirea Phase
Douglas-fir/Snowberry
Douglas-fir/Snowberry, Big Sagebrush/Idaho Fescue, Sticky Geranium Phase
Idaho Fescue/Tufted Hairgrass
Idaho Fescue/Bearded Wheatgrass
Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Idaho Fescue/Bluebunch Wheatgrass
Idaho Fescue/Richardson's Needlegrass
Lodgepole Pine/Bitterbrush
Lodgepole Pine/Elk Sedge
Mudflow mosaic
Ritchistone Plateau Complex
Sedge bogs
Shrubby Cinquefoil-Silver Sage/Tufted Hairgrass
Silver Sage/Idaho Fescue
Silver Sage/Idaho Fescue, Idaho Fescue/Tufted Hairgrass
Hot springs vegetation
Subalpine Fir/Elk Sedge
Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase
Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase
Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase, Subalpine Fir/Elk Sedge
Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase, Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase
Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase, Wet forests
Subalpine Fir/Grouse Whortleberry-Pinegrass Phase
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Alpine tundra
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Idaho Fescue/Tufted Hairgrass
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Talus
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Tufted Hairgrass/Sedge
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Wet forests
Subalpine Fir/Grouse Whortleberry-Whitebark Pine Phase, Wet forests, Tufted Hairgrass/Sedge
Subalpine Fir/Pinegrass
Subalpine Fir/Pinegrass, Hot springs vegetation
Subalpine Fir/Ross's Sedge
Subalpine Fir/Ross's Sedge, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Subalpine Fir/Twinflower Habitat-Grouse Whortleberry Phase
Subalpine Fir/Western Meadowrue
Talus
Tufted Hairgrass/Sedge
Tufted Hairgrass/Sedge, Sedge bogs
Wet forests
Wet forests, Subalpine Fir/Western Meadowrue
Wet forests, Subalpine Fir/Grouse Whortleberry-Grouse Whortleberry Phase
Wet forests, Subalpine Fir/Globe Huckleberry-Globe Huckleberry Phase
Wet forests, Tufted Hairgrass/Sedge
Whitebark Pine/Elk Sedge
Whitebark Pine/Elk Sedge, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Whitebark Pine/Elk Sedge, Talus
Whitebark Pine/Grouse Whortleberry
Whitebark Pine/Grouse Whortleberry, Alpine tundra
Whitebark Pine/Grouse Whortleberry, Idaho Fescue/Bearded Wheatgrass
Whitebark Pine/Grouse Whortleberry, Idaho Fescue/Bearded Wheatgrass-Sticky Geranium Phase
Whitebark Pine/Grouse Whortleberry, Talus
Whitebark Pine/Grouse Whortleberry, Tufted Hairgrass/Sedge
Willow/Sedge
Water



Site 3 Proposed Transects and Actual GPS HT Points