

Non-Native Vegetation Control 2013 Field Season

Yellowstone Center for Resources
Resource Management Operations
Yellowstone National Park



Dan Reinhart
Pat Perrotti
Troy Nedved
Brian Teets
Jaime Roper

Report Prepared December 2013
Branch Chief, Vegetation and Resource Management
Supervisor, Resource Management Operations
West District Resource Manager
North District Resource Manager
East District Resource Manager

Non-Native Vegetation Control 2013 Field Season

Review of Work Accomplishments and Related Statistics

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Report Summary

Resource Management staff within Yellowstone National Park have primary responsibility for the prevention and control of non-native invasive species. Invasive non-native terrestrial plants, or exotics, in Yellowstone Park are managed under a comprehensive Invasive Vegetation Management Plan (2013) using an Integrated Pest Management (IPM) strategy. The plan has three management objectives, they are: 1) Prevent the entry and establishment of species; 2) Eradicate or control existing populations by minimizing their spread, abundance, and density; and 3) Restore native plant populations where and when possible. In order to understand the extent of plant infestations and the effectiveness of control methods, the park also employs fundamental monitoring practices consistent with weed management programs. This report summarized the control work completed during the 2013 field season (May through September) involving park NPS resource management staffs (paid and volunteer), and the strategic work contributions from staff from the Northern Rockies Exotic Plant Management Team. For the year, resource management staff totaled 8,275 work hours in non-native vegetation management.

Actual surveys and control work for 2013 began on June 10, and concluded on September 19. During that time, 32 non-native plant species were treated in a combined area that totaled 103.96 acres. Under IPM principles, an integrated weed management approach was used that primarily involved chemical control (99.1% treated acres) and some mechanical control (0.9% treated acres). This use of herbicide control required a total of 937.31 liquid ounces and 208.45 dry ounces of various approved chemicals.

The majority of work during the field season involved survey, identification and control of individual plants, either singularly (incidental plants), or in population assemblages or patches. Plant populations were found in both mono-cultural groups or in mixed stands.

The tables and charts that follow represent highlighted statistics for the field season work. Additionally, other program components are summarized below:

- Staff conducted invasive plant assessments for 12 sand and gravel pits within the Greater Yellowstone Area (GYA) for materials use in the park. Of these, 10 were approved.
- Staff partnerships with agencies and the seven cooperative weed management areas within the Greater Yellowstone Coordinating Committee (GYCC) resulted in several completed GYA projects. This included Montana DOT funded state highway 191 control work; a multi-agency weed control project in Cooke City, Montana; and an ongoing assistance control project for the US Forest Service west of the park.

- Park staff conducted an increased number of entrance inspections in 2013. These included transported hay, numerous vehicles, and earth moving equipment primarily associated with park construction projects. Staff also inspected several entering vehicles, fire equipment and other apparatus during wildland fire incidents in the park.
- Staff assisted with herbicide treatments in the park's Boundary Lands Restoration project.
- Working with park vegetation specialists, staff established monitoring plots to assess the dynamics of targeted weed species being chemically controlled.

Definitions

Inventoried Acres

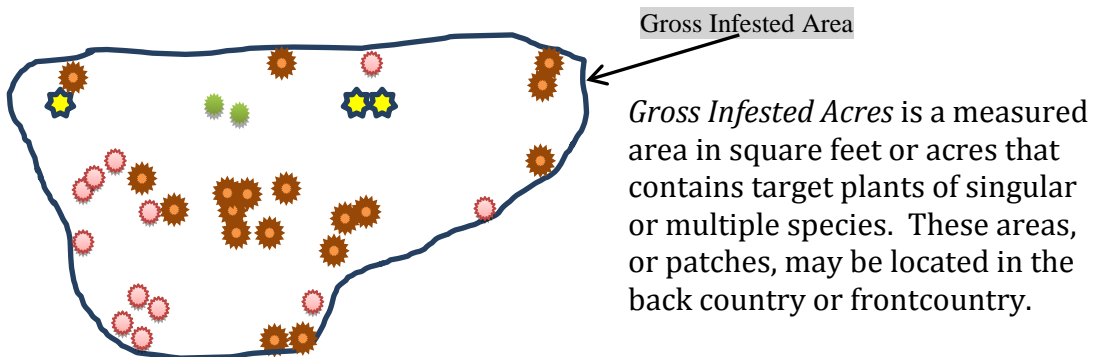
Total inventoried acres, or *Inventoried Acres*, comprise the acreage within the park that has been surveyed for targeted weed species for control. They are typically disturbed lands that include developments, utility corridors, and roadways. *Inventoried Acres* also include isolated disturbances in natural areas in both the backcountry and frontcountry where target species have been found. They may or may not contain target plants during any given year, but have a greater potential for such populations.

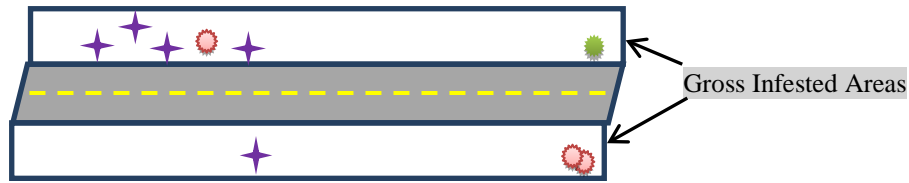
Gross Infested Acres

Gross Infested Acres is defined as the perimeter of a weed infestation, or what is commonly referred to as a weed patch. Within the gross infested area are the various target species for control and the spaces between individual plants. For spatial analysis of data (ArcGIS), gross infested areas are always described in polygons. Roadways, riparian areas, and other linear data are converted to polygons in GIS using a predetermined buffered distance. This generally coincides with the area of a land disturbance where invasive plants are typically found. Gross infested polygon areas are generally static in size from year to year; however, as the spread of targeted species across the landscape changes over time, gross infested areas may be adjusted.

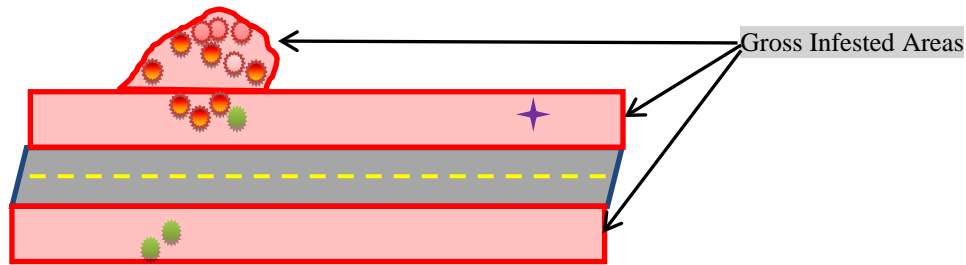
In Yellowstone National Park, *Gross Infested Acres* for individual species are no longer counted cumulatively towards the total. Rather, multiple species with overlapping acres are only counted collectively as one polygon. Total *Gross Infested Acres* are the cumulative acreage for all non-native species lumped together regardless of their individual identities for all areas in the park.

Examples of gross infested areas, or polygons:





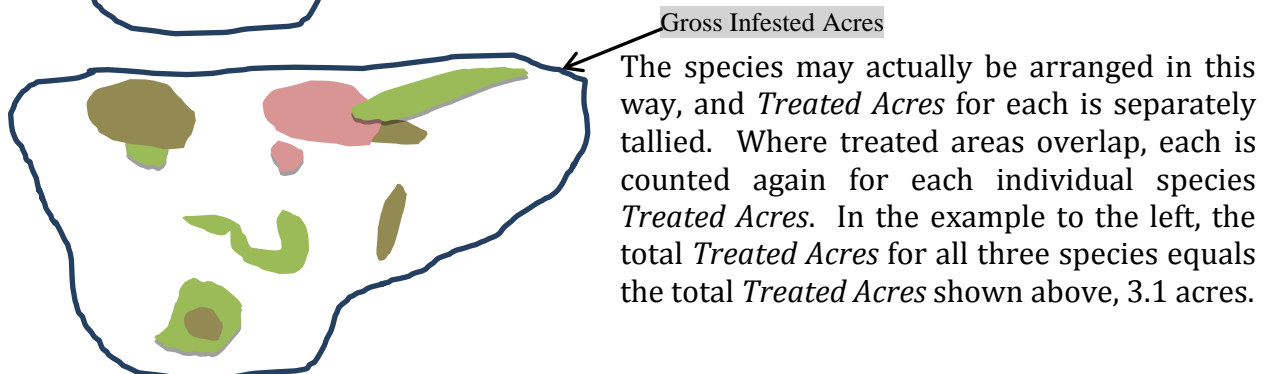
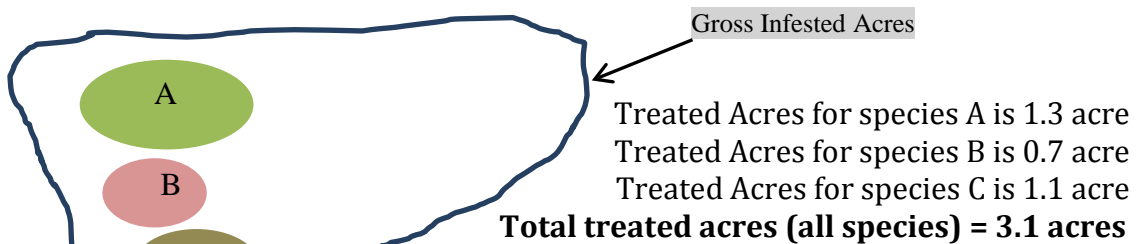
Gross Infested Acres may also be expressed as a predefined buffered area of a linear disturbance such as a roadway prism which contains targeted plants.



The total *Gross Infested Acres* is reported as the combined acres for all gross infested areas within the park. In the example of the roadway above, it includes all the acreage for four different target species within the red shaded areas. The acreage is not counted four times, but only once.

Treated Acres (individual and all species)

Treated Acres are the combined area of invasive plant species that have received a treatment (i.e. chemical, mechanical, etc.) within the *Gross Infested Acre* area. It represents only the concentrated area treated, and not the spaces between plants. *Treated Acres* may be expressed for a single species, or combined for multiple weed species as shown in the example below. *Treated Acres* can show the total acres treated for all species within the entire *Gross Infested Acre* area.



Retreated Acres

Retreated Acres are the actual acres of the first treatment treated again for a 2nd and 3rd time. The *Retreated Acres* are cumulatively added with each recurring treatment, and which may be different in size from previous treatments.

Retreated Acres can be tallied from any control method type (i.e. chemical or mechanical) and are cumulative for each individual species treated.

Example 1:



Original treatment for species A is 1.0 acre



1st Retreatment for species A is also 1.0 acre



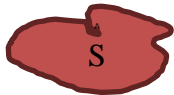
2nd Retreatment for species A is 0.5 acre

Total retreated acres for species A = 1.5

Example 2:



1st Retreatment for species S is 2.6 acre and species J is 2.6 acre



2nd Retreatment for species S is also 2.6 acre and species J is 0 acre

Total Retreated Acres for species S = 5.2 and species J = 2.6

Total Retreated Acres are for all species combined is 1.5 + 5.2 + 2.6 or 9.3 acres.

Program Trends

Five Year Treatment Record Comparison					
Program Year	2009	2010	2011	2012	2013
Inventoried Acres	17,090.7	20,291.0	20,429.0	20,500.0	18,594.6
Gross Infested Acres	3,679.3	4,600.0	4,641.6		4,078.6
Total Treated Acres	137.0	105.2	118.3	112.2	103.9
Re-treated Acres	23.2	8.8	4.1	9.9	1.0
Percent Acres Treated with Herbicides	95.0%	94.7%	97.5%	99.0%	99.1%
Percentage Acres Treated Mechanically	5.0%	5.3%	2.5%	1.0%	0.9%
Percentage of Road/Development Area	75.7%	75.0%	77.0%	76.0%	78.9%
Percentage of Backcountry Area	24.3%	25.0%	23.0%	24.0%	21.1%
Number of Species Treated	42	44	40	37	33
Number of Data Entries	1,726	1,780	1,717	1,516	1,091
Total Initial Treatments	1,354	1,542	1,652	1,321	1,012
Number of Entries Incidental Plants	635	738	840	697	410
Number of Entries Patches	1,091	1,042	877	817	681
Ounces of Herbicide Concentrate Used	2,514.2	1,398.0	1,320.0	1,207.0	1,145.8
Gallons of Mixed Herbicide	4,287.0	2,887.3	3,722.3	3,544.5	3,035.5
Total Person Hours	7,108	7,210	9,170	8,787	8,275
Number NPS Staff	25	26	24	20	20
Number Staff Interns	6	3	0	3	2
Number Volunteer Individuals	6	10	11	10	3

Treatment Methods

In keeping with trends from previous years, control work in the park was predominately done with herbicides. Mechanical treatments are generally a less effective treatment method and were only applied on select species.

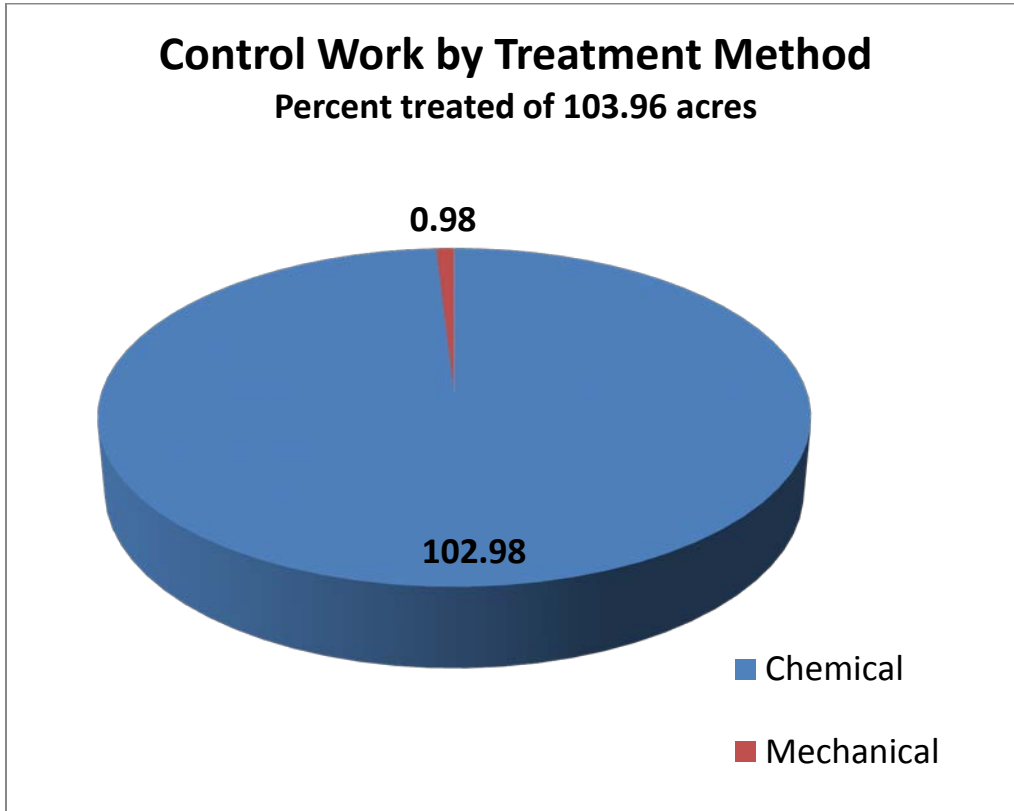


Chart 1. Total treated acres by percent treatment method (chemical and mechanical).

Treatment Method	Treated Acres	Percentage
Chemical	102.98	99.1
Mechanical	0.98	0.9
Total	103.96	100

Table 1. Non-native vegetation control by treatment method.

Treatment Areas

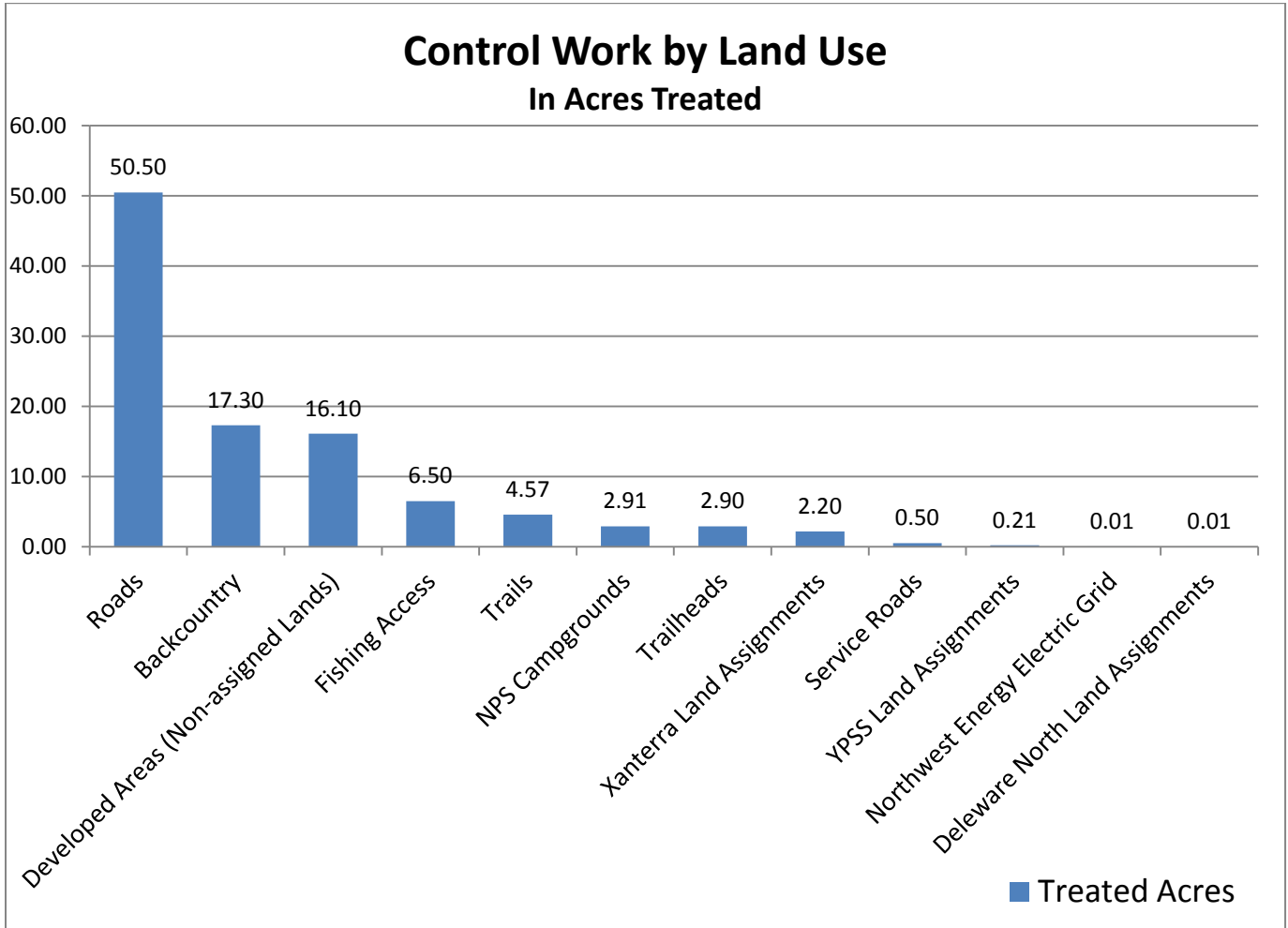


Chart 2. Treated acres of non-native vegetation by land use type or concession land assignment.

Land Type	Frontcountry	Backcountry
Total	78.9%	21.1%

Table 2. Acres treated in frontcountry and backcountry by percent total

Control Work by Road Section In Acres Treated

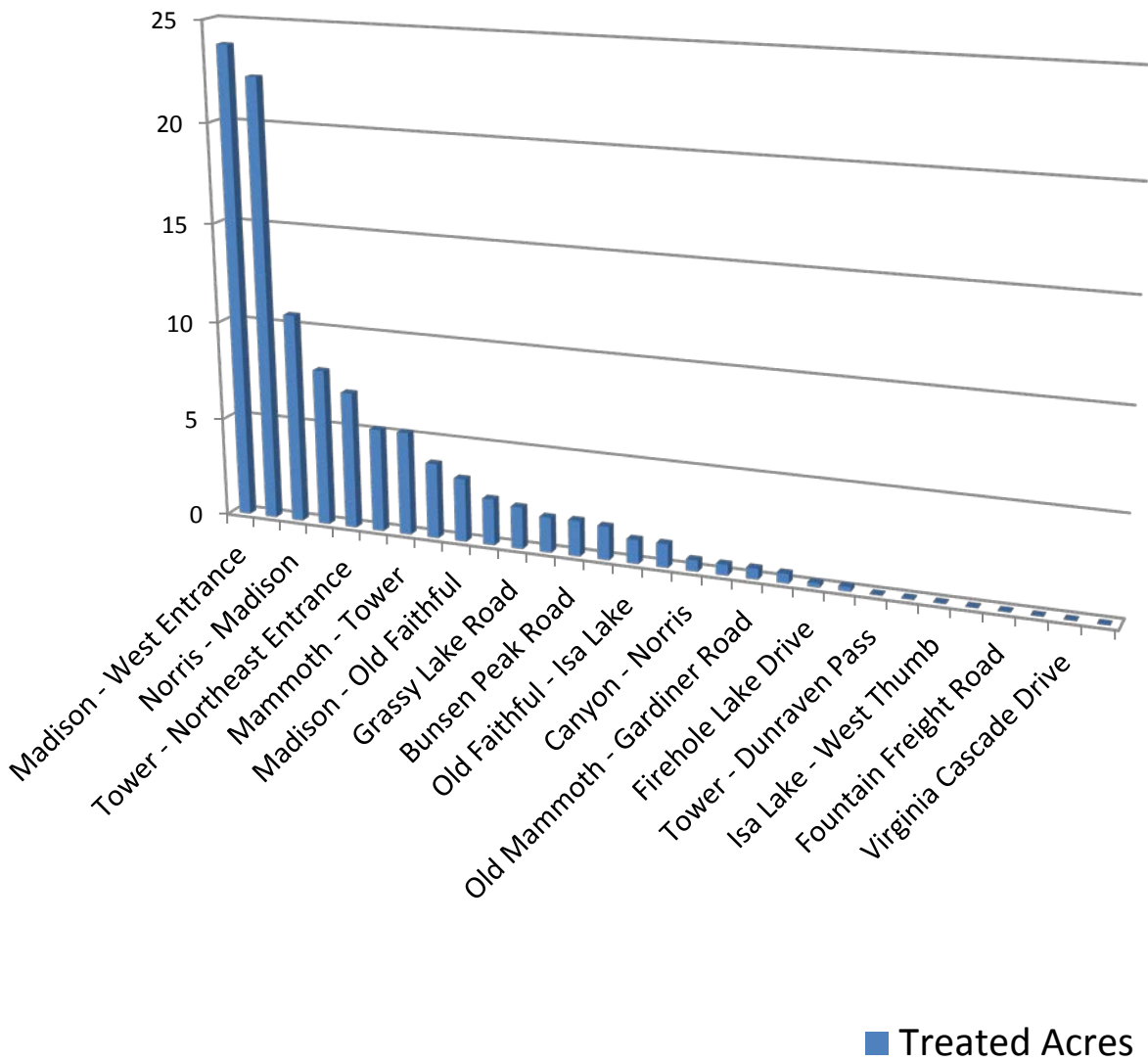


Chart 3. Non-native vegetation control in acres treated by road section

Treated Species

SPECIES	TREATED ACRES
Spotted Knapweed	23.80
Berteroa	12.12
Houndstongue	10.87
Dalmatian Toadflax	9.99
Yellow Hawkweed	9.41
Yellow Toadflax	8.46
Canada Thistle	5.35
Oxeye Daisy	5.31
Yellow Sweetclover	4.92
Bull Thistle	3.00
Yellow Mustard	1.61
St. John's wort	1.51
Wooly Mullein	1.36
White Champion	1.16
White Top	1.03
Tall Buttercup	1.02
Musk Thistle	0.70
Orange Hawkweed	0.58
Bladder Champion	0.45
Whiplash Hawkweed	0.41
Field Bindweed	0.34
Flixweed	0.20
Leafy Spurge	0.17
Sowthistle	0.06
Black Henbane	0.03
Tansy Aster	0.03
Black Medic	0.01
Curly Dock	0.01
Plumeless Thistle	0.01
Rush Skeletonweed	0.01
Scentless Chamomile	0.01
Sulfer Cinquefoil	0.01
Scotch Thistle	0.01
Total	103.96

Table 3. Treated acres by non-native vegetation species

Priority	Number of Species	Treated Acres
Watch List	2	0.01
Priority 1	6	0.53
Priority 2	18	85.49
Priority 3	2	5.36
Total	28	91.39

Table 4. Treated acres of non-native vegetation by *species priority* and number

Watch List Species	Treated Acres
Rush Skeletonweed	0.01
Scotch Thistle	0.01

Table 5. Treated acres of non-native vegetation *watch list species*.

Note: Scotch Thistle found and treated just outside of YNP and by Mammoth Corrals.

Treatment Herbicides

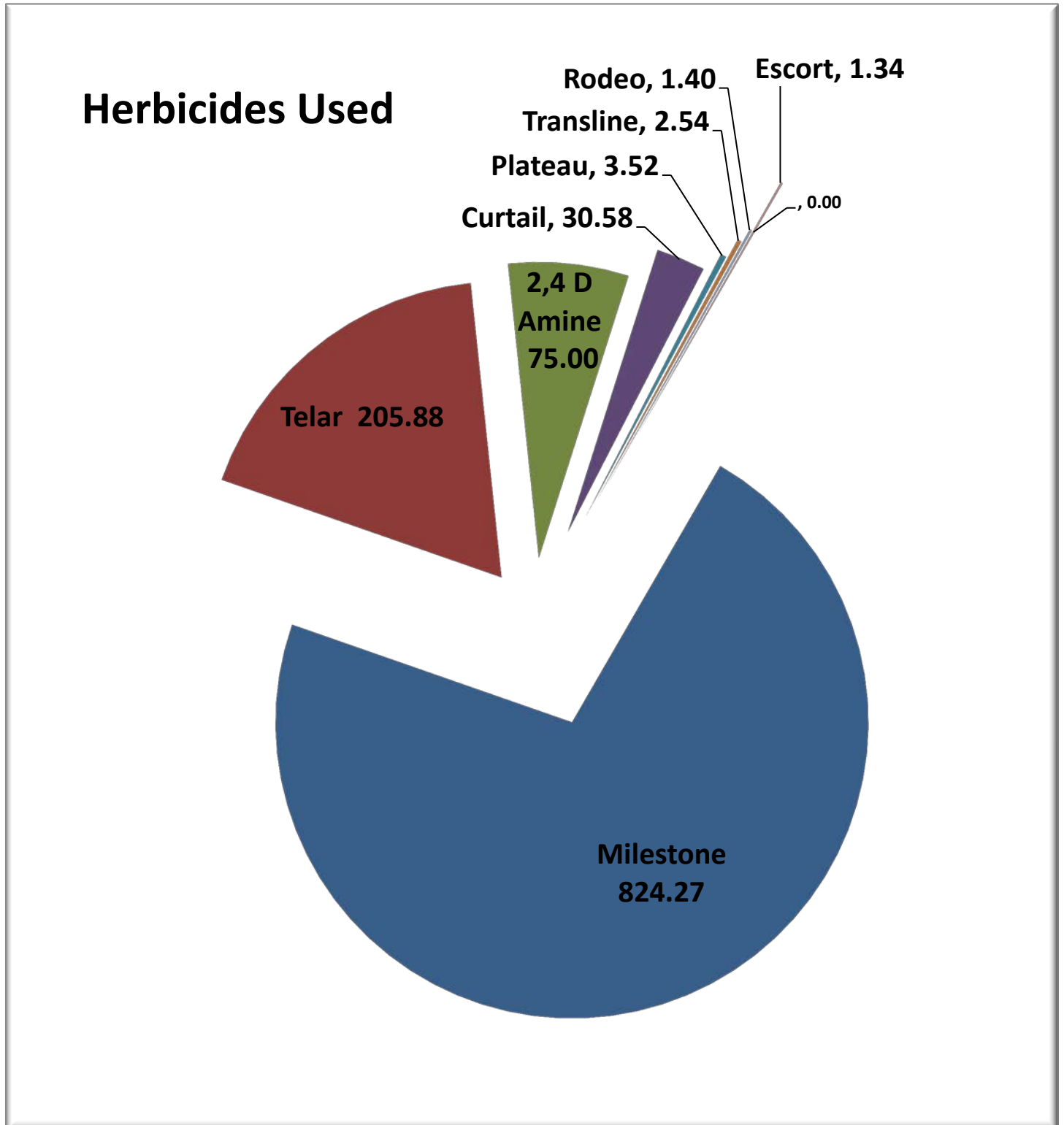


Chart 4. Herbicide use in concentrated ounces

Herbicide	Liquid Ounces	Dry Ounces
Milestone	824.27	N/A
Telar	N/A	207.11
2,4D Amine	75	N/A
Curtail	30.58	N/A
Plateau	3.52	N/A
Transline	2.54	N/A
Rodeo	1.4	N/A
Escort	N/A	1.34
Total	937.31	208.45

Table 6. Herbicide use in wet and dry concentrated ounces

Gallons of Prepared Herbicide Used Parkwide
3,041.07

Table 7. Total diluted herbicide used in non-native vegetation control

SPECIES	MILESTONE	TELAR (dry)	CURTAIL	TRANSLINE	ESCORT (dry)	PLATEAU	RODEO	2,4D AMINE
Spotted Knapweed	189.29	48.40	6.82	0.01	0.01	0.22		
Berteroa	107.41	31.97						
Houndstongue	88.56	24.27		0.20				
Dalmatian Toadflax	82.71	26.29				0.22		
Yellow Hawkweed	70.77	1.92						75.00
Yellow Toadflax	66.06	17.69			0.38	2.64	1.40	
Canada Thistle	38.19	9.19						
Oxeye Daisy	37.79	8.57	21.78	0.10				
Yellow Sweetclover	36.87	11.23						
Bull Thistle	28.56	8.56	1.98	0.12	0.74	0.22		
Tumble Mustard	14.15	4.31						
St. Johnswort	13.03	3.41						
White Champion	8.90	2.38						
Woolly Mullein	8.73	2.38		0.01				
Tall Buttercup	6.23	0.29						
Whitetop	5.54	1.59						
Musk Thistle	5.23	0.79			0.08			
Orange Hawkweed	3.66	0.76						
Whiplash Hawkweed	3.54							
Bladder Champion	3.35	0.92						
Field Bindweed	2.53	0.78		0.10	0.14			
Flixweed	1.68	0.56						
Leafy Spurge	1.50	0.34						
Scentless Chamomile	0.48	0.13						
Curly Dock	0.48	0.16						
Sowthistle	0.36	0.18						
Black Medic	0.34	0.02						
Tansy Aster	0.23	0.20				0.22		
Plumeless Thistle	0.06	0.02						
Black Henbane	0.03	0.01						
Red Clover	0.01							
Sulfur Cinquefoil	0.01							
Totals	826.27	207.32	30.58	0.54	1.35	3.52	1.40	75.00

Table 8. Herbicides used in ounces for each chemically treated species

Amount and Type of Herbicide Used By Species

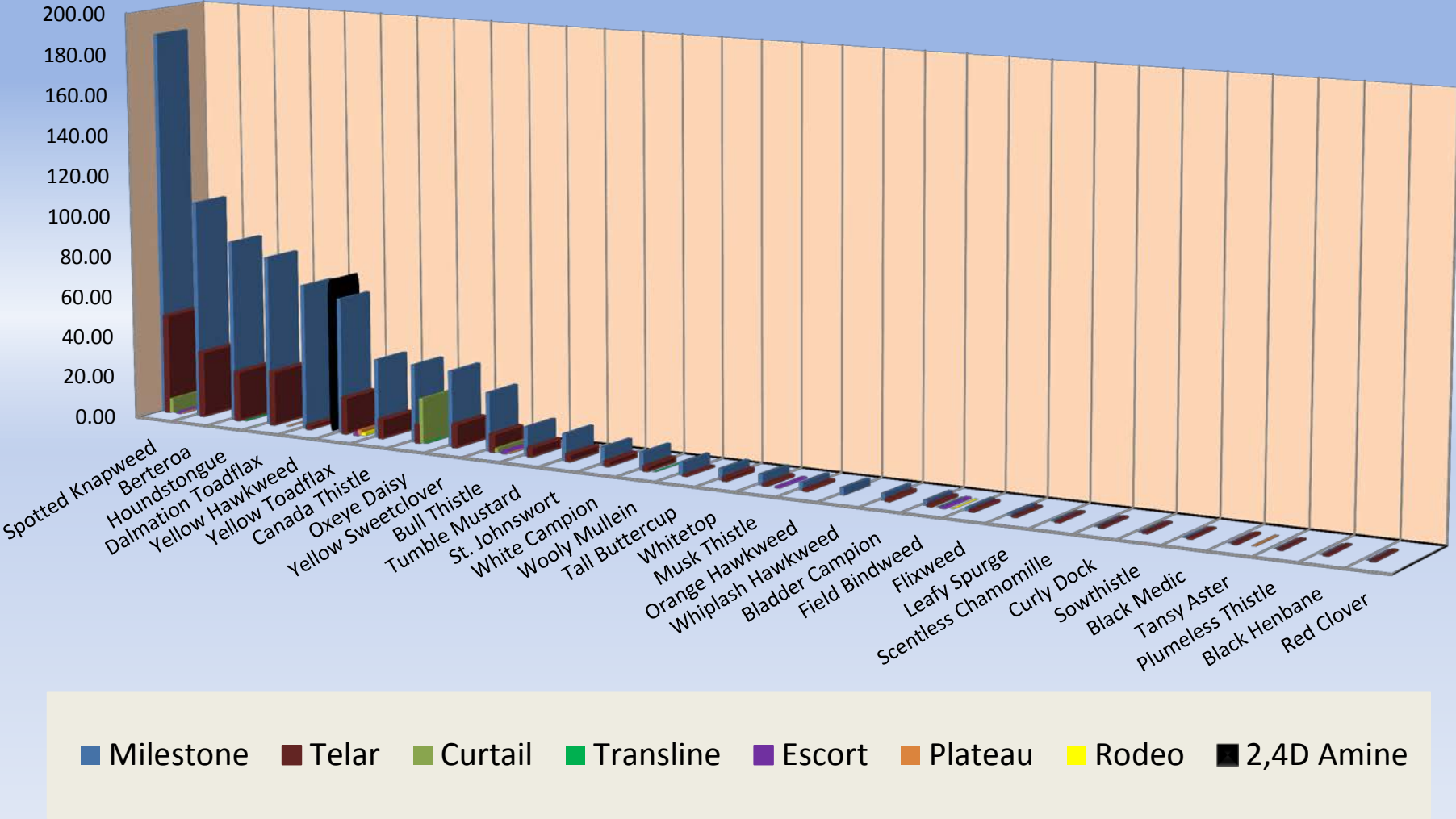


Chart 5. Herbicide use by species, measured in concentrated ounces