

AN INVENTORY OF INVASIVE PLANTS IN THREE JUNEAU WATERSHEDS

MONTANA CREEK, PETERSON CREEK, AUKE LAKE



Creeping buttercup and marsh forget-me-not growing along the edge of Montana Creek.

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Introduction

More than 80 species of non-native plants in more than 5,700 infestations have been documented in the City and Bureau of Juneau (CBJ). Many of these species are considered invasive. Invasive plants are plant species that are not native to an area and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Due to their aggressive nature, invasive plants in the CBJ threaten the integrity and productivity of terrestrial and aquatic ecosystems important to fish, wildlife, humans, and the local economy.

In 2011 the Juneau Fish and Wildlife Field Office partnered with the Alaska Association of Conservation Districts to conduct invasive plant surveys in three CBJ watersheds: Montana Creek, Auke Lake, and Peterson Creek (Figure 1). These watersheds were selected because of their relatively intact conditions, valuable fish and wildlife habitat, and vulnerability to invasive plant infestations. The purpose of these surveys was to map invasive plant distributions and to identify infestations that threaten fish and wildlife habitats and ecological processes.

Watershed Background

Montana Creek

Montana Creek is a clear-water tributary of the Mendenhall River (Figure 2). The stream drains a 10,000 acre watershed that supports four species of salmon as well as cutthroat trout, Dolly Varden char and numerous aquatic- and riparian-dependent bird and mammal species. Undeveloped portions of the watershed consist of Sitka spruce-western hemlock forest and various types of wetlands including beaver ponds, and alder and willow thickets. Rock, snow, alpine tundra, and ice cover the upper portions of McGinnis Creek, a major tributary of Montana Creek. The watershed contains federal, state, borough, and private lands.

Land development within the Montana Creek watershed is limited to the lower portion of the watershed and consists of single-family housing, light industry (gravel mining, construction equipment and material storage), recreational facilities (e.g., community garden, archery and gun ranges), and associated transportation networks. A hiking trail parallels the stream for most of its length. This trail is accessible to off-road vehicles (ORV) between the end of Montana Creek Road and McGinnis Creek. At the mouth of McGinnis Creek, unmaintained ORV trails extend into two tributaries of Montana Creek, including the McGinnis Creek watershed.

Peterson Creek

Peterson Creek drains a 6,200 acre watershed located 25 miles north of Juneau (Figure 3). The watershed is mostly intact with land development limited to the lower watershed along Glacier Highway and Amalga Harbor Road. Several private residences and the SAGA Eagle Valley Center are located in this area. A hiking trail extends 4 miles from Glacier

Highway to a U.S. Forest Service cabin on Peterson Lake. Land within the area surveyed for invasive plants is owned by the CBJ, State of Alaska, U.S. Forest Service, and private individuals.

About one-half of the Peterson Creek watershed is covered by wetlands with most of the remaining land cover consisting of forest. The lower reaches of the stream are bordered by uplifted marine terraces covered with meadow and fen habitat and containing scattered stands of Sitka spruce and deciduous thickets of alder and willow. The stream flows into a 16 acre lake, referred to as Peterson Salt Chuck, just before entering saltwater. Peterson Creek supports pink, chum and coho salmon as well as Dolly Varden char, cutthroat trout, and steelhead trout. The stream supports the only recreational steelhead trout fishery on the Juneau Road System. In addition to angling, other recreational activities that take place in the watershed include berry picking, hunting, wildlife viewing, and hiking.

Many wildlife species inhabit the lower Peterson Creek watershed, including brown and black bears, beaver, mink, otter, deer mouse, bald eagles, belted kingfisher, kestrel, and great blue heron.

Auke Lake

Auke Lake is located approximately 12 miles north of downtown Juneau. The 2,558 acre watershed extends from Auke Bay at sea level to an elevation of 2,000 feet at the headwaters of Lake Creek, the largest tributary of the lake (Figure 4). Most of the watershed is within the Tongass National Forest and consists of spruce-hemlock forest, wetlands, and urbanized areas; the latter concentrated around Auke Lake. Land owners in the lower portion of the watershed include the National Oceanic and Atmospheric Administration, CBJ, private individuals, the State of Alaska, and the University of Alaska.

Most land development in the watershed is concentrated along the west and north sides of the lake (Figure 4). Land development in this area includes the University of Alaska Southeast (UAS) campus, single family housing, churches, hiking trails, roads, and a boat launch facility. Riparian habitat along the east and west shorelines is mostly intact while much of the native vegetation along the south and north shorelines has been removed to construct roads and develop private property, respectively.

The Auke Lake watershed supports sockeye, pink, coho, and chum salmon; cutthroat trout; and Dolly Varden char. Some of the bird species found in the watershed include belted kingfisher, great blue heron, loons, and a variety of waterfowl and song birds. Beaver, river otter, black-tailed deer, black bear, and wolves occur in the watershed. The Auke Lake watershed provides recreational opportunities for hiking, jet skiing, boating, fishing, and wildlife viewing. The lake is also used by floatplanes.



Figure 1. Peterson Creek, Auke Lake, and Montana Creek Watersheds. Red boxes indicate the portion of each watershed where invasive plant surveys were located.

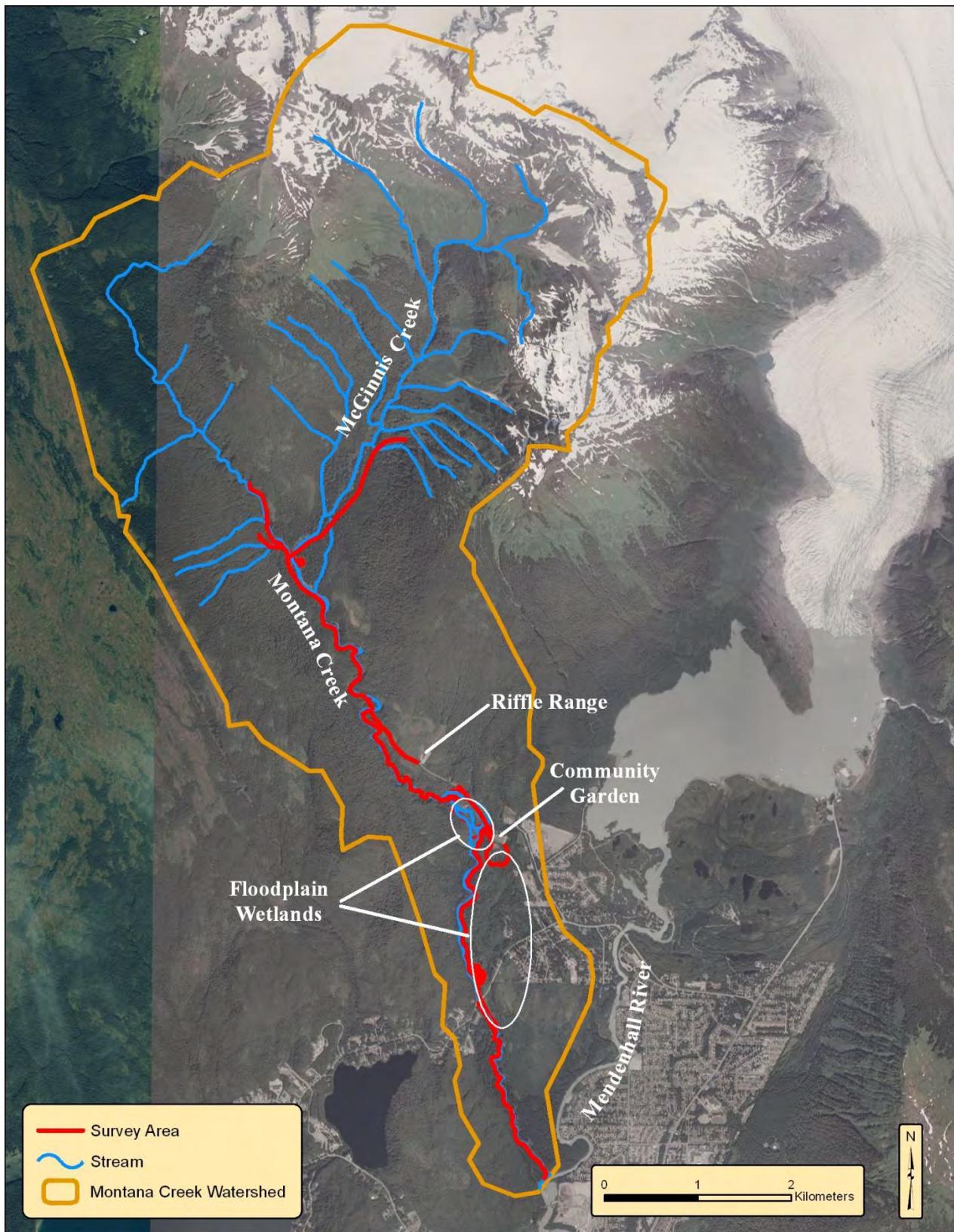


Figure 2. Montana Creek watershed invasive plant survey area.



Figure 3. Peterson Creek watershed invasive plant survey area.



Figure 4. Auke Lake watershed invasive plant survey area.

Methods

Invasive plants commonly establish in areas where native vegetation or soils have been removed or disturbed by human activities and natural processes. Consequently, infestations are often found along roadsides and hiking trails, on land that has been cleared or filled to facilitate development, and in erosional (e.g., stream banks) and depositional areas (e.g., gravel bars) within stream corridors. Streams can function as conduits for invasive plant dispersal by transporting plant parts and seeds to new sites downstream of infestations. In the selected watersheds, native plant communities occurring on relatively undisturbed soils appear to be resistant to invasion by non-native plants. Therefore, our survey efforts were focused on areas within each watershed where invasive plants were most likely to occur, including:

- 1) areas up to 100 m from the primary stream channel (e.g. Montana Creek, Peterson Creek, Lake Creek, McGinnis Creek) or lake shoreline (e.g. Auke Lake, Peterson Salt Chuck) that were adjacent to or downstream of developed portions of the watershed, and
- 2) areas developed for roads, driveways, hiking and ORV trails, and lands cleared of native vegetation

Infestations were defined as a single plant or group of plants separated from adjacent invasive plants by more than 6 feet. Infestations along road edges sometimes extended as a continuous infestation tens to hundreds of yards in length. These long and narrow infestations were divided into smaller infestations (< 30 feet long) for the purpose of accurately depicting their location and extent on maps.

For each infestation encountered, we recorded:

- Species
- Infestation area (nearest 0.001, 0.01, 0.1, 0.5, 1 acre)
- Percent coverage (the percentage of the infestation area covered by invasive plants)
- Latitude and longitude (NAD 83, decimal degrees)
- Number of primary stems (1-5, 6-25, 26-50, 51-150, 151-500, 500+)
- Notes

Invasive plant surveys were conducted on the following dates in each watershed:

- Montana Creek: August 23, 24, 25, 30; September 5, 6, 7, 14, 23
- Auke Lake: September 9, 23, 28, 29; October 3, 7
- Peterson Creek: October 12

Field data were entered on datasheets or into a portable computer with GPS capabilities.

Infestation coordinates were also obtained using a handheld GPS unit. Data were stored in Excel spreadsheets and plotted on aerial imagery in ArcGIS 9.3 and 10.0. Infestation records were submitted to the Alaska Exotic Plant Inventory Clearinghouse (AKEPIC) database for archiving and public access (<http://aknhp.uaa.alaska.edu/botany/akepic/>). Invasiveness rankings used in this report were derived from AKEPIC (<http://aknhp.uaa.alaska.edu/botany/akepic/non-native-plant-species-biographies/>). Ranks are expressed on a 100 point scale based on scores for 21 criteria within four areas: ecological impacts (40 points), biological characteristics and dispersal ability (25 points), distribution (25 points), and feasibility of control (10 points).

Invasiveness categories:

- Extremely Invasive (> 80)
- Highly Invasive (70-79)
- Moderately Invasive (60-69)
- Modestly Invasive (50-59)
- Weakly Invasive (40-49)
- Very Weakly Invasive (< 40)

Results

Montana Creek

The Montana Creek survey area encompassed 31 acres consisting primarily of road and trail corridors extending from the McGinnis Creek area to the Mendenhall River (Figure 2). Invasive plants were distributed throughout the survey area, although infestations were rare in the surveyed portions of upper Montana Creek and McGinnis Creek (Figure 9). Most invasive plant infestations occurred at sites disturbed by human activities and infrastructure (e.g. roads, trails, land development) (Figures 5 & 6) or natural processes (e.g. tree uprooting, bank erosion, fluvial sediment deposition) (Figure 7). While roads and trails are the principal routes of invasion, water appears to transport some species (e.g. creeping buttercup, marsh forget-me-not) from transportation corridors to relatively pristine and semi-remote areas. Some invasive species, such as creeping buttercup, are introduced to new sites when yard waste is disposed in roadside ditches (Figure 8).

Eighteen (18) invasive plant species in 562 infestations covering 6.7 acres were documented in the survey area (Table 1, Figures 10-17). Creeping buttercup (rank 54) was the most common species found, occurring at 54% of infestation sites and comprising 85% of the total area infested with invasive plants (Figure 10). One-third (33%) of creeping buttercup infestations contained more than 500 plants. Other common invasive species found during the survey were marsh forget-me-not (6.8% of total infestation area, Figure 14), common dandelion (2.0%, Figure 17), tall buttercup (2.1%,

Figure 16), and reed canarygrass (2.6% of the total infestation area, Figure 11).

Five invasive plant species found during the survey are ranked as moderately to extremely invasive (i.e. ranked 60 or greater): reed canarygrass (rank 83), oxeye daisy (61), ornamental jewelweed (82), orange hawkweed (79), and Bohemian knotweed (87). These species comprised 16% of all infestation sites found during the survey and collectively represented 23% of the area of all infestations combined. Although widely distributed in the survey area, most reed canarygrass infestations were found in roadside ditches along Montana Creek Road from the CBJ riffle range to the end of the road, and within an extensive area of braided channels upstream of the CBJ Community Garden (Figure 9). A single infestation of ornamental jewelweed containing approximately 100 plants was found in a roadside ditch near the CBJ riffle range (Figure 12); all of these plants were removed by hand in 2011 and additional plants were removed from the site in 2012. One orange hawkweed infestation (26-50 plants) was found next to a trail in the upper watershed (Figure 12) and a single Bohemian knotweed infestation containing 6-25 plants was found on the roadside next to Montana Creek in the middle portion of the watershed (Figure 12).

Table 1. Invasiveness ranks and infestation data for non-native invasive plants found in the Montana Creek watershed survey area in August and September 2012. Infestation area has been adjusted to account for the percent aerial coverage of each species within the infestations. Species in bold text are ranked moderately to extremely invasive.

Common/scientific name	Invasive-ness rank	No. of infestations	% of total infestations	Infestation area (acres)	% of total infestation area	Fig. #
creeping buttercup <i>Ranunculus repens</i>	54	302	53.74	5.73	85.21	10
marsh forget-me-not <i>Myosotis scorpioides</i>	54	88	15.66	0.46	6.83	14
common dandelion <i>Taraxacum officinale</i>	58	49	8.72	0.13	1.96	17
common plantain <i>Plantago major</i>	44	30	5.34	0.01	0.21	15
tall buttercup <i>Ranunculus acris</i>	54	26	4.63	0.14	2.11	16
reed canarygrass <i>Phalaris arundinacea</i>	83	18	3.20	0.18	2.64	11
white clover <i>Trifolium repens</i>	59	17	3.02	0.06	0.82	13
alsike clover <i>Trifolium hybridum</i>	57	15	2.67	0.01	0.13	12
common eyebright <i>Euphrasia nemorosa</i>	42	4	0.71	< 0.01	0.03	12
common chickweed <i>Stellaria media</i>	42	4	0.71	< 0.01	0.02	12
oxeye daisy <i>Leucanthemum vulgare</i>	61	2	0.36	< 0.001	< 0.001	12
bishop's goutweed <i>Aegopodium podagraria</i>	57	1	0.18	< 0.001	< 0.01	12
ornamental jewelweed <i>Impatiens glandulifera</i>	82	1	0.18	< 0.01	0.04	12
pineappleweed <i>Matricaria discoidea</i>	32	1	0.18	< 0.001	< 0.01	12
common comfrey <i>Symphytum officinale</i>	48	1	0.18	< 0.001	< 0.001	12
orange hawkweed <i>Hieracium aurantiacum</i>	79	1	0.18	< 0.001	< 0.01	12
Bohemian knotweed <i>Polygonum bohemicum</i>	87	1	0.18	< 0.001	< 0.001	12
European mountain ash <i>Sorbus aucuparia</i>	59	1	0.18	< 0.001	< 0.001	12
Total		562	100	6.72	100	



Figure 5. An invasive plant infestation containing ornamental jewelweed, creeping buttercup, and reed canarygrass alongside Montana Creek Road near the rifle range.



Figure 6. Marsh forget-me-not growing in a ditch-line along a trail in the upper Montana Creek Watershed.



Figure 7. Creeping buttercup growing on a streambank in the lower reaches of Montana Creek.



Figure 8. Invasive plant species such as creeping buttercup (above) are likely introduced into the Montana Creek Watershed in yard waste that is dumped into roadside ditches.

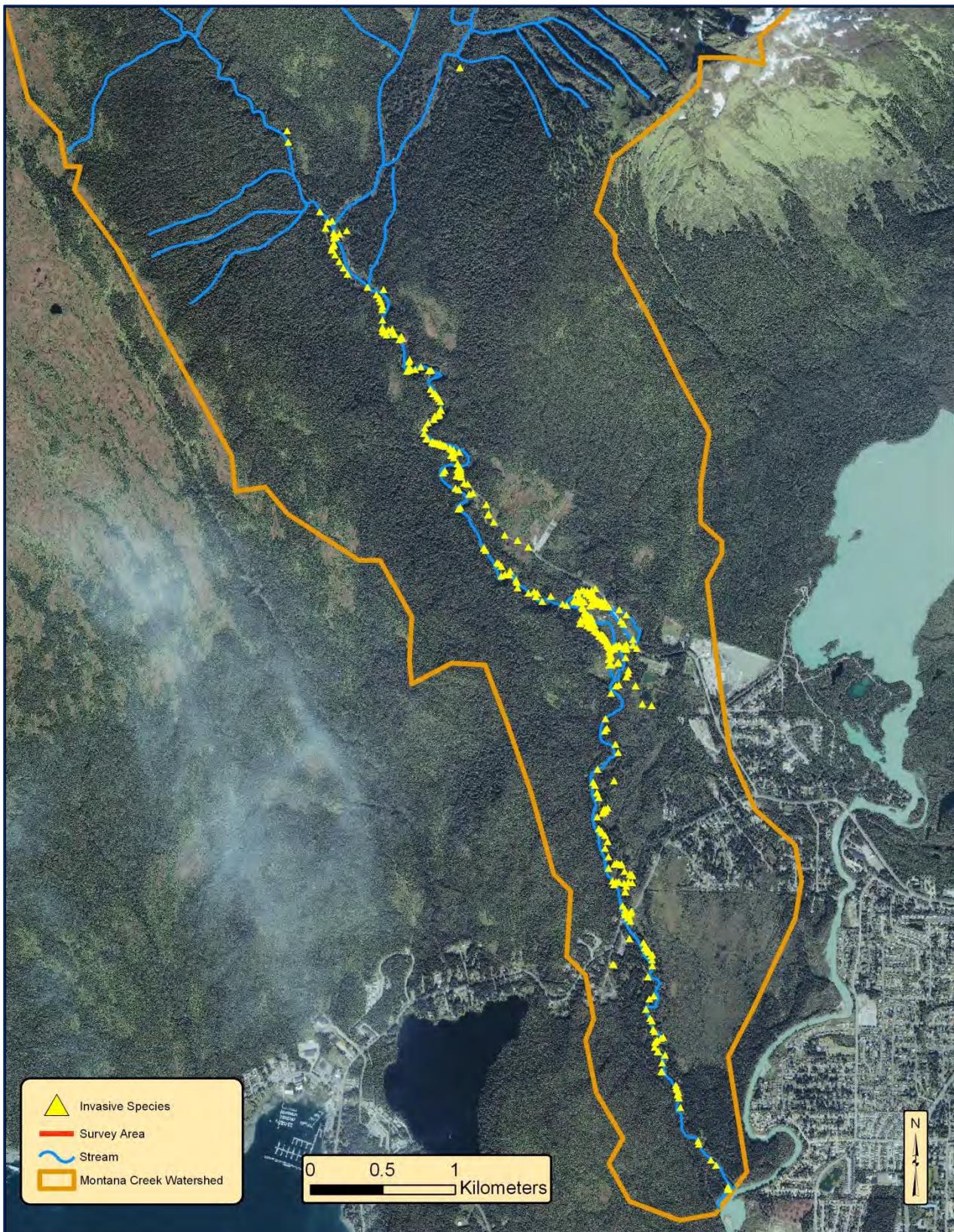


Figure 9. Invasive plant infestations found within the surveyed portion of the Montana Creek Watershed.

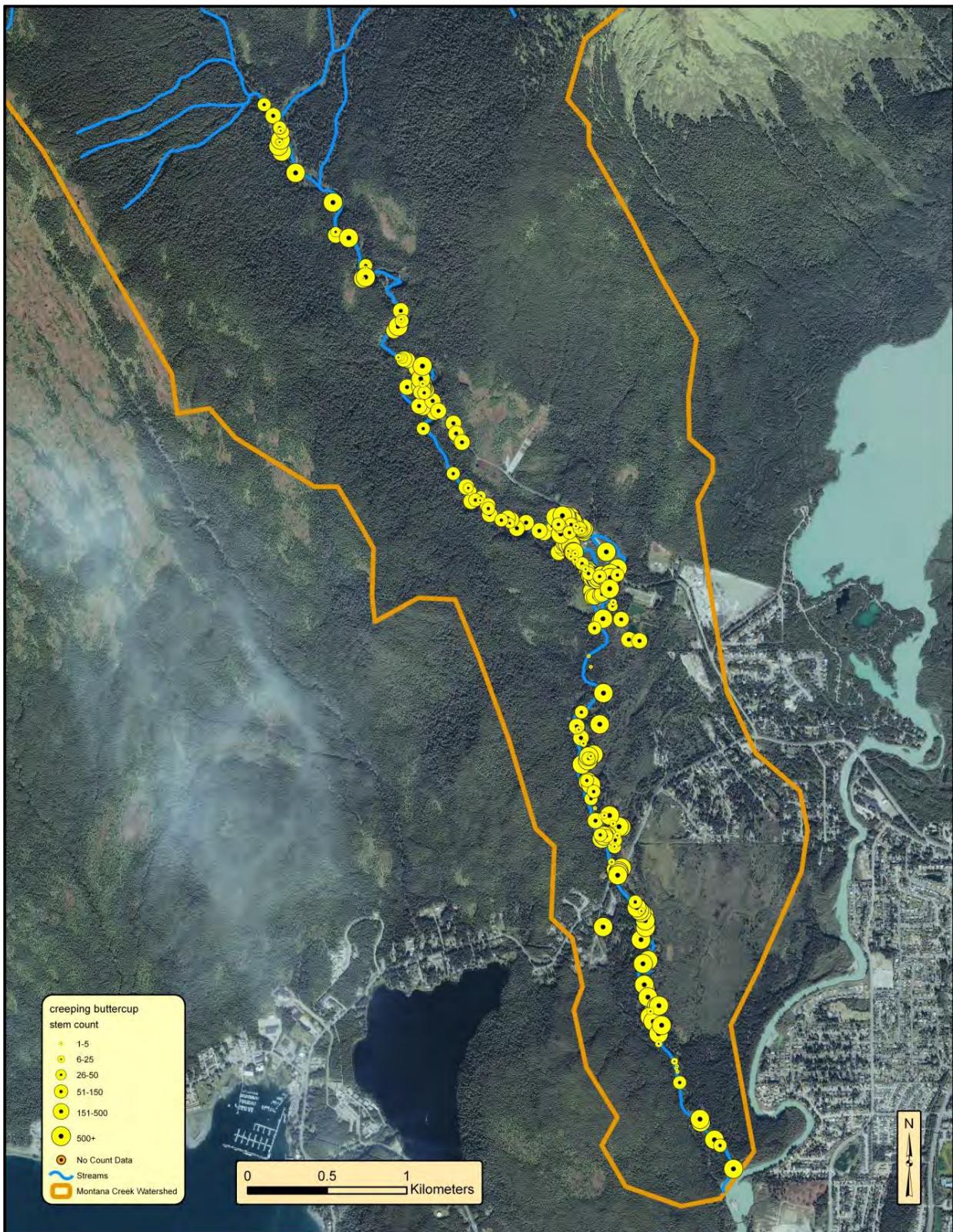


Figure 10. Creeping buttercup (rank = 54) infestations within the Montana Creek watershed survey area.

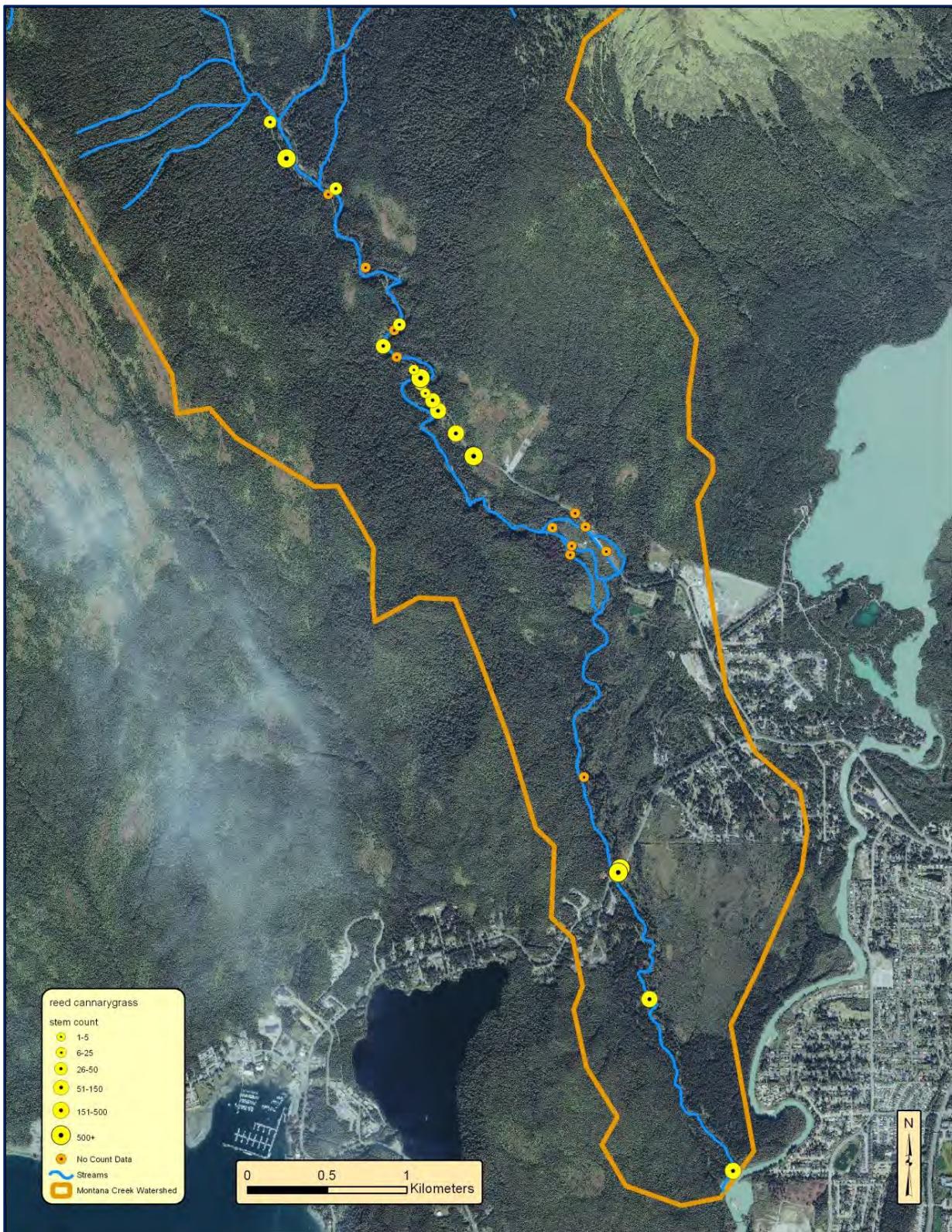


Figure 11. Reed canarygrass (rank = 83) infestations within the Montana Creek watershed survey area.

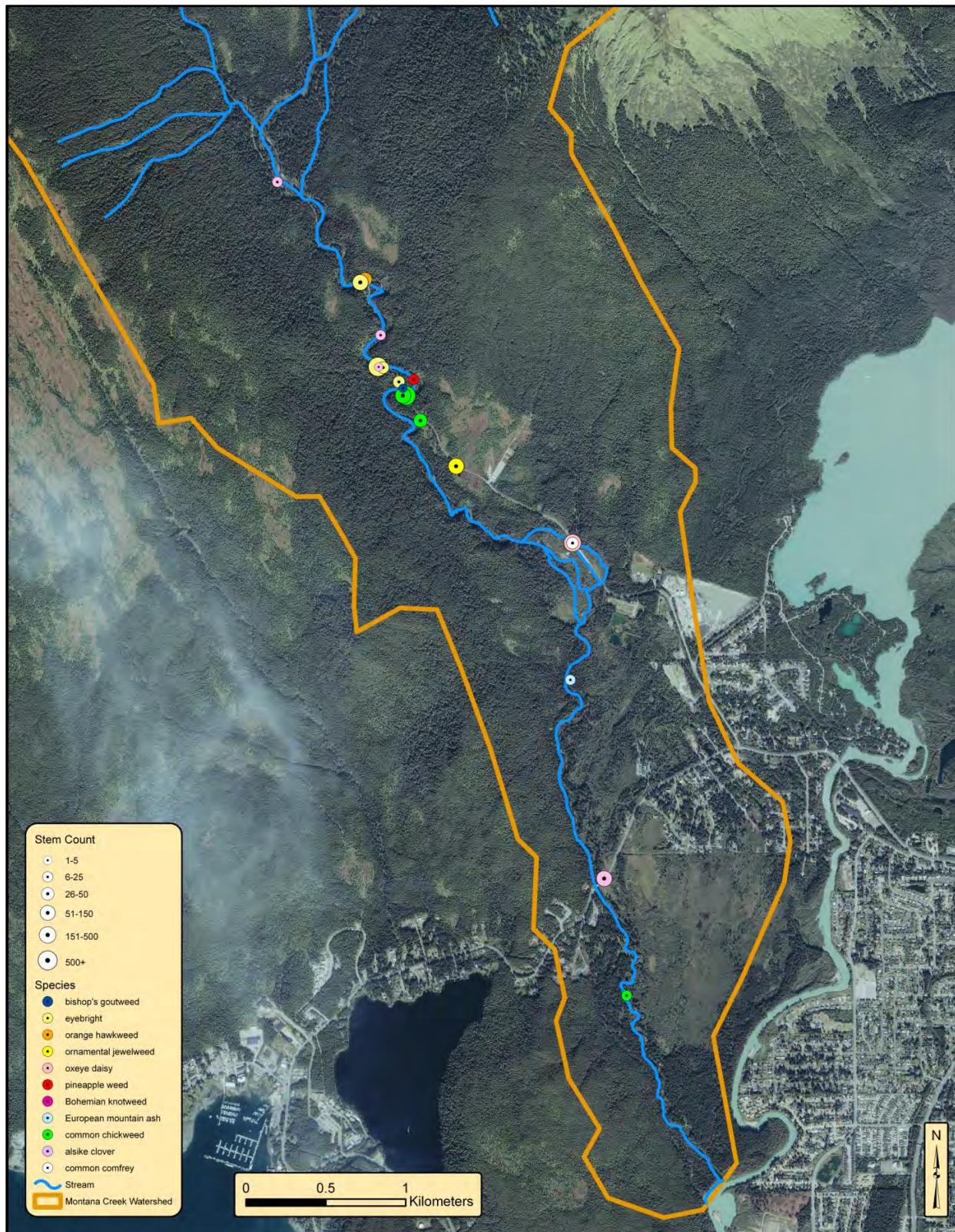


Figure 12. Infestations of 11 invasive plant species found in the Montana Creek watershed survey area.



Figure 13. White clover (rank = 59) infestations within the Montana Creek watershed survey area.

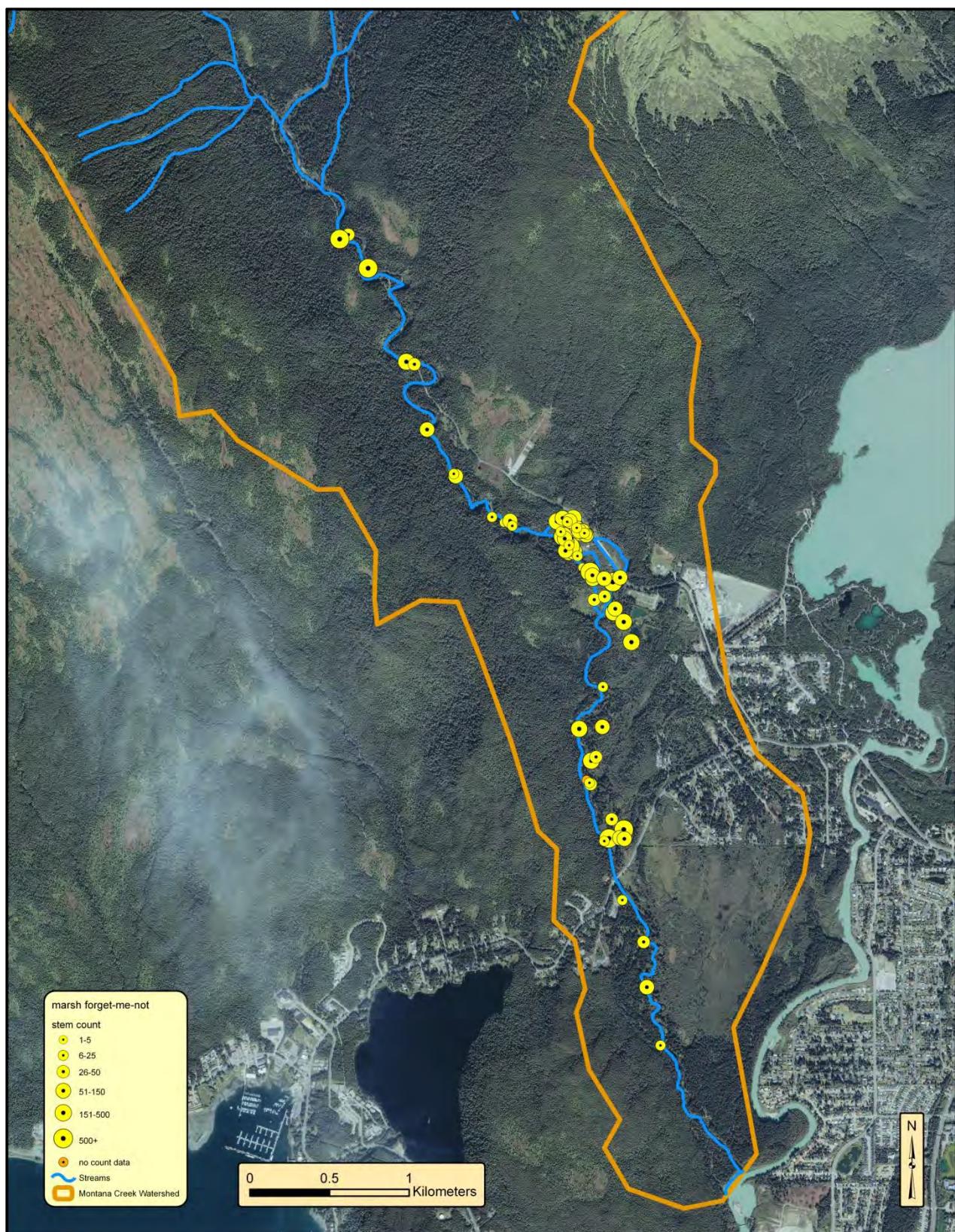


Figure 14. Marsh forget-me-not (rank = 54) infestations within the Montana Creek watershed survey area.

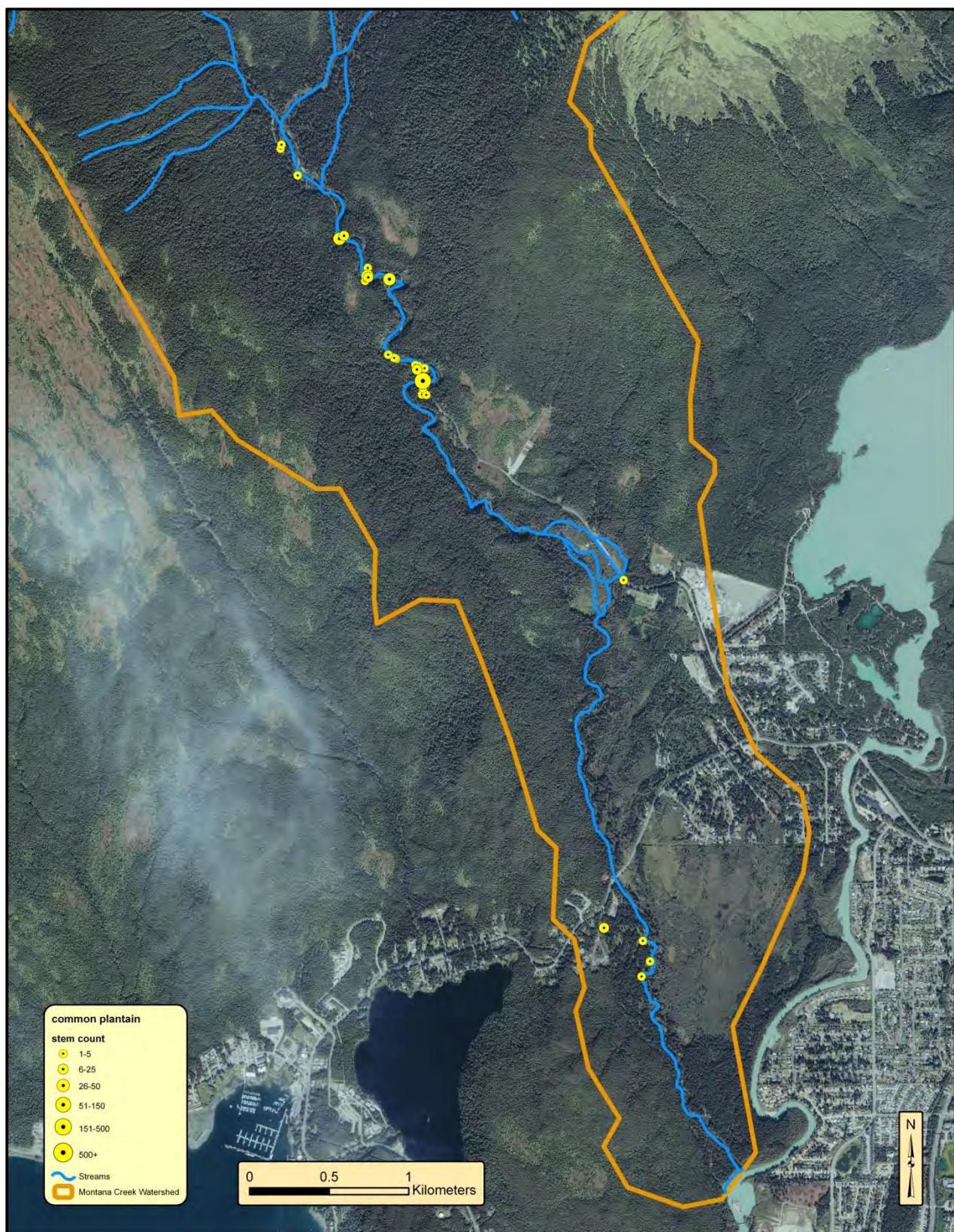


Figure 15. Common plantain (rank = 44) infestations within the Montana Creek watershed survey area.

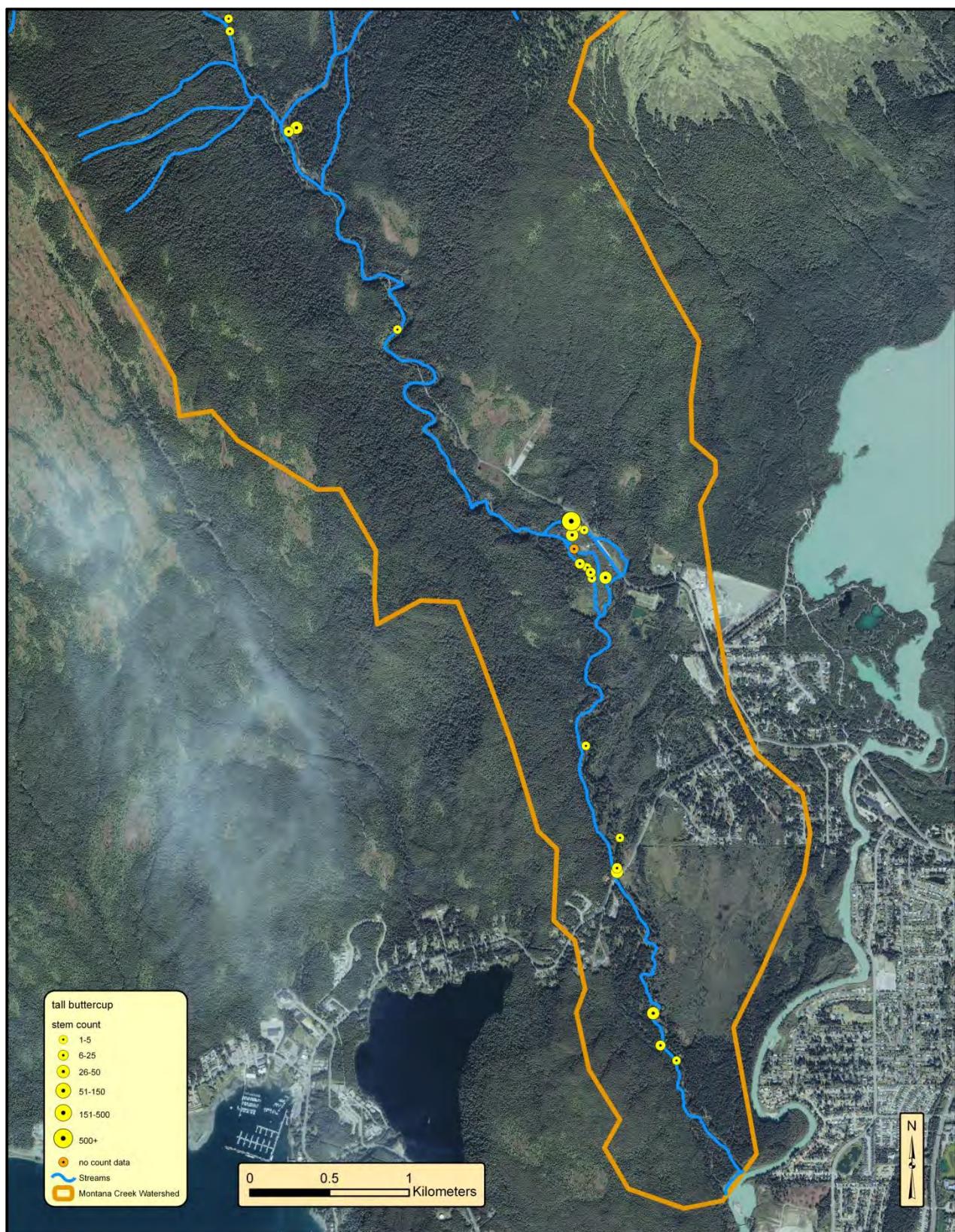


Figure 16. Tall buttercup (rank = 54) infestations within the Montana Creek watershed survey area.

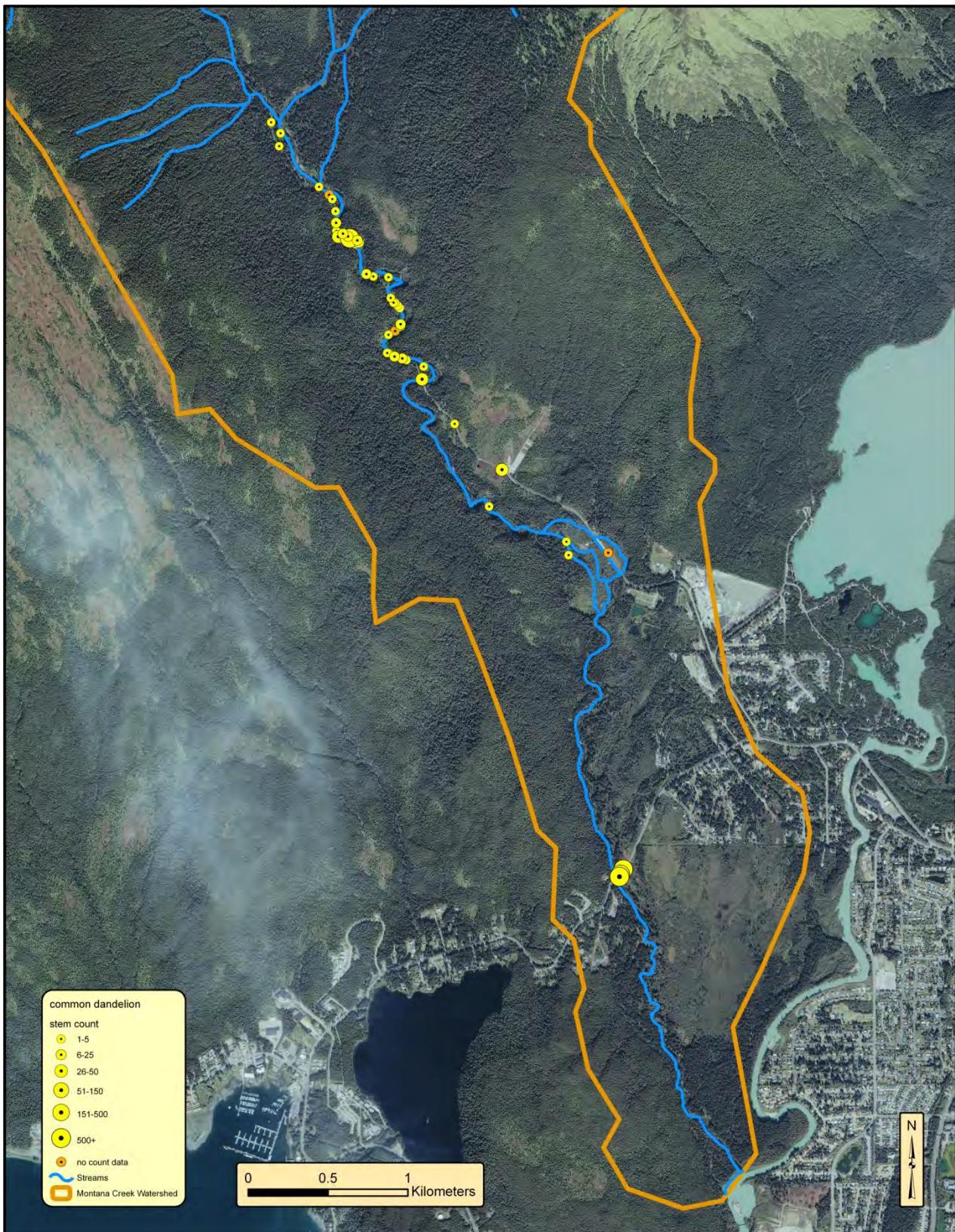


Figure 17. Common dandelion (rank = 58) infestations within the Montana Creek watershed survey area.

Invasive Plant Management Recommendations for the Montana Creek Watershed.

- Reed canarygrass can become the dominant species in emergent wetlands and riparian habitat and can degrade or eliminate open-water aquatic habitat used by rearing salmonids and other species. Reed canarygrass infestations should be a high priority for eradication to prevent continued expansion in wetlands where it occurs and to prevent spread into high value wetland habitat on the east side of Montana Creek, between the community garden and Mendenhall Loop Road.
- All infestations of oxeye daisy, orange hawkweed, Bohemian knotweed, and ornamental jewelweed should be controlled in 2013 using mechanical or chemical means until all plants have been eradicated.
- During the survey, disposal of yard waste into roadside ditches and importation of soil and plants into the community garden were identified as likely vectors for invasive plant introductions into the Montana Creek watershed. Members of the community garden and general public should be informed of their role in preventing the introduction and spread of invasive plants by these means. Yard waste disposed of in inappropriate areas should be removed, double bagged, and disposed in the landfill.
- Despite extensive disturbance to native plants and soils from ORV use in the McGinnis Creek watershed, only a single invasive plant infestation was found on the trail system. To prevent the spread of invasive plants into the McGinnis Creek watershed via ORV trails, the watershed should be closed to ORV use and native vegetative cover should be restored to all trails.

Peterson Creek Watershed

Thirty-two (32) acres in the lower Peterson Creek watershed were surveyed for invasive plants. The survey area encompassed a 1.3 mile long corridor extending from the stream mouth at Amalga Harbor to a point approximately 1,500 feet upstream of Glacier Highway (Figure 3). The survey area also included a portion of two tributaries, the Amalga Harbor boat launch parking lot, Amalga Harbor Road, and Glacier Highway between Amalga Harbor Road and the Glacier Highway Bridge over Peterson Creek.

Invasive plant infestations were found throughout the survey area. Twelve invasive plant species in 442 infestations covering 14 acres were documented (Table 2, Figure 20). Creeping buttercup was the most common invasive plant found comprising 43% and 53% of the total number and area of infestations, respectively (Figure 21). Common dandelion, white clover, reed canarygrass, and marsh forget-me-not (Figures 22-25) comprised from 8% to 13% of all infestations and from 3% to 20% of the total infestation area. The remaining 7 species found in the survey area collectively represented 1.2% (by area) of all infestations combined. Two species ranked 60 or greater for invasiveness - reed canarygrass (rank 83) and oxeye daisy (rank 61) - comprised 9% of the total area infested with invasive plants. Reed canarygrass

infestations covered 1.2 acres of land within the survey area.

Creeping buttercup infestations were distributed throughout the survey area and the majority of infestations contained 500 or more plants (Map X). Only 4 infestations were found upstream of the Glacier Highway Bridge. Reed canarygrass infestations were concentrated along Glacier Highway and Amalga Harbor Road (Map X). White clover, a species considered moderately invasive (rank 59), was widely distributed throughout the survey area, particularly along Glacier Highway, Amalga Harbor Road, and the shoreline of Peterson Salt Lake (Map X). This species has yet to invade riparian habitat between Glacier Highway and Amalga Harbor Road.



Figure 18. Creeping buttercup infestation along a tributary used by rearing coho salmon in the lower Peterson Creek watershed (June 2012).

Table 2. Invasiveness ranks and infestation data for non-native invasive plants found during a survey of lower Peterson Creek in October 2011. Infestation area has been adjusted to account for the percent aerial coverage of each species within the infestations. Species in bold text are ranked moderately to extremely invasive.

Common/scientific name	Invasive-ness rank	No. of infestations	% of total infestations	Infestation area (acres)	% of total infestation area	Map #
creeping buttercup <i>Ranunculus repens</i>	54	188	42.53	10.495	52.57	21
common dandelion <i>Taraxacum officinale</i>	58	55	12.44	1.142	20.41	23
white clover <i>Trifolium repens</i>	59	58	13.12	0.496	15.69	24
reed canarygrass <i>Phalaris arundinacea</i>	83	37	8.37	1.229	3.54	25
marsh forget-me-not <i>Myosotis scorpioides</i>	56	56	12.67	0.213	2.71	22
common plantain <i>Plantago major</i>	44	11	2.49	0.033	2.24	26
tall buttercup <i>Ranunculus acris</i>	54	19	4.30	0.020	1.48	26
alsike clover <i>Trifolium hybridum</i>	57	7	1.58	0.322	0.93	24
European mountain ash <i>Sorbus aucuparia</i>	59	6	1.36	0.032	0.38	26
common comfrey <i>Symphytum officinale</i>	48	3	0.68	0.011	0.03	26
curly dock <i>Rumex crispus</i>	48	1	0.23	< 0.001	0.03	26
oxeye daisy <i>Leucanthemum vulgare</i>	61	1	0.23	< 0.001	0.003	26
Total		442	100	13.99	100	



Figure 19. Green patches of creeping buttercup infestations contrast against the dead foliage of native plants along the lower reaches of Peterson Creek (view looking upstream near Amalga Harbor Road, October 2011).

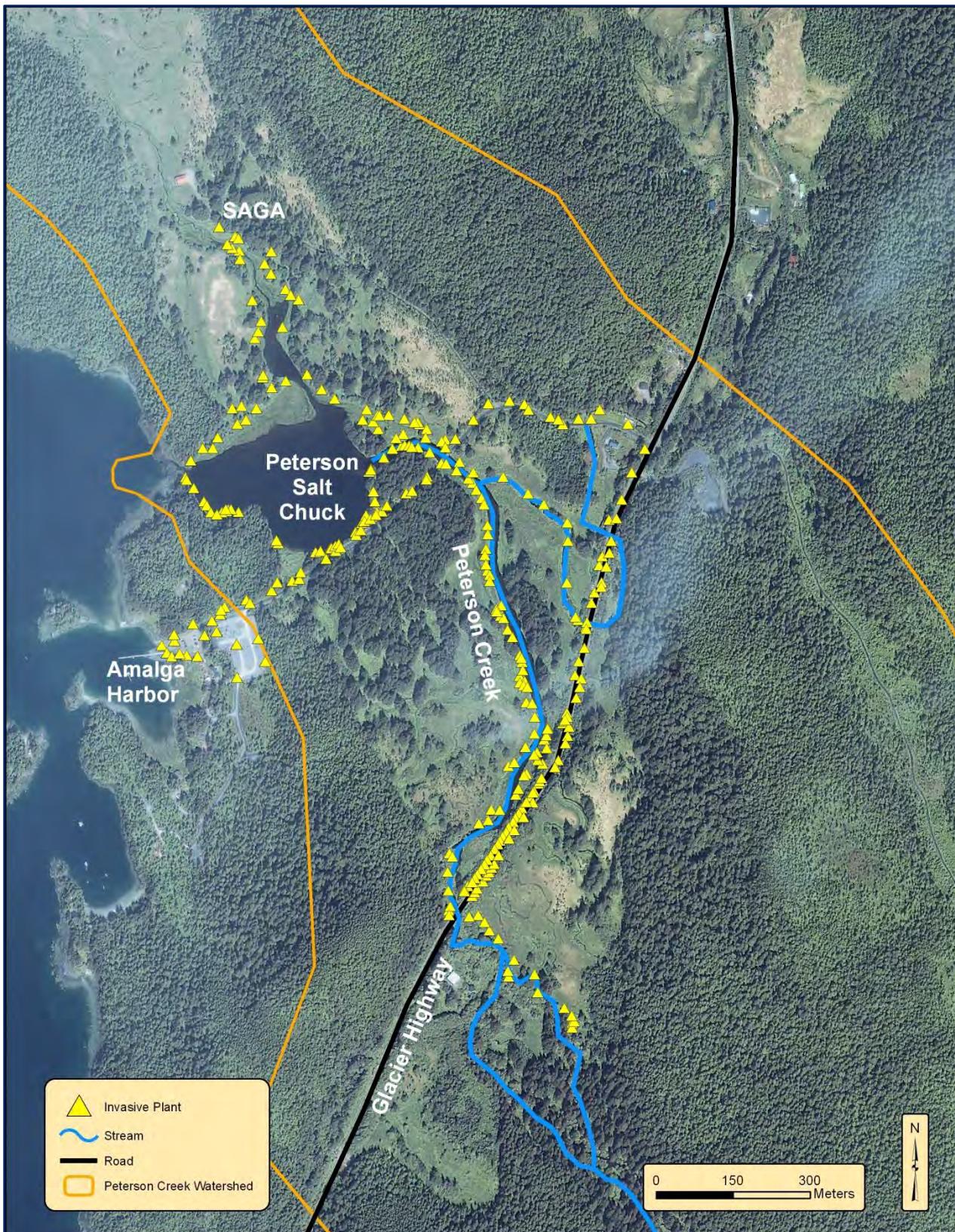


Figure 20. Invasive plant infestations found within the surveyed portion of the Peterson Creek Watershed.

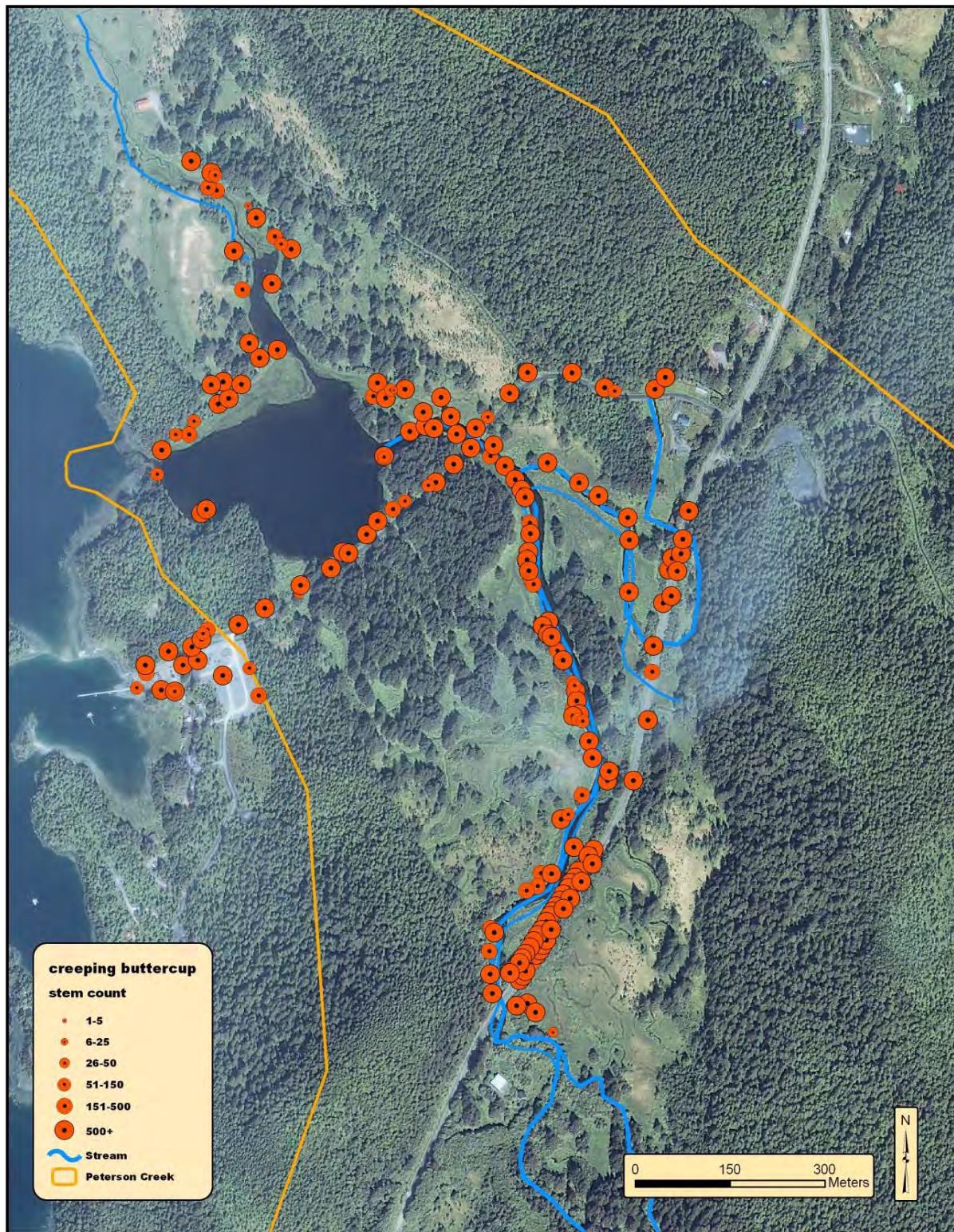


Figure 21. Creeping buttercup infestations within the Peterson Creek watershed survey area.

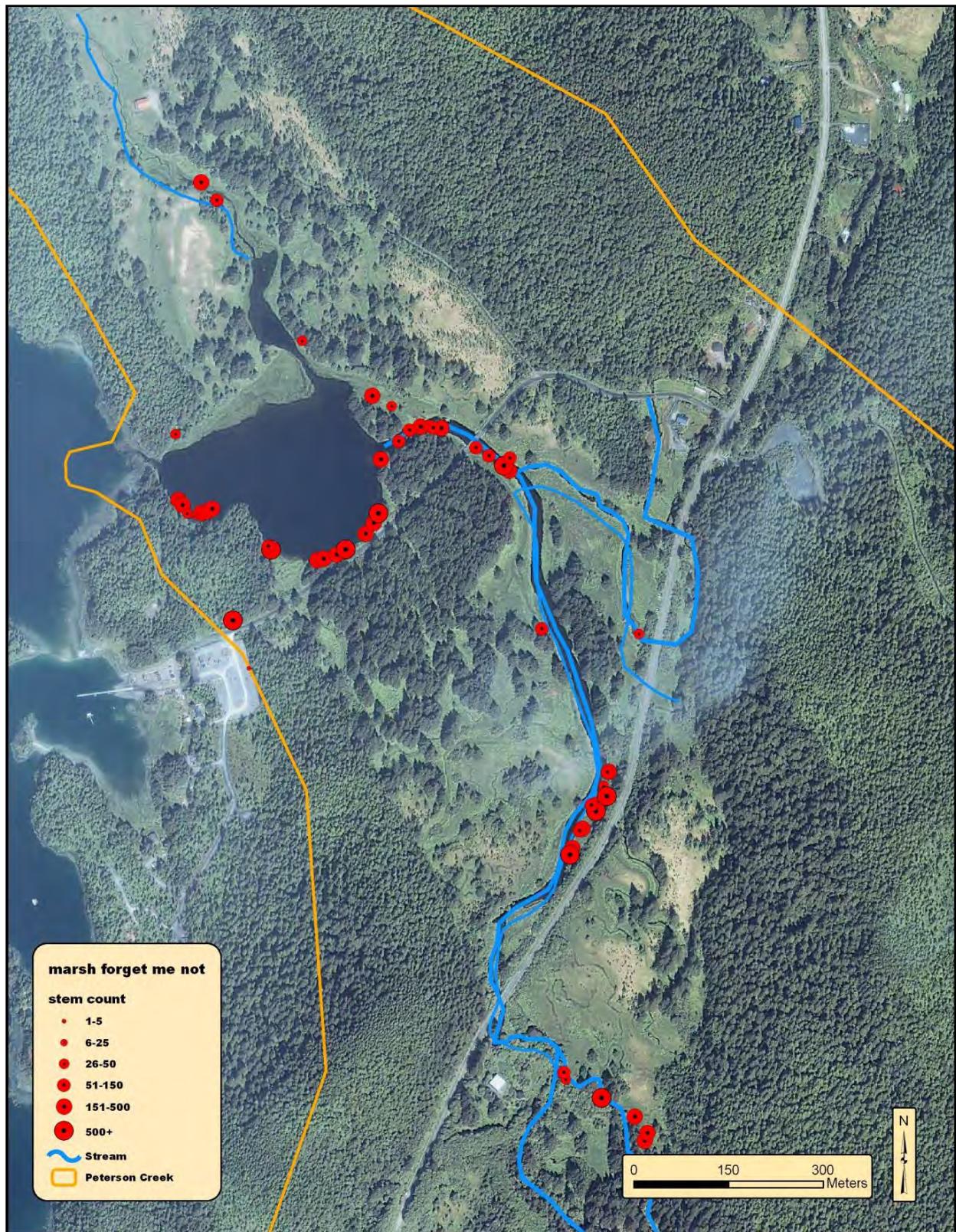


Figure 22. Marsh forget-me-not infestations within the Peterson Creek watershed survey area.

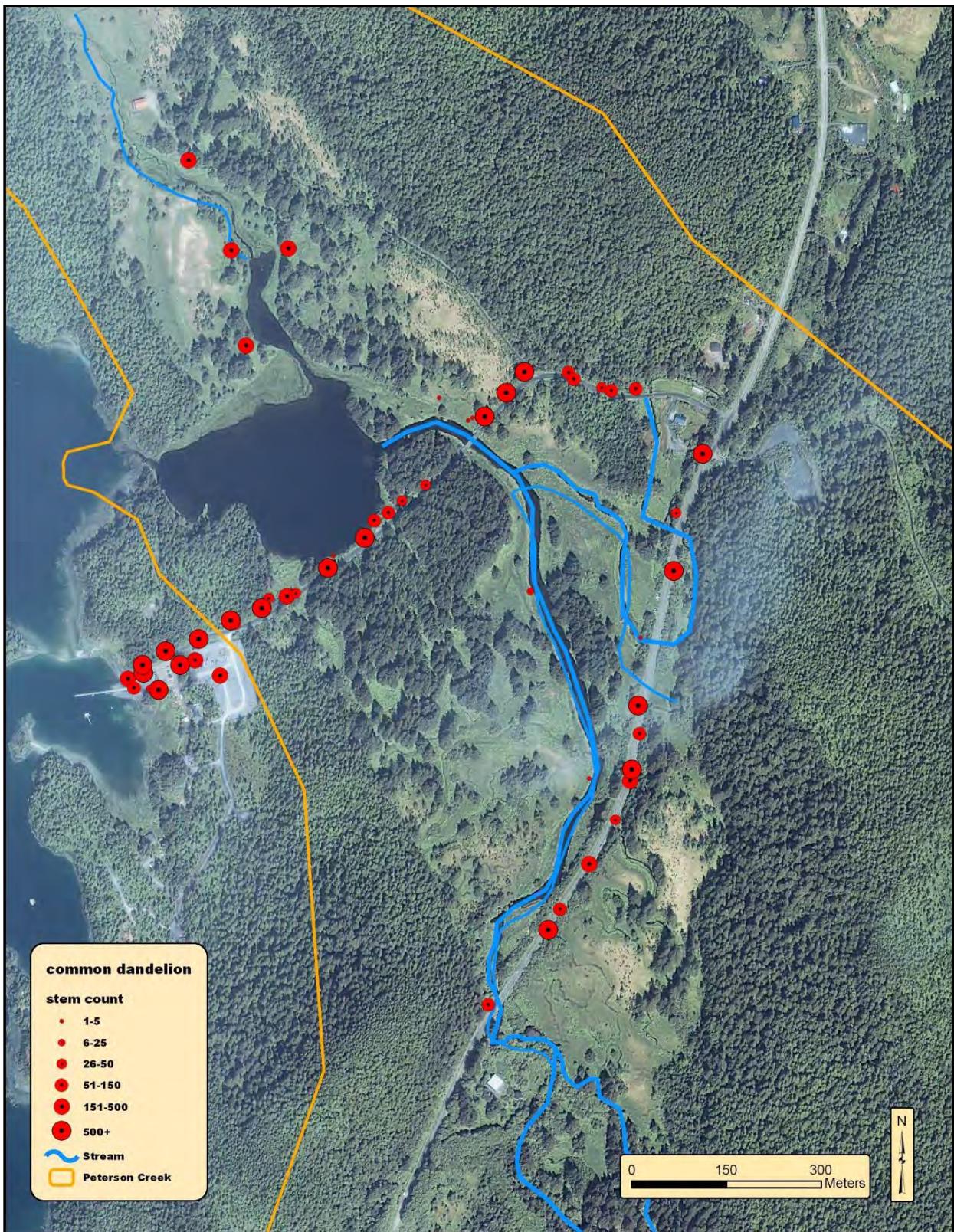


Figure 23. Common dandelion infestations within the Peterson Creek watershed survey area.

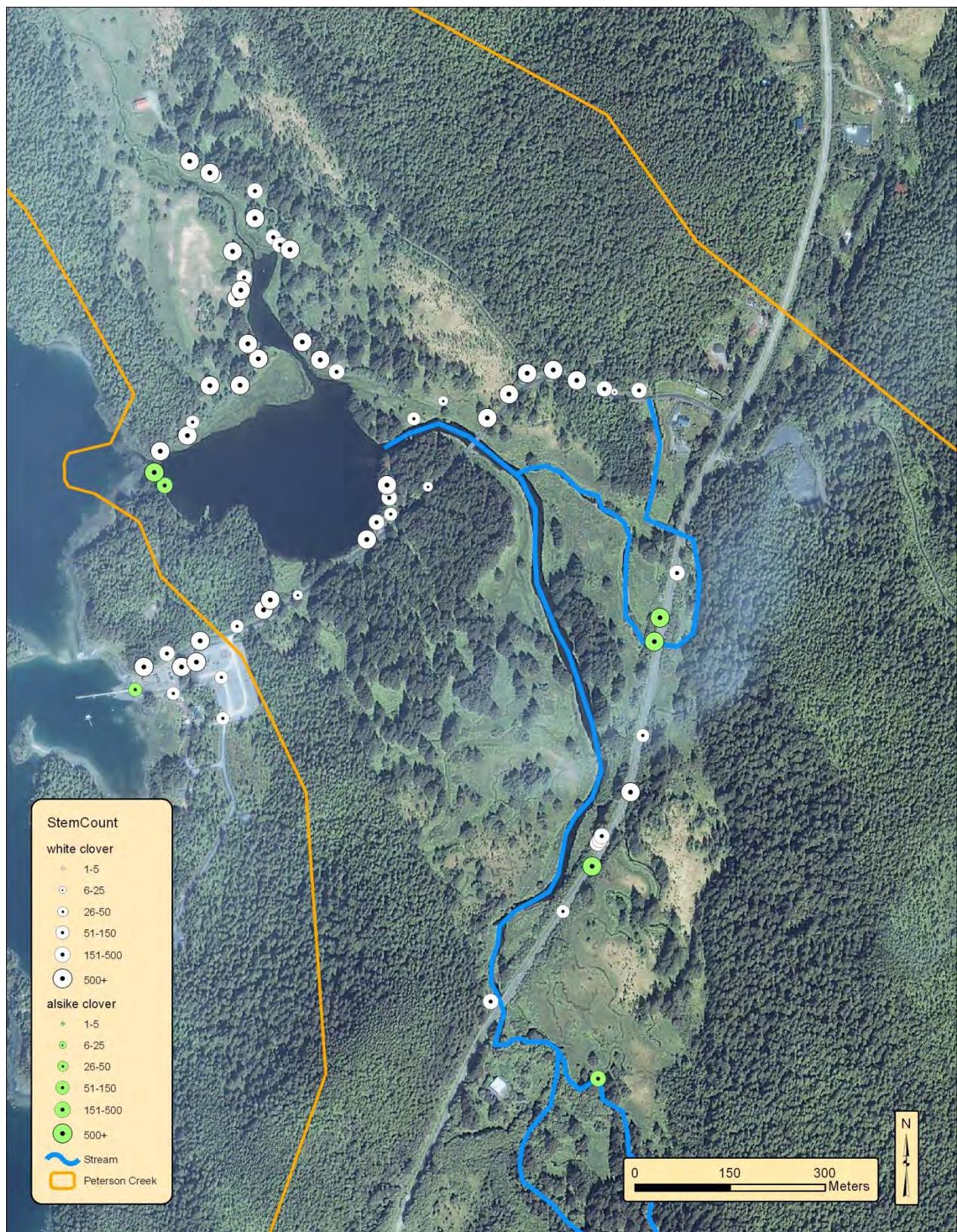


Figure 24. White clover and alsike clover infestations within the Peterson Creek watershed survey area.

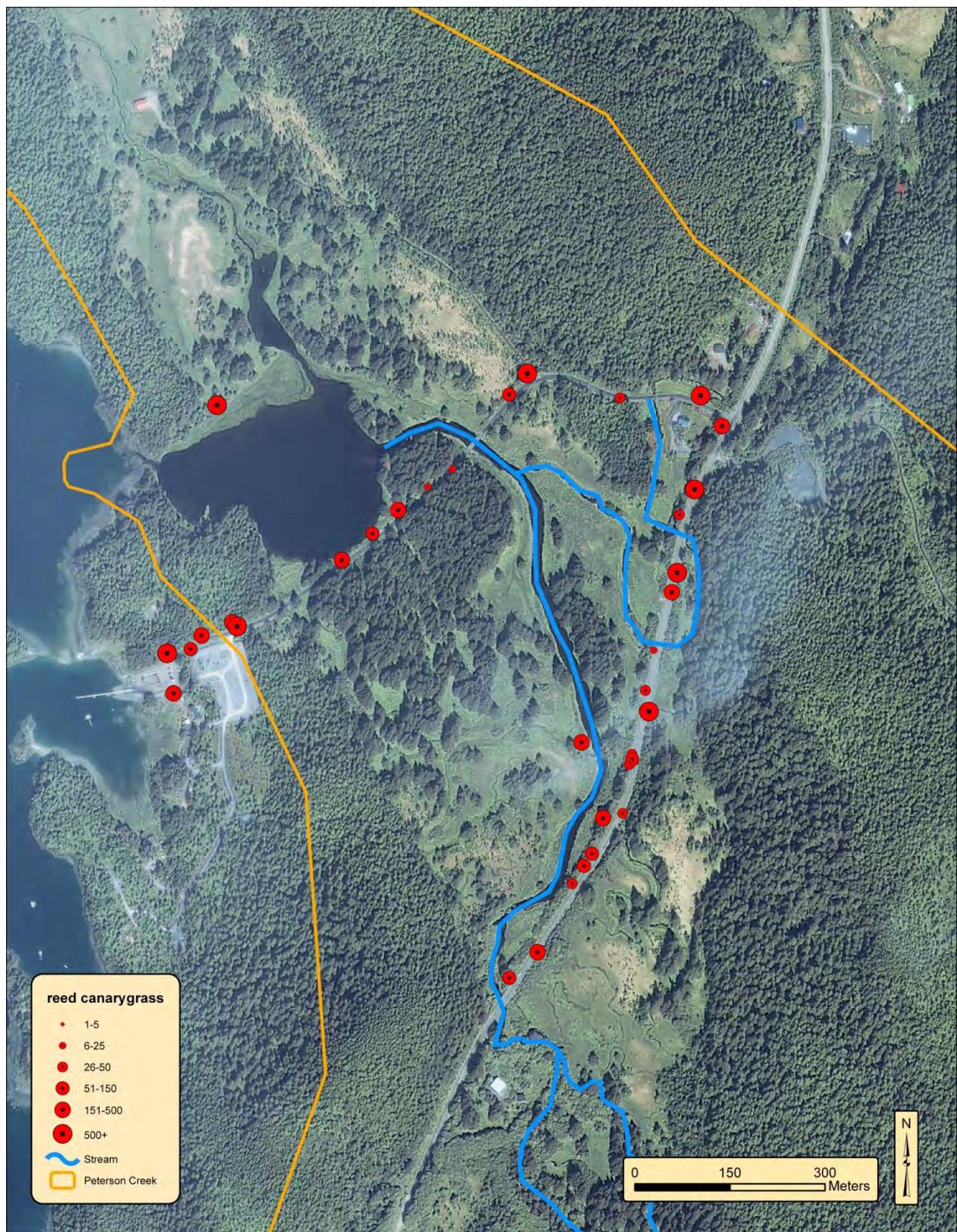


Figure 25. Reed canarygrass infestations within the Peterson Creek watershed survey area.

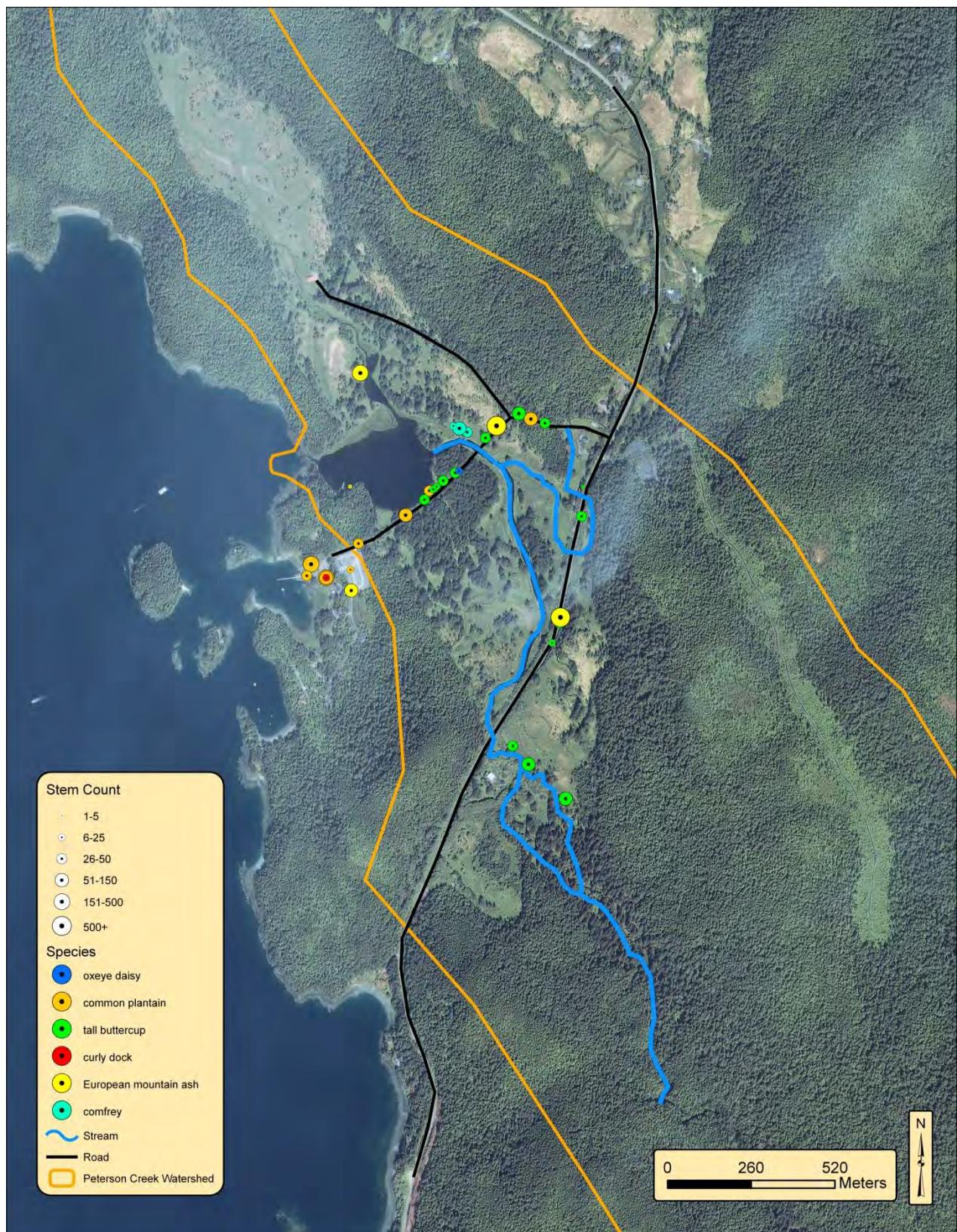


Figure 26. Infestations of 6 invasive plant species found within the Peterson Creek watershed survey area.

Invasive Plant Management Recommendations for the lower Peterson Creek Watershed.

- Although distributed throughout the survey area, reed canarygrass is primarily limited to roadside areas. This extremely invasive species will likely move outward from existing infestation areas into adjacent open-canopy riparian habitats and meadows in the lower watershed, eventually establishing monotypic stands. Reed canarygrass infestations in riparian habitat near the lake and stream channel should be eradicated as soon as possible, followed by eradication (in order of priority) of infestations near bridge and culvert crossings of stream channels, trailheads, and within road corridors.
- Creeping buttercup is well establish throughout the riparian corridor of the survey area. This species is forming monotypic stands that have displaced native plant communities, especially in areas with moist soil and lacking tree and shrub canopies. The uplifted meadows in the lower Peterson Creek watershed represent a relatively uncommon and important type of wildlife habitat in the CBJ. Although considered only a moderately invasive species, expansion of existing creeping buttercup infestations and establishment of new ones in the survey area could result in significant ecological impacts. Additional study of the potential threats of this species to riparian and meadow habitat and ecological functions is necessary to determine if control is warranted.
- Invasive plant species ranked 50 or greater and occupying less than 0.1 acres should be considered for eradication, particularly oxeye daisy which is considered moderately invasive and can spread rapidly along road corridors.
- The three common comfrey infestations in the survey area should be eradicated as this species appears to be capable of expanding into adjacent meadow habitat.
- The 4 European mountain ash trees found in this survey should be removed. Small trees may be pulled from the ground; large trees can be cut down followed by annual monitoring for new growth from the stump.
- Developed portions of the SAGA Eagle Valley Center, including the access road, parking areas, trails, the garden, and other disturbed land were not surveyed for invasive plants during this project. These areas should be surveyed and all moderately to extremely invasive plants eradicated.

Auke Lake Watershed

The Auke Lake watershed invasive plant survey encompassed 32 acres in the lower Auke Lake watershed. The survey area included the lake shoreline, a hiking trail along the eastern edge of the lake, a portion of Mendenhall Loop Road, the lower portion of the Spaulding Meadows snowmobile access trail, the UAS Student Housing area and access road, and riparian zones adjacent to Auke Lake and the lower reaches of Lake Creek and other tributaries (Figure 4). Invasive plants were distributed throughout the survey area with the exception of the east shoreline of Auke Lake (Figure 28). Infestations found near the east shoreline of the lake were associated with disturbed ground along a hiking trail that parallels the shoreline.

Twenty-one (21) invasive plant species in 718 infestations covering 5.7 acres were discovered in the survey area (Table 3). Five of the invasive plant species found during the survey have invasiveness ranks of 60 or greater and comprise about 21% of the total area infested: reed canarygrass (21% of area infested), Bohemian knotweed (0.04%), oxeye daisy (0.04%), bird vetch (< 0.0001%), and orange hawkweed (0.01%) (Table 3). Orange hawkweed was found at 7 sites including on the north shoreline of the lake, on the snowmobile trail, and at the lake outlet (Figure 30). A single Bohemian knotweed infestation was found on private property adjacent to Mendenhall Loop Road (Figure 30). Oxeye daisy infestations were concentrated at the lake outlet and the lower half of the UAS Housing access road (Figure 38). Bird vetch was found growing in a flower bed at the UAS student housing complex (Figure 30). Reed canarygrass infestations occurred throughout the survey area, although most of the 82 infestations found during the survey were concentrated along the north and northeast shorelines of the lake, and along Mendenhall Loop Road (Figure 31). Several infestations were also found in the southeast portion of the lake.

The five most common species of invasive plants found during the survey were creeping buttercup, reed canarygrass, European mountain ash, white clover, and marsh forget-me-not (Table 3). Collectively, these five species accounted for 69% of all infestations and 73% of the total area of all infestations.

Creeping buttercup accounted for nearly one-third of all infestations and almost half of the total area of all infestations (Table 3). Large infestations (500+ stems) of creeping buttercup occurred extensively along Mendenhall Loop Road; along the north, west, and south shorelines of Auke Lake; and along the lower portion of the Spaulding Meadows snowmobile access trail (Figure 29).

European mountain ash trees occurred primarily as single-tree (\leq 2- inch diameter) infestations scattered around the north, west, and south shorelines of Auke Lake and along the lower reaches of Lake Creek (Figure 36). A concentration of single- and multiple-tree infestations was found at the UAS Student Housing Facility (Figure 36). Several large ash trees growing on the facility grounds appeared to have been planted

as landscape trees. Small ash trees growing on the facility grounds are likely the progeny of these mature landscaping trees.

White clover infestations in the survey area were concentrated along the margins of Mendenhall Loop Road and were also found along the southwest shoreline of the lake and along the lower portion of the snowmobile trail (Figure 33). Marsh forget-me-not infestations were concentrated along the southeast shoreline of Auke Lake and in the lake outlet area (Figure 37).



Figure 27. A European mountain ash tree (light colored foliage) growing on the root wad of a downed tree in Lake Creek, the main tributary to Auke Lake.

Table 3. Invasiveness ranking and infestation data for non-native invasive plants found during the survey of the lower Auke Lake watershed. Infestation area has been adjusted to account for the percent aerial coverage of each species within each infestation. Species in bold text are ranked moderately to extremely invasive. NR, not ranked.

Common/scientific name	Invasive-ness rank	No. of infestations	% of total infestations	Infestation area (acres)	% of total infestation area	Map #
creeping buttercup <i>Ranunculus repens</i>	54	227	31.62	2.73	48.12	29
reed canarygrass <i>Phalaris arundinacea</i>	83	82	11.42	1.20	21.09	31
European mountain ash <i>Sorbus aucuparia</i>	59	73	10.17	0.56	9.79	36
white clover <i>Trifolium repens</i>	54	58	8.08	0.48	8.38	33
marsh forget-me-not <i>Myosotis scorpioides</i>	54	56	7.80	0.28	5.00	37
common plantain <i>Plantago major</i>	44	47	6.55	0.07	1.23	35
alsike clover <i>Trifolium hybridum</i>	57	46	6.41	0.12	2.14	32
common dandelion <i>Taraxacum officinale</i>	58	43	5.99	0.07	1.27	34
tall buttercup <i>Ranunculus acris</i>	54	36	5.01	0.02	0.31	39
oxeye daisy <i>Leucanthemum vulgare</i>	61	22	3.06	0.04	0.78	38
common chickweed <i>Stellaria media</i>	42	9	1.25	0.00	0.04	30
orange hawkweed <i>Hieracium aurantiacum</i>	79	7	0.97	0.01	0.14	30
bishop's goutweed <i>Aegopodium podagraria</i>	57	2	0.28	0.00	0.05	30
sheep sorrel <i>Rumex acetosella</i>	51	2	0.28	0.00	0.00	30
red clover <i>Trifolium pratense</i>	59	2	0.28	0.00	0.06	30
purple foxglove <i>Digitalis purpurea</i>	51	1	0.14	0.00	0.01	30
common groundsel <i>Senecio vulgaris</i>	36	1	0.14	0.00	0.01	30
large yellow loosestrife <i>Lysimachia punctata</i>	NR	1	0.14	0.05	0.88	30
Bohemian knotweed <i>Fallopia bohemica</i>	87	1	0.14	0.04	0.70	30
scentless chamomile <i>Tripleurospermum inodorum</i>	48	1	0.14	< 0.001	0.01	30
bird vetch <i>Vicia cracca</i>	73	1	0.14	< 0.0001	0.001	30
Total		718	100	5.67	100	

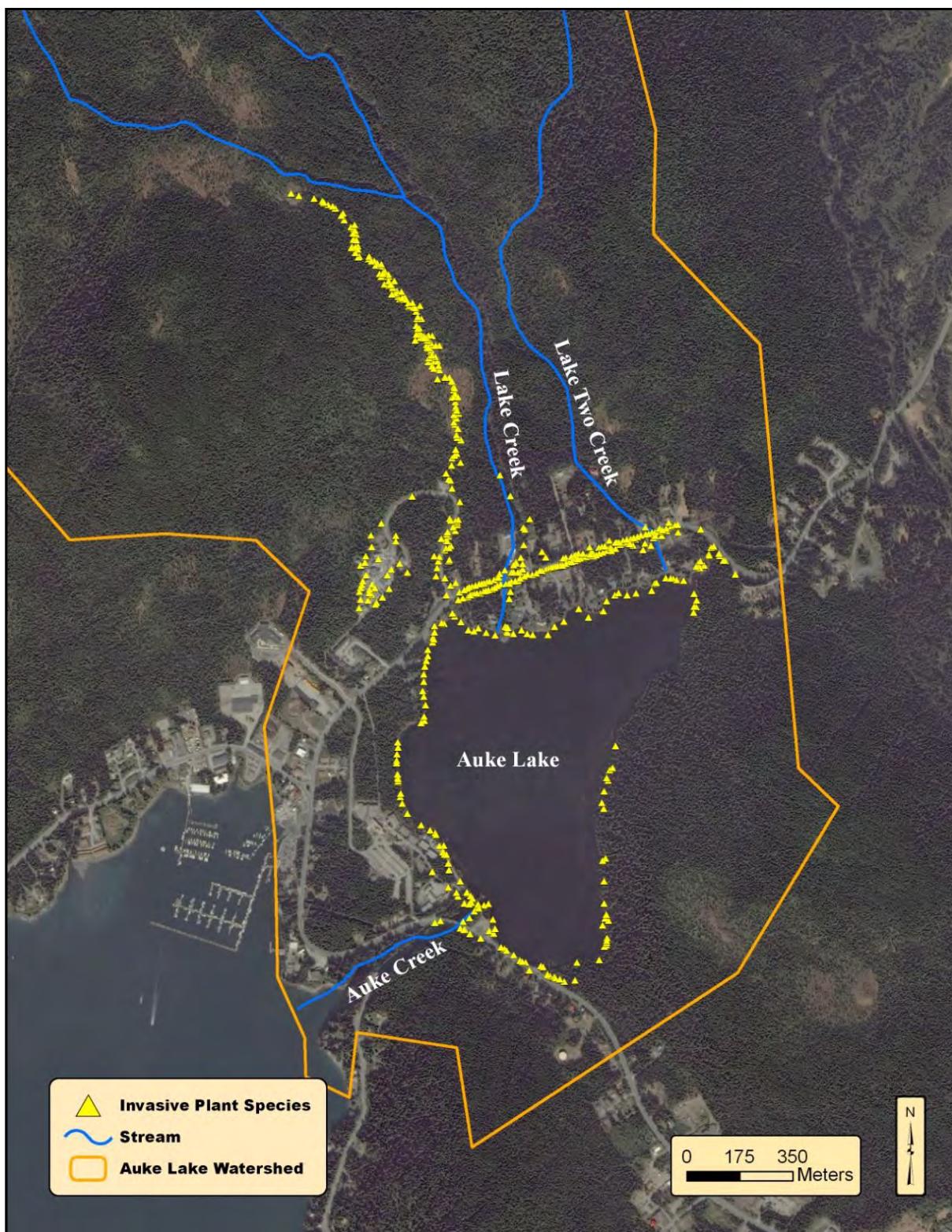


Figure 28. Invasive plant infestations found within the surveyed portion of the Peterson Creek Watershed.

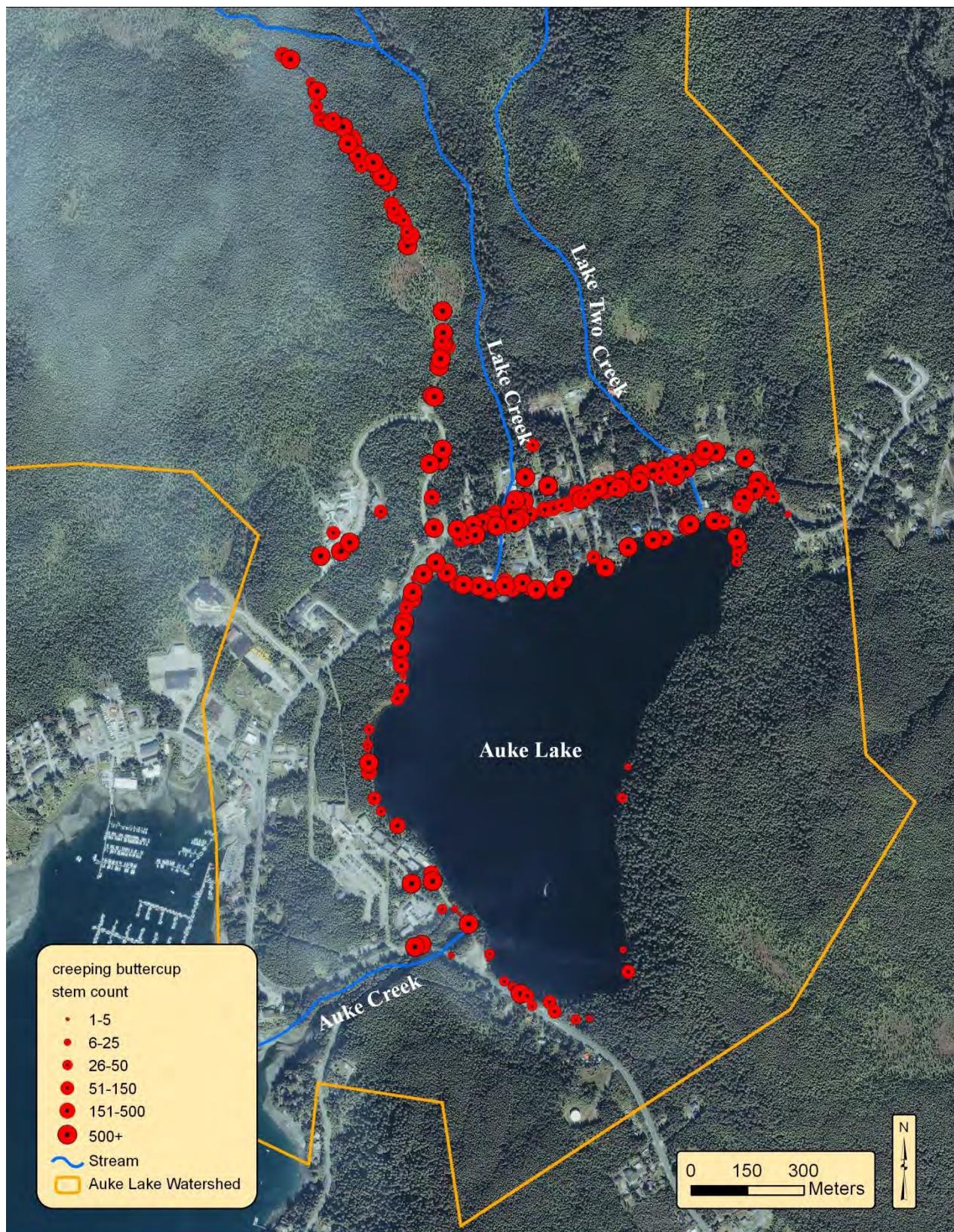


Figure 29. Creeping buttercup (rank = 54) infestations within the Auke Lake Watershed survey area.

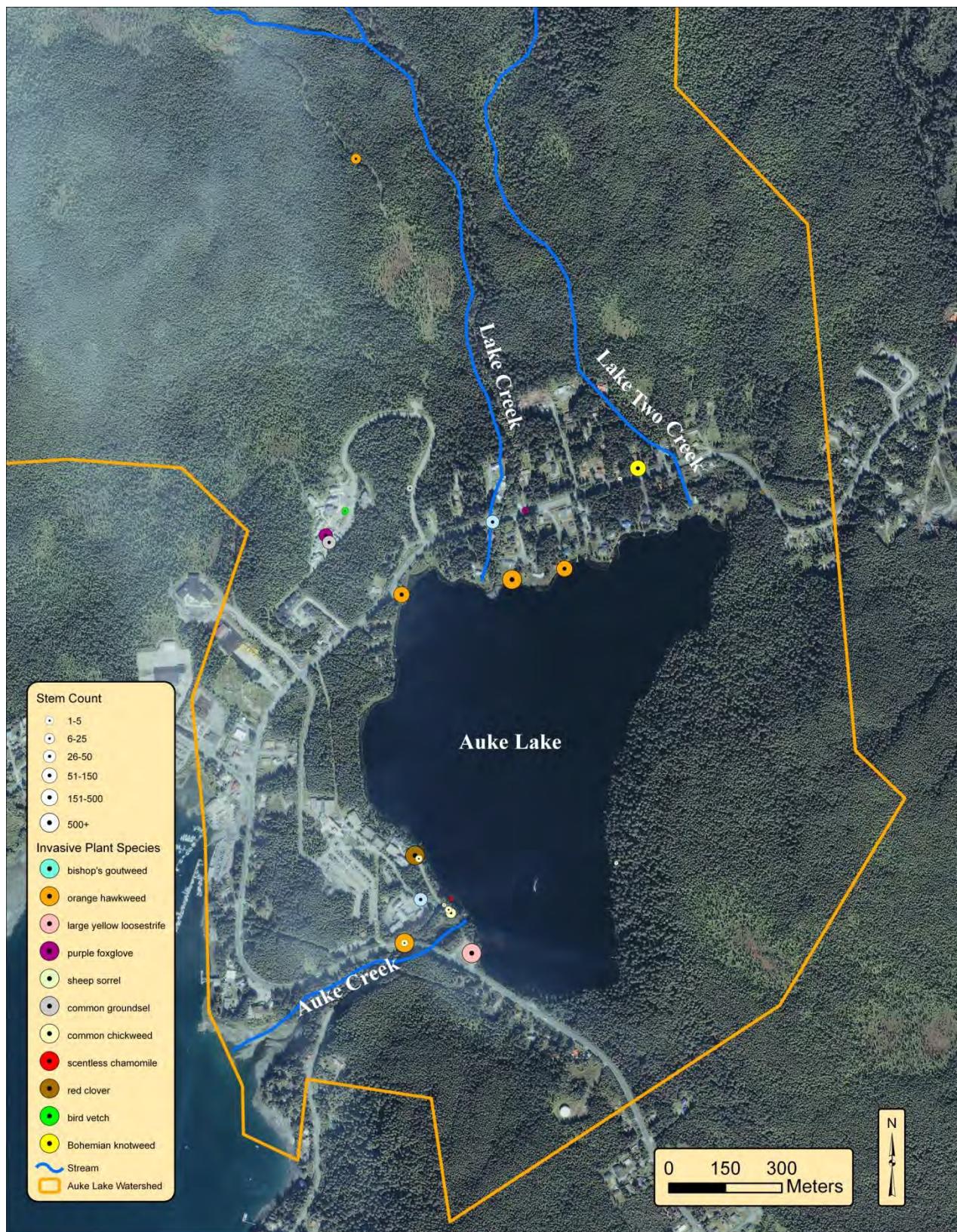


Figure 30. Infestations of 11 invasive plant species found within the Auke Lake Watershed survey area.

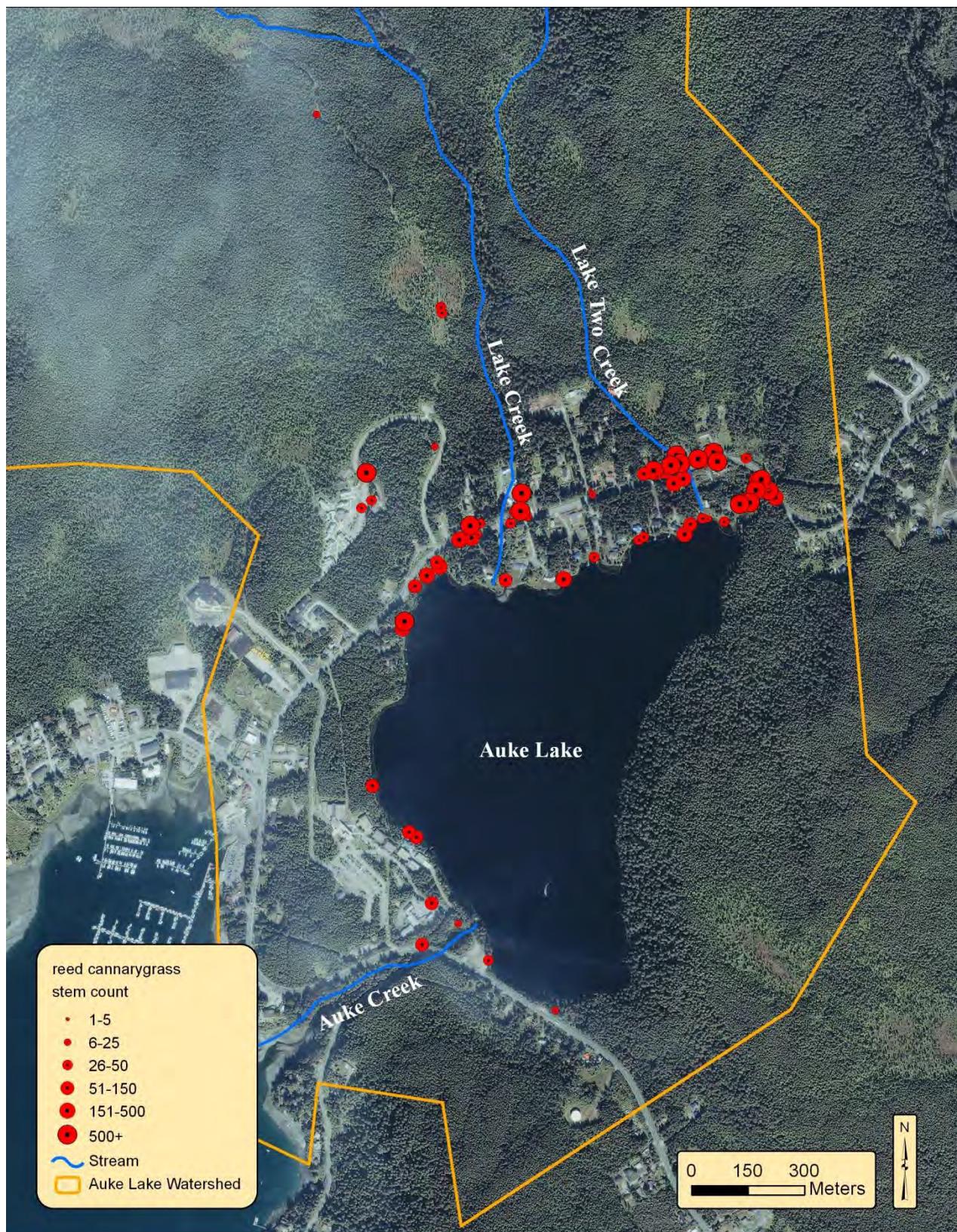


Figure 31. Reed canarygrass (rank = 82) infestations within the Auke Lake Watershed survey area.

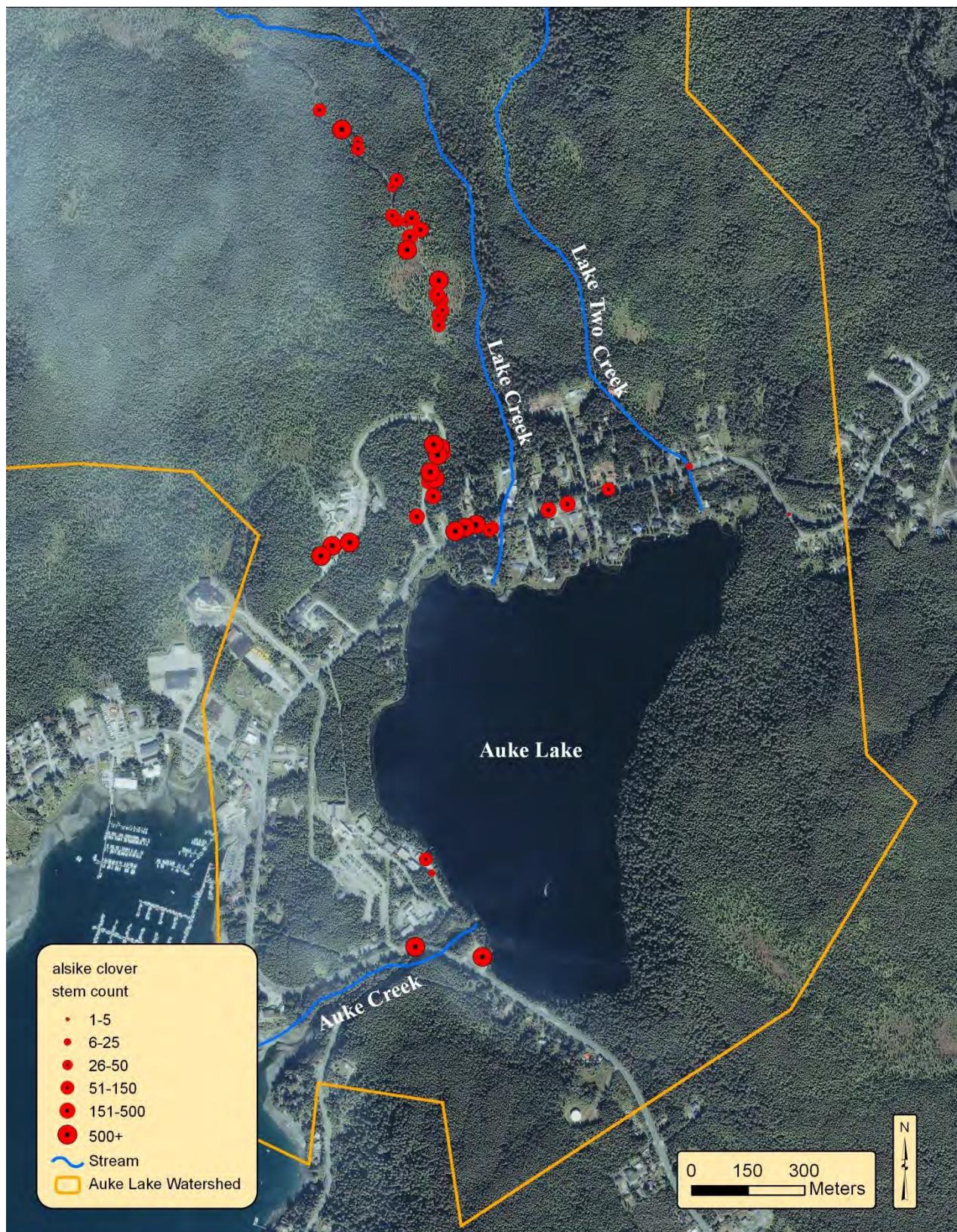


Figure 32. Alsike clover (rank = 57) infestations within the Auke Lake Watershed survey area.

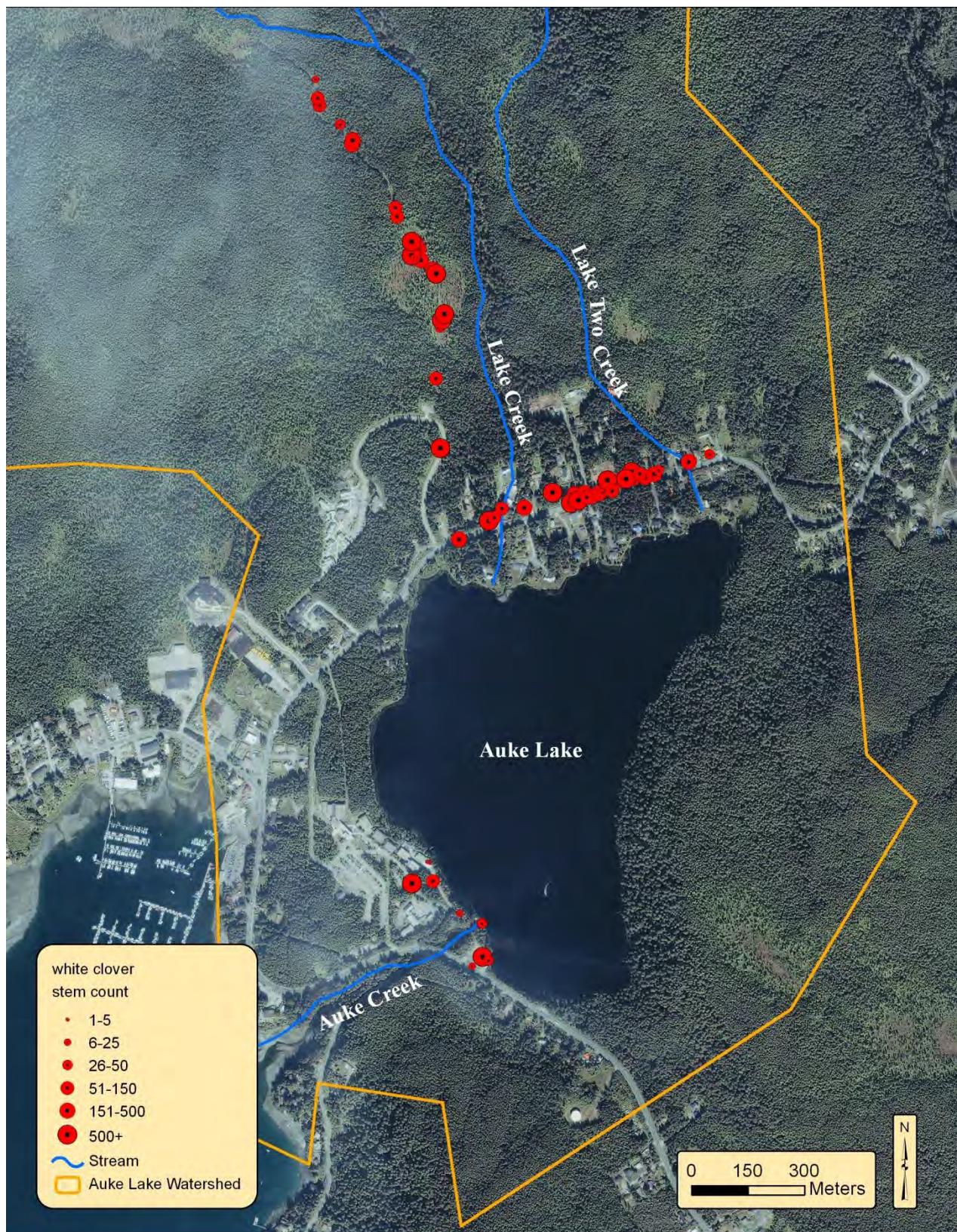


Figure 33. White clover (rank = 54) infestations within the Auke Lake Watershed survey area.

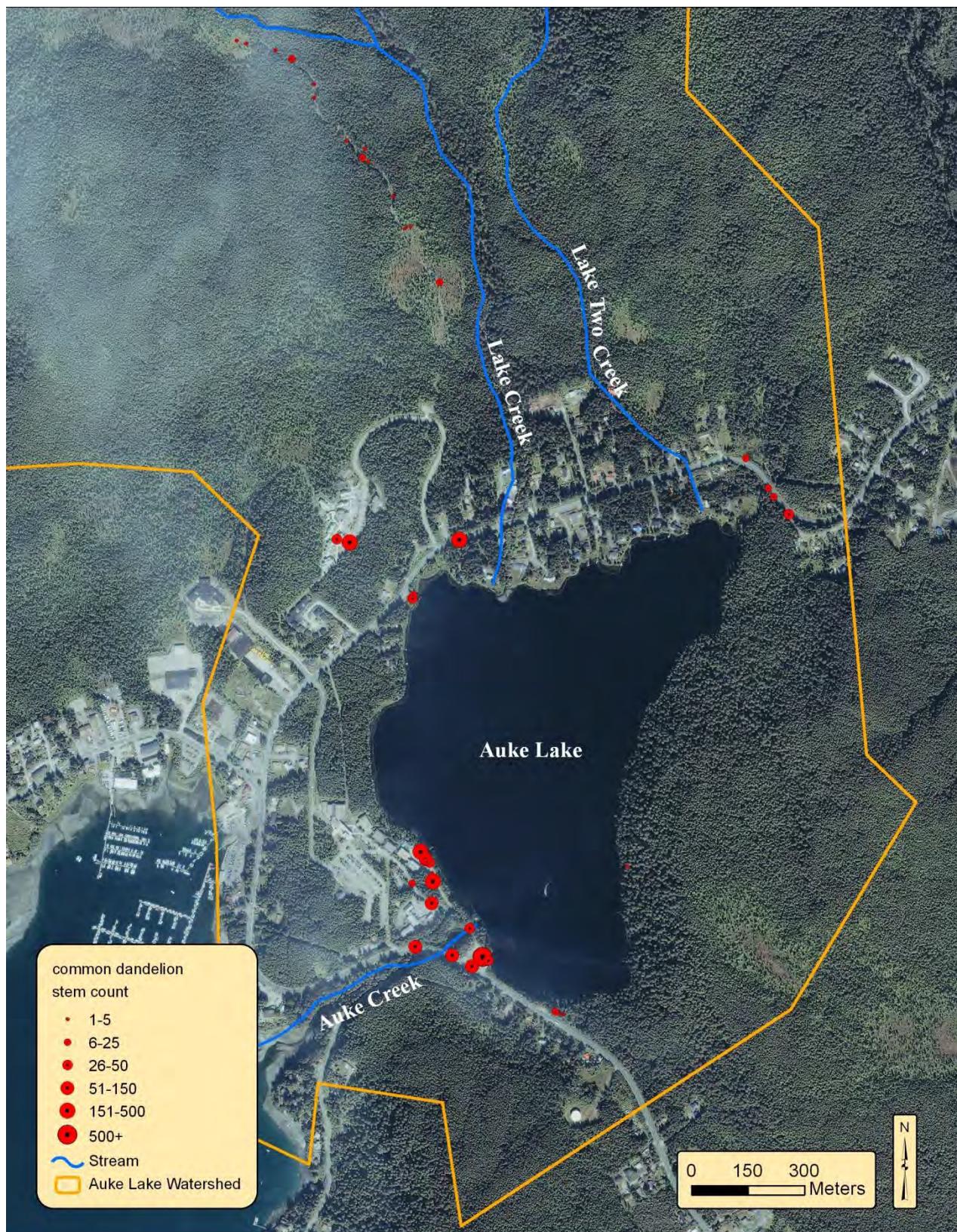


Figure 34. Common dandelion (rank = 58) infestations within the Auke Lake Watershed survey area.

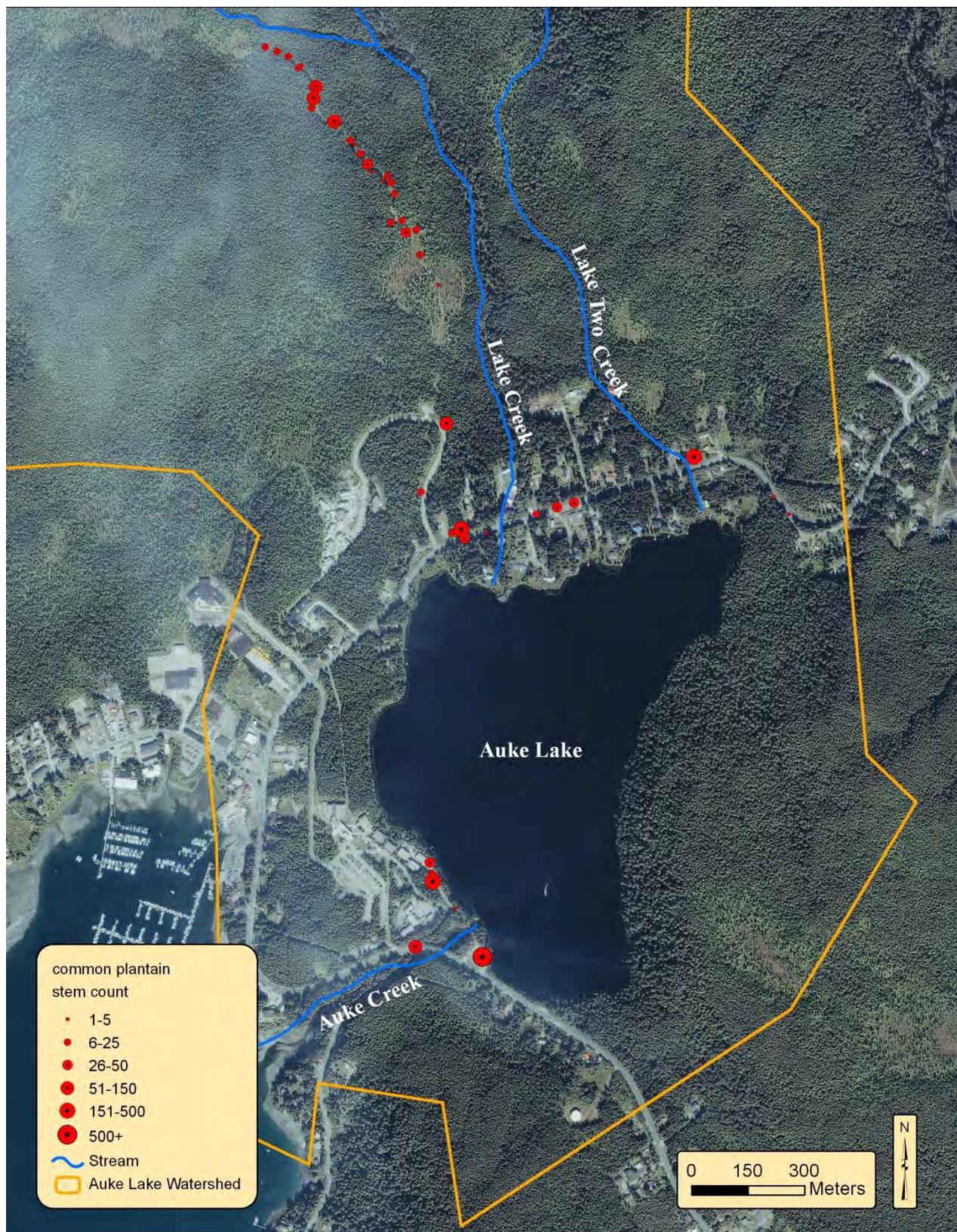


Figure 35. Common plantain (rank = 44) infestations within the Auke Lake Watershed survey area.

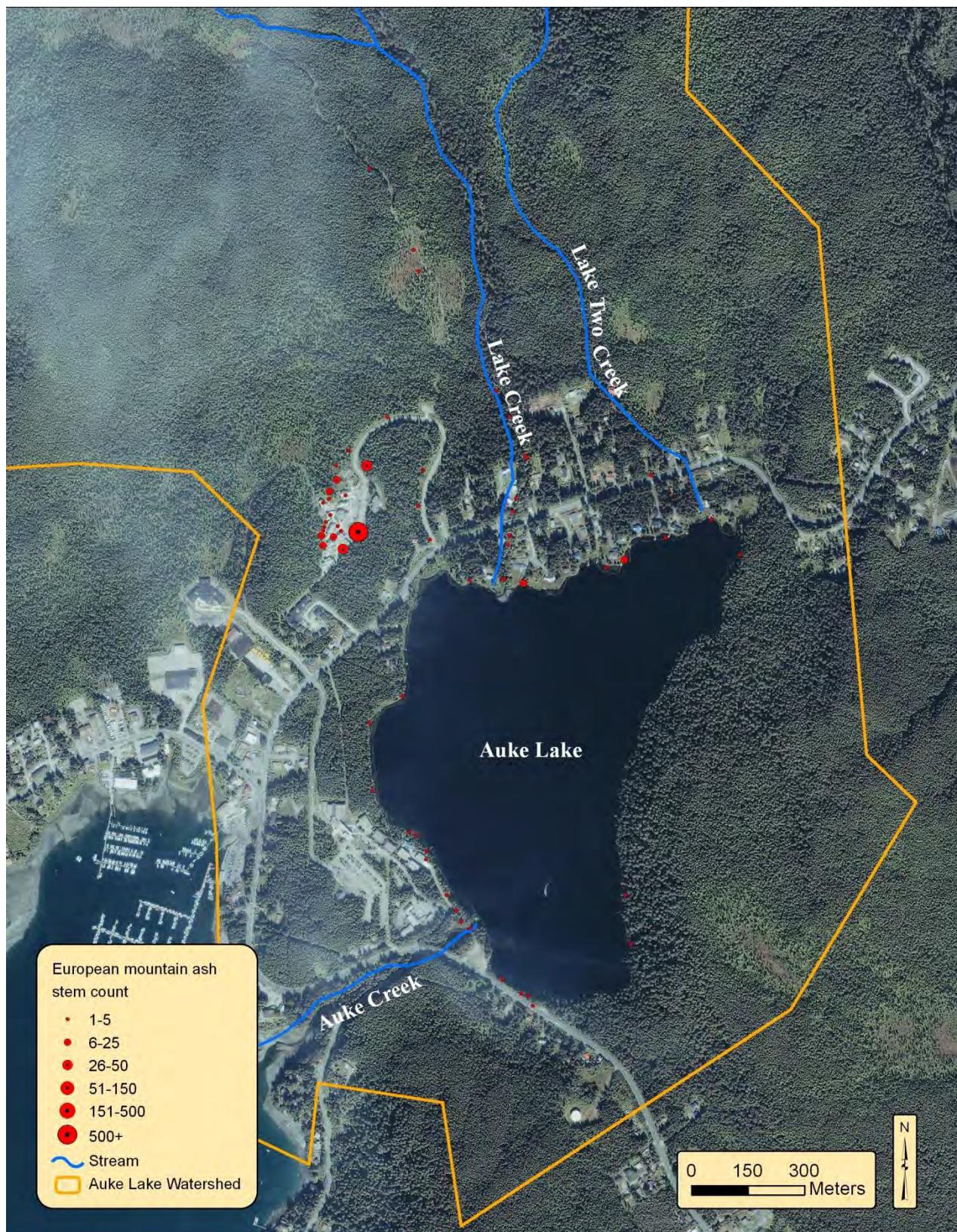


Figure 36. European mountain ash (rank = 59) infestations within the Auke Lake Watershed survey area.

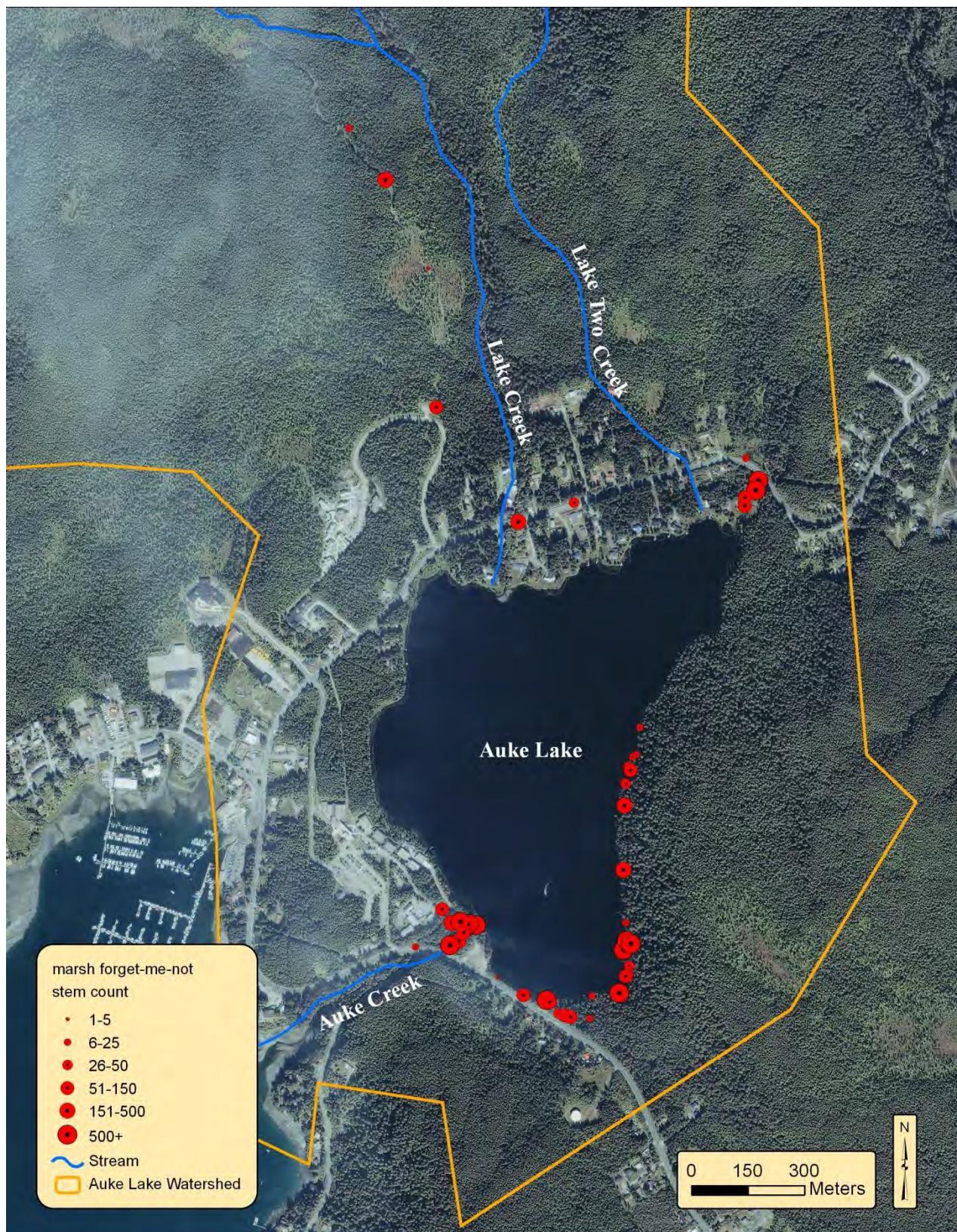


Figure 37. Marsh forget-me-not (rank = 54) infestations within the Auke Lake Watershed survey area.

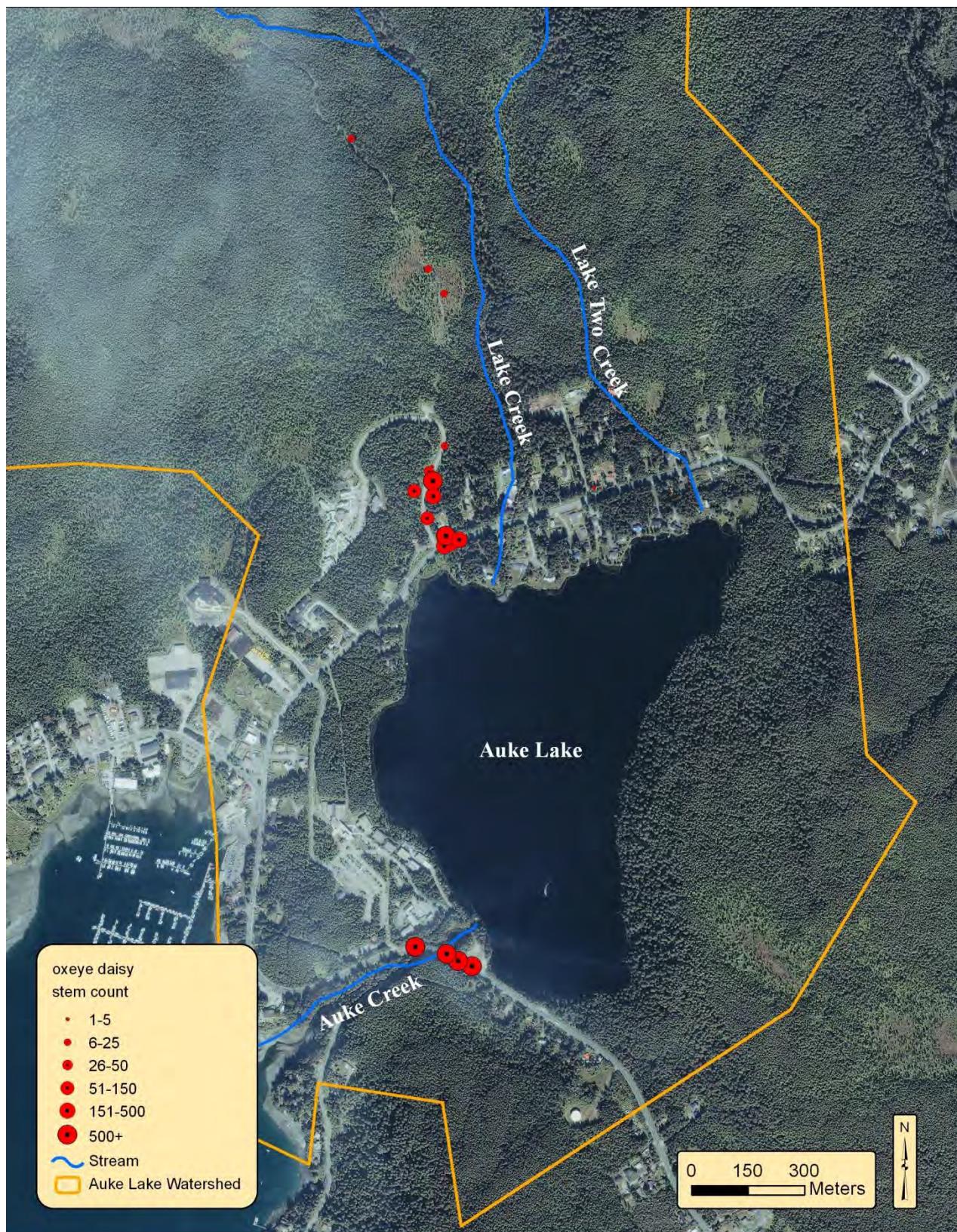


Figure 38. Oxeye daisy (rank = 61) infestations within the Auke Lake Watershed survey area.

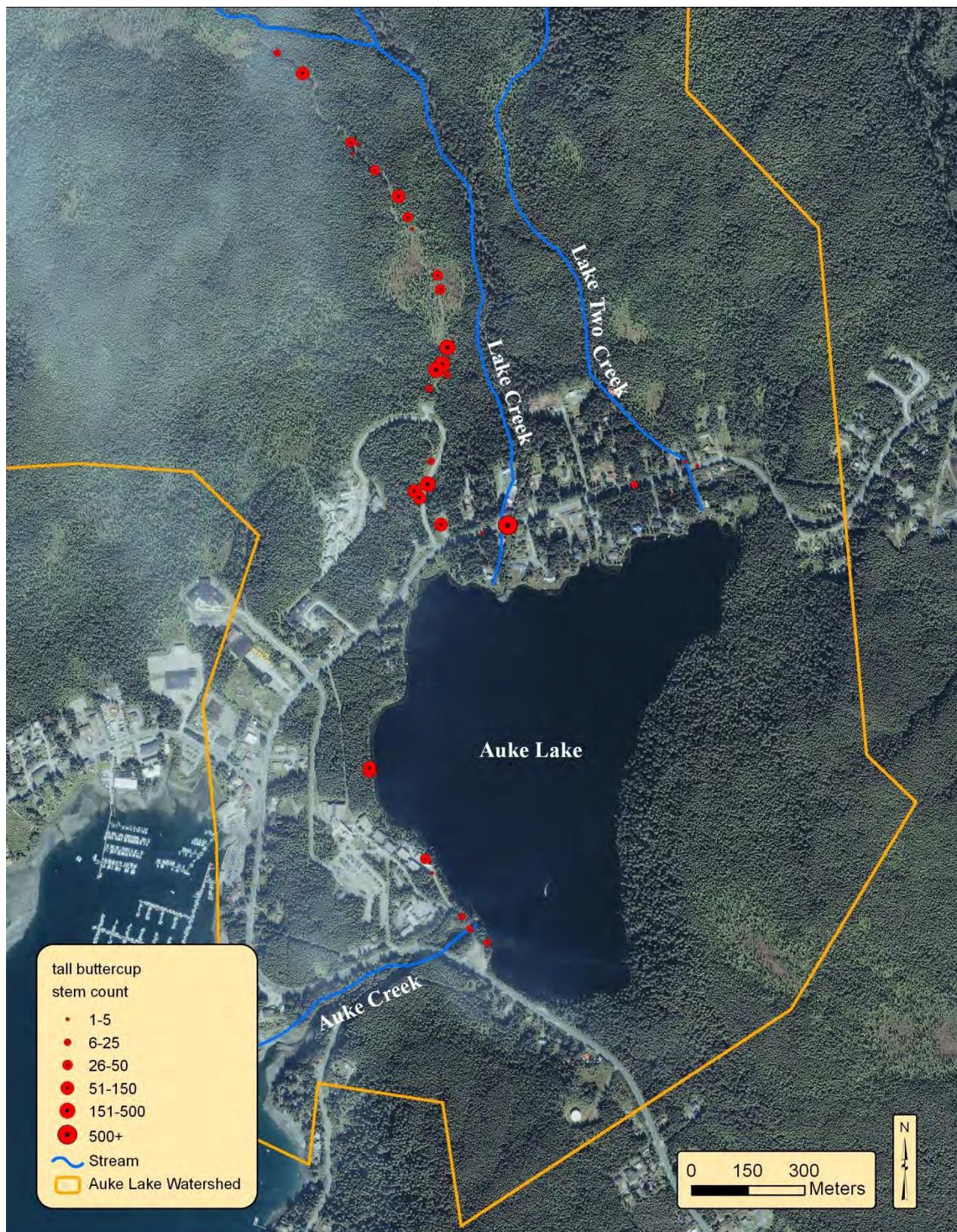


Figure 39. Tall buttercup (rank = 54) infestations within the Auke Lake Watershed survey area.

Invasive Plant Management Recommendations for the Auke Lake Watershed

- Bird vetch was introduced to the CBJ in contaminated landscaping plants, some of which were planted on the UAS campus. UAS landscaping staff are currently managing the infestations with herbicides. Encourage UAS to continue efforts to eradicate bird vetch infestations on university lands through their participation in the Juneau Cooperative Weed Management Area.
- Eradicate oxeye daisy infestations through mechanical means (i.e. pulling) or herbicide application. Encourage UAS to control oxeye daisy infestations on campus property.
- Work with landowner to eradicate (stem injection of herbicide) Bohemian knotweed infestation on private property near Mendenhall Loop Road.
- Eradicate orange hawkweed infestations by mechanical or chemical means as soon as possible.
- Reed canarygrass appears to be outcompeting and displacing native plant communities in riparian and aquatic habitats around Auke Lake. Reed canarygrass infestation along the shoreline should be eradicated to prevent impacts to riparian and aquatic species, including juvenile salmonids that use nearshore habitat. Eradicate infestations near stream crossings along Mendenhall Loop Road to prevent plants from spreading downstream into marshes and side-channels containing high-value fish and wildlife habitat.
- All wild European mountain ash trees found in this survey should be removed. Small trees may be pulled from the ground; large trees can be cut down followed by annual monitoring for new growth from the stump. Encourage UAS to replace ash trees used for landscaping with other non-invasive tree species, such as maple.
- Determine the impact of creeping buttercup on native plant communities, especially within riparian habitats. Investigate control techniques suitable for buttercup infestations near sensitive aquatic habitats.