



Invasive Species Management for Katmai National Park & Preserve, Alagnak Wild River, and Aniakchak National Monument & Preserve

2019 Summary Report

Natural Resource Report NPS/KATM/NRR—2020/2130





ON THIS PAGE

SCA Interns pack raft through Royal Wolf Lodge Creek at Katmai National Preserve for an aquatic survey.
(NPS-SCA/SHAYLA RAMOS)

ON THE COVER

Fure's Cabin in July showing a decrease of *T. officinale*.
(NPS-SCA/SHAYLA RAMOS)

Invasive Species Management for Katmai National Park & Preserve, Alagnak Wild River, and Aniakchak National Monument & Preserve

2019 Summary Report

Natural Resource Report NPS/KATM/NRR—2020/2130

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Abstract

The team was composed of two Student Conservation Association interns, a park bear monitor, and biological science technician. The primary objectives of the team were early detection and quick management of invasive plant infestations to prevent the establishment and spread of these species. Twenty sites were visited to survey and control terrestrial invasive plants, including parts of the preserve and private inholdings within the park and could not have been completed without a partnership with the private owners and the park. Eight locations were surveyed for invasive aquatic plants in areas of high float plane traffic. Gilliland's airstrip was the only new terrestrial site surveyed in 2019. Thirteen of the twenty sites were chemically treated with herbicides, Milestone and 2,4-D. We treated five main invasive plants within the park. Field work consisted of 32.97 acres of survey sites and the treatment of 28 known infestation sites with high visitation. In 2019, a total of 22.7 gallons of herbicide mixture was applied. There were no new invasive species found within Katmai National Park and Preserve, wilderness, Alagnak Wild River and Aniakchak National Monument and Preserve this season. The SCA interns outreach event was at the 2019 Fishtival Bazaar, a celebration of a successful fishing season in Bristol Bay.



Two sub adults playing on the spit preventing us from working (NPS-SCA/LILLY SETTERS)

Acknowledgments

We would like to express the utmost gratitude to B. Peterson for organizing our work for the season and making sure all trips ran as smoothly and safely as possible. Many thanks to the EPMT data manager, P. Frank and regional GIS specialist J. Cusick, for ensuring we had thorough training. Thanks to A. Grenda and T. Hamon, for safely transporting us to and from our backcountry sites and imparting knowledge on us along the way. We appreciate M. Saxton for transporting us to and from Brooks Camp and King Salmon. Thank you to the bear management staff at Brooks Camp for contributing to manual treatments while we were at other sites. Thanks to A. Reischauer for helping with GPS/GIS issues this season. Thanks to K. Griffin, L. Chisholm, K. Evans, B. Smith, and M. Sturm for supporting our work, and advocating for our mission. Thanks to K. Johnson, L. Wilson, and the rest of the KATM administration team for helping us any time we needed it.

We also want to recognize Grosvenor Lodge, Battle River Wilderness Retreat, Royal Wolf Lodge, and A. & V. Gilliland for allowing us to survey and treat their private land. Acknowledgment also goes to SCA Alaska Corps crew of 6 who helped survey the Valley Road. We certainly want to give thanks to the Student Conservation Association for providing us with the opportunity to have such wonderful and unique experiences all while doing our part to keep Alaska parks pristine.

Acronyms

AKEPMT: Alaska Exotic Plant Management Team
AKNHP: Alaska Natural Heritage Program
ALAG: Alagnak Wild River
ANIA: Aniakchak National Monument & Preserve
APCAM: Alien Plant Control and Monitoring
BC: Brooks Camp
BCDA: Brooks Camp Developed Area
DNR: Department of Natural Resources
EPMT: Exotic Plant Management Team
FAA: Federal Aviation Administration
FWS: Fish and Wildlife Service
GPS: Global Positioning System
HQ: Head Quarters
KATM: Katmai National Park & Preserve
KSVC: King Salmon Visitor's Center
NPS: National Park Service
TCC: Tribal Civilian Corps
SCA: Student Conservation Association
SAGA: Southeast Alaska Guidance Association
VRAA: Valley Road Administrative Area
VTTSR: Valley of Ten Thousand Smokes Road
VTTS: Valley of Ten Thousand Smokes

Introduction

Katmai National Park & Preserve, established in 1918, spans over four million acres of land on the Alaska Peninsula. The park draws in visitors from around the globe to fish, view bears, and experience its vast wilderness. Visitors arrive by plane or boat to visit sites such as Brooks Camp, VTTS, and various lodges in the park. 2019 marked the tenth consecutive season of survey and control of invasive plants throughout Katmai National Park & Preserve, Alagnak Wild River, and Aniakchak National Monument & Preserve. The Alagnak Wild River (ALAG) and Aniakchak National Monument & Preserve (ANIA) are nearby national park units also managed by KATM. Treated sites include Brooks Camp, Lake Camp, Fure's Cabin, Grosvenor Lodge, Gilliland's airstrip, and the Battle River Wilderness Retreat. Most disturbance in this park is caused by construction and visitation from boat, vehicle, footpath, and plane. New sites surveyed and treated in 2019 include Little Ku Lake, Enchanted Lake, Nonvianuk Pike Lake, and Gilliland's airstrip. Most of the surveys and chemical and manual treatments were conducted near lodges, park cabins, and popular fishing destinations, as these are areas of high disturbance caused by visitation.

Katmai EPMT Survey and Management History

Human activity is the most common vector for the introduction of invasive plants, as seeds and plant fragments are easily transported on clothing, gear, and vehicles. Certain invasive plants, such as *Taraxacum officinale* (Common Dandelion), *Capsella bursa-pastoris* (Shepherd's Purse), and *Rumex acetosella* (Sheep Sorrel) are able to thrive in a few disturbed locations.

Invasive plant monitoring in KATM began in 2000, when members of the United States Geological Survey (USGS) took Global Positioning System (GPS) data showing the location of the known extent of invasive infestations. Since 2010, the majority of EPMT work has been conducted by two Student Conservation Association interns. In addition to fieldwork, the Katmai EPMT participates in educational outreach events including boot brush installations, vehicle inspections, and informative booths at Fishtival's Bazaar.

The goal of the 2019 crew was to continue surveys for exotic plants and treatment of infestations to prevent establishment and spread in the park. Survey and treatment data was systemically collected to evaluate current and inform future management efforts.

Methods

Overview

In 2019, work was conducted from late April through September in accordance with the Alaska Exotic Plant Management Team 2019 Field and Office Protocols (Overbaugh and Frank, 2019) and the Alaska Region Elodea Survey Protocol (Frank and Overbaugh, 2017). Fieldwork was carried out by SCA interns L. Setters and S. Ramos along with the help and supervision of a NPS Biological Science Technician and assistance of a bear monitor. Additional guidance and training was provided by the team's data manager. Bear management technicians also contributed to the removal of *C. bursa-pastoris* and *T. officinale* at Brooks Camp. Fieldwork involved surveying for and treating terrestrial invasive plant infestations and surveying for *Elodea*, an aquatic invasive plant. Priority locations for treatment included Lake Camp, Gilliland's Airstrip, Fure's Cabin, Grosvenor Lodge, and Brooks Camp. Within Brooks Camp, the Spit, the falls platform, and 5-mile gravel pit. These areas were considered high priority sites because of the high-ranking plant species on the site, amount of visitation, and plane/boat traffic.

Data Management

Almost all areas surveyed or treated were mapped using a Trimble GeoExplorer GeoXT (2008 Series) GPS unit using the standard AKEMPT 2019 data dictionary with TerraSync 5.86 software. A Garmin GPS unit was used while surveying for *Elodea*. Site information and chemical and manual treatment data were recorded. Standardized polygons were used for frequently visited infestations to streamline data collection and evaluate the effectiveness of control efforts. Data collected in the field was uploaded, edited, and differentially corrected using Pathfinder Office (Version 5.85) before being submitted to team's data manager.

Chemical Control

Chemical treatment was carried out on *T. officinale*, *R. acetosella*, and *Plantago major*. *Taraxacum officinale* was treated with Milestone, a broad-leaf specific herbicide with the active ingredient aminopyralid. A mixture of Milestone and 2,4-D was used to manage *R. acetosella*. All treatments were performed using backpack sprayers calibrated for each applicator. The average application rate was 33 gallons per acre (GPA). Herbicide was diluted with water and mixed with blue dye to ensure accurate application. Milestone was applied at a rate of 6 oz. /acre and 2,4-D was applied at a rate of 2 pints /acre. Herbicide usage was documented on herbicide data sheets and the Trimble.

Manual Control

Manual control methods of hand pulling and trowels were used to control *C. bursa-pastoris*, *P. major*, and *Crepis tectorum*. Manual control methods were also used when weather did not allow for chemical control methods. Invasive plants removed were disposed of in trash bags and incinerated. Although *M. discoidea* and *P. annua* are prevalent within the park, we did not use manual control methods to treat them, as they are low priority species. Low priority species are based on the Alaska Invasive ranking system (Carlson, 2008). Manual control was recorded by number of individual plants pulled for each site and date.

Aquatic Surveys

The team's Elodea Survey Protocol was followed when surveying in selected areas of waterbodies deemed by park staff to be at high risk of infestation. Meander surveys with a double headed rake on a line were conducted with 25 survey spots for each lake. Points were collected with a Garmin Device.

Results

Overview

Gilliland's airstrip was the only new terrestrial site surveyed in 2019. Thirteen of the twenty sites were chemically treated (Table 1), with *T. officinale* being the most common and highly ranking terrestrial invasive plant found and treated. Eight sites were visited to survey for *Elodea*, and neither *Elodea* nor other aquatic invasive plants were found.

Table 1. The total amount (gallons) of Milestone and 2,4-D herbicide mixtures applied at each site throughout the season. Infested and gross acres are also listed.

Location	Number of Chemical treatments	Total amount sprayed for season	Infested acres for the season	Gross acres of site
Alagnak Confluence	1	0.167	0.0278	0.049
Battle Lodge	2	0.371	0.061	0.81
BC Campground	3	0.00113	0.000185	2.61
BC Cultural	3	0.00392	0.000605	0.13
BC Developed Area	4	0.01233	0.00203	5.02
BC Fall Trail	1	0.00126	0.00021	0.0024
Fure's Cabin	6	0.3551	0.0742	1.29
Gilliland's Airstrip	8	4.865	0.22952	5.56
Grosvenor Lodge	4	0.0403	0.00673	0.43
KS Housing	4	1.329	0.1815	1.71
KS Maintenance	2	0.1778	0.0022	1.16
Lake Camp	4	2.142	0.0648	2.20
Nonvianuk Cabin	2	0.02105	0.0071	0.37

Site Narratives – Terrestrial Surveys

Detailed descriptions of the survey and treatment completed by 2019 crew follows, organized by location. See appendix B for map site locations.

Katmai National Park

Brooks Camp Developed Area (BCDA)

BCDA includes all developed areas in Brooks Camp and Valley Road area. This area has seasonal housing facilities for NPS employees, the private lodge staff, and park visitors, and is a frequently visited area of the park. High visitation equates to high disturbance and thus substantially more

invasive plants than any other area within KATM. Because of this, this site is a priority for EPMT efforts each season. The most common invasive plants found included: *T. officinale*, *C. bursa-pastoris*, *P. major*, *M. discoidea* and *Poa annua*.

5-mile Gravel Pit

5-Mile Gravel Pit is a large gravel pit at mile five of the VTTS Road. Gravel and fill material used for all construction and maintenance within the BCDA is taken from 5-Mile Gravel Pit. This site (Figure 1) is laden with invasive plant species and has potential to be a vector for new species because the site is frequently disturbed. This site was a priority for the crew in 2019. Manual treatment of *C. bursa-pastoris*, *P. major*, and *C. tectorum* was conducted. On the two pull-offs leading into of the gravel pit, *P. major* was found. *C. bursa-pastoris* was found on the VTTS road outside the gravel pit. A polygon of the site and the area were collected.



Figure 1. Lilly Setters surveys for *C. bursa-pastoris* among native *A. lyrata* at 5 mile gravel pit. (NPS-SCA/SHAYLA RAMOS).

Brooks Campground

The campground is located at the northeast end of Brooks Camp. In the beginning of season, *T. officinale* was abundant along the paths around the campsites themselves, but became less prevalent the remainder of the summer. In the month of August, *P. major* was only observed between the eating area and food/gear cache, and was manually treated. This area does receive regular mechanical treatment by KATM maintenance staff, however May is the best time to visit and keep record of sections of *T. officinale*. Later in the season, the grass gets too tall to see the *T. officinale*.

Brooks Camp Developed Area North Side

The majority of visitors arrive to Brooks Camp by float plane on the Shore of Naknek Lake and stay in the Brooks Lodge area, which are all located on the North side of the new bridge. This area contains KATM employee housing, the bathhouse/old maintenance building, incinerator building, gear cache, leach field, yurt, generator building, auditorium, freezer building, and “Tuckerville,” the Brooks Lodge employee housing. In Tuckerville, *T. officinale* was found and chemically treated in the beginning of the season. It was surveyed later in the season and was not found after July. The bathhouse, incinerator, gear/food cache, yurt and generator building, visitor center, auditorium, freezer building were surveyed and no high-ranking invasive plants were found. We noticed a drop in population of *T. officinale* in the month of July, then an increase at the beginning of August. Overall, the population of *T. officinale* tapered down throughout the season in this area and became more of a survey site instead of a treatment site as our priority shifted to 5-mile gravel pit.

Brooks Cultural Site and Oxbow Overlook Trail

Park interpreters and visitors access the cultural site via the oxbow overlook trail that runs parallel to the Brooks River. The trail begins in front of the auditorium and loops around the cultural building. We surveyed the trail on each trip to the cultural site and found no invasive plants along the trail. *T. officinale* was observed at the cultural site.

Dumpling Mountain Trail

The Dumpling Mountain Trail has multiple overlooks of Naknek Lake, Lake Brooks, the Illiuk arm and Brooks Camp. The trailhead lies at the north end of the campground and slopes uphill for 4 miles. Surveys were done throughout June, July and August and no invasive plants were found.

Brooks Falls

The Brooks Falls is arguably the most popular destination in the park. Visitors from all over the world come to the park to observe bears feasting on salmon jumping the falls. The trail, retired fish ladder (Figure 2), and area underneath the platform (Figure 3) were surveyed. Along the trail and underneath the platform, *C. bursa-pastoris*, *P. major*, *M. discoidea* were found. Underneath the bridge to the platform, *T. officinale* was found and treated. There are bathrooms located opposite of the Brooks Falls trailhead where *C. bursa-pastoris* and *P. major* were manually treated by T. Carmack and L. Setters.



Figure 2. Adjacent to the fall, the old retired fish ladder has *P. major* behind it. (NPS-SCA/SHAYLA RAMOS).



Figure 3. Brooks Falls from the viewing platform. (NPS-SCA/SHAYLA RAMOS).

Lake Brooks Area

The Lake Brooks area can be accessed by the VTTSR and contains NPS employee housing, a boat launch, and picnic area. This area sees consistent visitor and employee use, and also serves as a backup landing area for float planes (Figure 4). This year *P. major* was observed where the closed road meets the main road and across the road in a pullout section before employee housing, BL 3. This area was manually controlled and visited at least twice a month.



Figure 4. Lilly Setters, Tammy Carmack, and Bob Peterson survey for invasive plants around buildings at Lake Brooks. (NPS-SCA/SHAYLA RAMOS).

Maintenance Shop

The maintenance shop is located to the left of the Y and before VRAA housing. T. Carmack manually treated *C. bursa-pastoris* at this site regularly throughout the season, along with a handful of manual treatments done by other EPMT staff.

Margot Falls Trail

Margot Falls is a popular stop at approximately mile 10.5 of the VTTS Road. The unmarked trail begins to the left of the bathrooms. We surveyed the Margot Falls trail in early June and we did not find any invasive species.

Mouth of Brooks River

The mouth of Brooks River is divided into three sections: the lower platform, the Spit, and the Closed trail. Until 2019, the Closed trail had a high level of foot traffic for visitor access to a floating bridge which allowed them to cross the Brooks River to the lower platform. This season a new bridge was constructed to allow visitors to cross the Brooks River more freely, however; fishermen still use the Closed trail (Figures 5, 6). *M. discoidea* and *P. annua* are abundant along the mouth of Brooks river. During visits in late May and June, we found and manually removed hundreds of *C. bursa-pastoris* from each section. We found and treated *T. officinale* and *C. bursa-pastoris* under the lower platform, an area that also continues to see foot traffic as it is the pickup and dropoff location for the Valley Road Bus Tour. The Spit (Figure 7), a gravel bar at the mouth of the river, has the highest concentration of *C. bursa-pastoris* within BCDA. We removed several thousand individual plants

throughout the season. A polygon was mapped for each area. Carmack visited this site opportunistically.



Figure 5. East of Closed Trail from the bridge. (NPS-SCA/SHAYLA RAMOS).



Figure 6. West of Closed Trail from the bridge. (NPS-SCA/SHAYLA RAMOS).

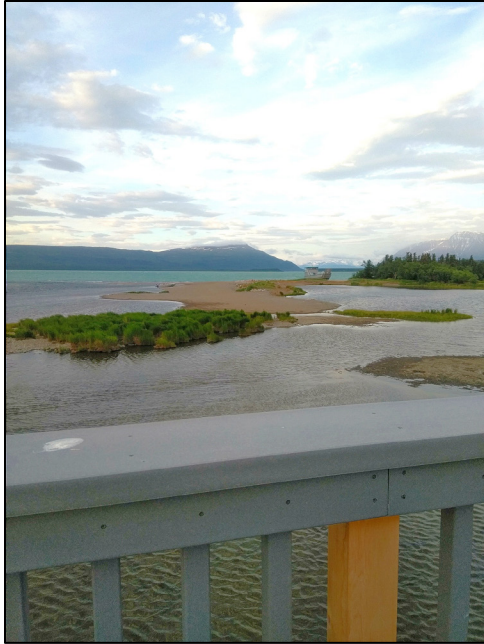


Figure 7. Looking on to the Spit from the bridge. (NPS-SCA/SHAYLA RAMOS).



Figure 8. The Barge, Q, is the ship to the right. (NPS-SCA/SHAYLA RAMOS).

Q Compound

The Q compound (Figure 8) is a fenced area that stores maintenance equipment located between the beaver pond and the barge landing area. This area was visited by the crew five times and *C. bursa-pastoris* was found twice at the entrance of the fence to the road.

Valley Road Administrative Area

This area is located next to the maintenance shop and is near Lake Brooks. The VRAA includes employee housing, the road, utility corridors, and two conexas. Employees moved into cabins in 2017 and the bunk house was completed in the winter of 2018. Between buildings, VR13B and VR14A, *C. bursa-pastoris* was mainly found. The road and surrounding employee housing had *M. discoidea* and *P. annua* that covered less than 5%. The area was mapped and T. Carmack manually treated this area regularly, along with manual treatments by other crew members throughout the season.

Valley of Ten Thousands Smokes

The Valley of Ten Thousand Smokes (VTTS) is a landscape covered in volcanic ash from the 1912 eruption of Novarupta. Most of the valley floor is still devoid of vegetation, but some native species are beginning to thrive here. The VTTS road extends 23 miles from the BCDA allowing access to the valley and is a potential vector for invasive plants to spread into the backcountry (Mortensen et al. 2009).

From mile one to mile six, *C. bursa-pastoris* is prevalent then tapers off beyond. From the middle of the road at mile six, *T. officinale* was found and manually removed twice. *M. discoidea* and *P. annua*, were also present along the VTTSR.

The SCA Alaska Corps crew supported the EPMT crew on August 19–20 by helping survey all 23 miles of the Valley Road. Aside from some *P. annua* and *M. discoidea*, no invasive species were found between miles 9 and 22. At approximately mile 22.5, *C. bursa-pastoris* was found among native *A. lyrata* and a GPS point was taken with the Trimble. There were no invasive plants found in the Three Forks VC parking lot.



L. Setters removes and disposes of *C. bursa-pastoris* in front of the Honey pit (NPS-SCA/SHAYLA RAMOS)

Ukak Falls

Ukak Falls is a popular destination in the Valley of 10,000 Smokes. It is an outcropping where visitors can stand next to a waterfall created by the Ukak River. This site was surveyed at the beginning and end of the season and no invasive plants were found.

Bay of Islands

The Bay of Islands lies in the North Arm of Naknek Lake.

Fure's Cabin

Roy Fure built a cabin in 1926 to serve as his winter home, and it is now a restored public use cabin maintained by the NPS. The cabin is surrounded by a south facing grass field (Figure 9) and backed by the Portage trail (1.5 miles) leading to Grosvenor Lake. *T. officinale* was treated with a Milestone herbicide solution.



Figure 9. L. Setters and B. Peterson treating *T. officinale* at Fure's Cabin. (NPS_SCA/SHAYLA RAMOS)

Grosvenor Lodge

Grosvenor Lodge (Figure 10) is approximately a 1.5 mile hike and 20 minute boat ride from Fure's Cabin one way. It is a private lodge that has *T. officinale* and between 50–100 individuals of *P. major*.



Figure 10. L. Setters treating *T. officinale* while B. Peterson maintains rapport with Grosvenor Lodge employees. (NPS-SCA/SHAYLA RAMOS).

Designated Wilderness

This section lies between the Park and Preserve boundary and is within the jurisdiction of the KATM Park.

Battle Lake Lodge

Battle Lake is located in the northern portion of the park near the border of the preserve, and west of McNeil River State Game Sanctuary. Battle River Wilderness Retreat (Figure 11) is the private lodge along Battle River where we chemically treated *T. officinale* with Milestone.



Figure 11. Aerial view of Battle River Wilderness Retreat treatment area. (NPS-SCA/SHAYLA RAMOS).

Bristol Bay Borough

This area lies west of the Park, where the Naknek River meets the Bering Sea.

Gilliland's Airstrip

This is a new site that is located down Lake Camp road and is privately owned. The area treated was an airstrip that is still used by the owner. We found eight invasive plants on this site. We chemically treated *T. officinale*, *P. major* and *R. acetosella* and manually treated *P. major*, *C. tectorum*, and *C. bursa-pastoris*.

King Salmon NPS Housing

King Salmon housing includes a dormitory, a duplex in front of the dorm (Figure 12), the cabins across the street (Q buildings), the warehouse and connected housing, and the yard next extends to the main road. Chemical treatments were conducted in this area. This area contains *T. officinale*, *P. Major*, *M. discoidea*, *R. acetosella*, *Allium schoenoprasum*, and *Trifolium hybridum* near walking paths and the roadside.



Figure 12. King Salmon housing from dormitory. (NPS-SCA/SHAYLA RAMOS).

King Salmon NPS Maintenance Yard

The maintenance yard is a fenced-in area next to King Salmon housing. An infestation of *T. officinale* was found; less than 25 individuals were found along both sides of the entrance between equipment and the fuel tank. Most of the work was manual treatment of *C. tectorum*, *C. bursa-pastoris*, and *R. acetosella* growing along the fence, around the building, and between the conexes.

Lake Camp

Locals, visitors, and park employees travel from King Salmon to Lake Camp to fish, head out into the park, or stay at private lodges. The road to Lake Camp ends in a loop with access to the Naknek River. We chemically and manually treated the parking lot, up to the docks, and the roadway to the first stop sign on a side road leading south to lodges. *R. acetosella* was prevalent in the parking lot, adjacent gravel mound, and near the fuel truck parking spot. To the north and west of the bathrooms and along the north side of the loop *P. major* was sporadically found. From late June–August, *C. tectorum* was observed and manually treated along the entrance to Lake Camp and in the picnic area. Near the fuel truck parking spot and bathrooms *C. bursa-pastoris* (Figure 13) was also found.



Figure 13. *C. bursa-pastoris* in seed at Lake Camp. (NPS-SCA/LILLY SETTERS).

Katmai National Preserve

Alagnak & Nonvianuk Confluence

This site is on private land at the confluence of the Alagnak and Nonvianuk Rivers. We boated from the Nonvianuk ranger cabin down the Nonvianuk River to reach this area. The site was heavily infested with *T. officinale*.

Nonvianuk Ranger Cabin

Infestations of *T. officinale* at the Nonvianuk ranger cabin were chemically treated twice. At the time of our second treatment, the grass had grown really tall, making it difficult to find *T. officinale*. Each visit had less than 20 individual plants.



Nonvianuk shore line surveying for *T. officinale* and other invasive species. (NPS-SCA/SHAYLA RAMOS)

Aquatic Surveys

The aquatic sites surveyed were mainly in the Preserve and included lakes with private lodges. Detailed descriptions of the survey work done is as follows, organized by location. See appendix B for map site locations.

Enchanted Lake Lodge

Enchanted Lake is south of Nonvianuk Lake in the Preserve. We reached this location by hiking from the south shore of Nonvianuk Lake west of private land. We conducted a meander survey using a double headed rake on a line. We surveyed 22 areas on the lake with no *Elodea* detected.

Kulik River Outlet

This survey was performed at the outlet of the Kulik River near the Park and Preserve boundary (Figure 14). We performed 39 rake pulls with no *Elodea* detected.



Figure 14. Aquatic survey for *Elodea* at the Kulik River Outlet. (NPS-SCA/SHAYLA RAMOS).

Lake Camp Pike Lake

This lake is located west of Lake Camp and lies partially within the park boundary (Figure 15). No *Elodea* was detected in this lake.



Figure 15. S. Ramos pulls *P. zosteriformis* (Flatstem pondweed) and *P. praelongus* (Long-stalked pondweed) in Lake Camp Pike Lake with a double headed rake. (NPS-SCA/Lilly Setters).

Little Ku Lake

We accessed this lake by boating up the Alagnak River into Kukaklek Lake, beaching, and then hiking south a short distance. It serves as a popular drop off and pick up location for fisherman. This was the first year this lake was surveyed. We did another meander survey with 25 rake tosses. No *Elodea* was found in this lake.

Nonvianuk Pike Lake

An unnamed and unmapped trail leads south from the Nonvianuk River to an unnamed lake. We referred to this unnamed lake (Figure 16) as Nonvianuk Pike Lake, since there is another Pike lake that we surveyed. A meander survey was done, and 25 points were collected with no *Elodea* detected.



Figure 16. Bob Peterson and Lilly Setters performing a meandering aquatic survey on Nonvianuk Pike Lake. (NPS-SCA/SHAYLA RAMOS).

Rapids Camp

This site is located outside of the park boundary with high visitor use by locals and lodges along Naknek River (Figure 17). No *Elodea* was detected.



Figure 17. Lilly Setters paddling at Rapids Camp surveying for aquatic plants. (NPS-SCA/SHAYLA RAMOS).

Royal Wolf Lodge

Royal Wolf Lodge is a private fishing lodge located adjacent to the Nonvianuk River, approximately one mile downstream from the Nonvianuk Ranger Cabin. Royal Wolf Lodge granted us permission to pass through their property to access the lakes. Two lakes were surveyed (Big Royal Wolf and Little Royal Wolf) and no *Elodea* was detected (Figure 18).



Figure 18. Pack raft on the shore of Little Royal Wolf Lake looking onto Big Royal Wolf Lake. (NPS-SCA/SHAYLA RAMOS).

Education and Outreach

Educating the public about what invasive species are and how they spread is a crucial part of prevention. The Fishtival Bazaar is part of Fishtival, an annual, weekend-long festival where the communities of Naknek and King Salmon celebrate the end of the commercial salmon fishing season. This year, the SCA interns (Figures 19, 20) shared a table with Burt Smith and park interpretation staff, displaying bear skull fossils, animal pelts, and invasive plant identification material. We were able to engage many community members and raise their awareness of invasive species and the problems they pose.



Figure 19. SCA intern, S. Ramos at Fishtival Bazaar. (NPS/WENDY ARTZ).



Figure 20. SCA intern, L. Setters at Fishtival Bazaar. (NPS/WENDY ARTZ).

Recommendations

Future staff should carefully review and learn the information contained in the site manual, Identification of Non-Native Plants in Alaska, black field binder and information in the T:\ResourcesNatural\Programs\EPMT file. We recommend that future EPMT's also pass pesticide application test early in the season.

One EPMT member should be stationed at Brooks Camp for the season. This could dramatically cut down on the invasive species present at each of the sites in that area. Poor weather, boat access, and bears would be less of an issue if a crew member was permanently stationed at Brooks. That crew member could also oversee/organize the efforts of other park employees who like to help manually treat throughout camp. They could ensure that the EPMT Manual Treatment Form is used, filled out, and submitted correctly, which gives EPMT staff a more accurate representation of the EPMT work completed throughout the season. They could also spend time revegetating sites throughout camp. Revegetating with native plants could drastically change the infestation levels at the Spit, Closed Trail, and lower platform.

At Brooks Camp, the Spit, platform, Closed Trail, and Brooks Falls should all be visited in late April and early May, weekly if possible. That will give ample time to treat these sites before bears arrive later in the season. Five-Mile Gravel Pit should also be a priority, and we recommend beginning to heat treat to reduce the seed bank. On the first trip to 5-mile, EPMTs should be trained to drive the VTTS road so that they do not need supervision throughout the rest of the season.

Because traveling within the park is often difficult, EPMT members should complete their MOCC training. This will benefit the EPMT team when other boat operators are unavailable to shuttle. Along similar lines, multiple trips and flight times should be reserved for sites that require a floatplane drop off. This will ensure that sites don't go untreated.

We recommend that EPMTs keep trowels on them most of the time for opportunistic manual treatment. We also recommend confirming the collection bag has no holes when doing manual treatment. Also be sure not to remove the native *A. lyrata* when treating *C. bursa-pastoris*.

We recommend establishing rapports with the lodges and private landowners throughout the park by contacting them throughout season. B. Peterson did reach out to lodges and private landowners, some replied, some did not. B. Peterson has contact information for some lodges and has been able to maintain great relationships with them.



Sunset over VRAA employee housing. (NPS-SCA/LILLY SETTERS)

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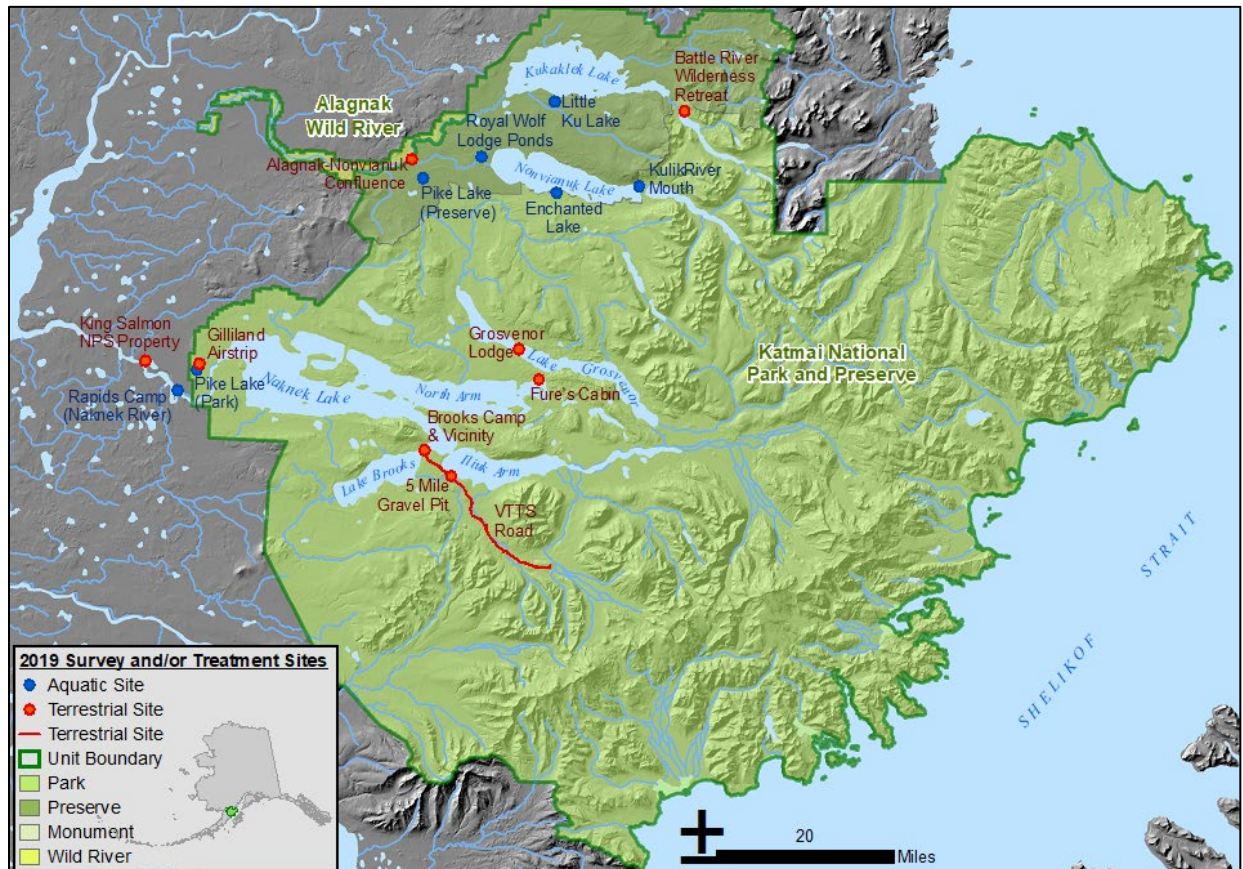
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Appendix A: Species summary for KATM

Table A-1. Taxon and common name of species.

Taxon	Common Name
<i>Allium schoenoprasum</i>	Wild Chive
<i>Callitriche</i> spp.	Water Starwort
<i>Capsella bursa-pastoris</i>	Shepherd's Purse
<i>Charra</i> spp.	Muskwort
<i>Crepis tectorum</i>	Narrowleaf Hawksbeard
<i>Leontodon autumnalis</i>	Fall Dandelion
<i>Matricaria discoidea</i>	Pineapple Weed
<i>Myriophyllum</i> spp.	Watermilfoil
<i>Plantago major</i>	Common Plantain
<i>Poa annua</i>	Annual Bluegrass
<i>Potamogeton praelongus</i>	Long-Stalked Pondweed
<i>Potamogeton zosteriformis</i>	Flatstem Pondweed
<i>Ranunculus</i> spp.	Crowfoot
<i>Rumex acetosella</i>	Sheep Sorrel
<i>Taraxacum officinale</i>	Common Dandelion
<i>Trifolium hybridum</i>	Alsike Clover

Appendix B: Terrestrial and Aquatic sites surveyed and treated for 2019



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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