

Canada Goose Management Plan

for the

City of Duluth



June 2022

City of Duluth Canada Goose Management Plan

1.0 Context and Background

The purpose of this Canada Goose Management Plan (Plan) is to enable and support the City of Duluth (City) and its partners in managing a growing Canada Goose population that is negatively impacting efforts to restore wild rice plantings in the St. Louis River Estuary (Estuary).

As a migratory species, Canadian Geese are federally protected. Thus, permits are required for managing Canadian Geese populations. The Minnesota Department of Natural Resources - Wildlife Division, requires any entities seeking a permit for goose management to have an approved Management Plan in place. Although the City itself has no immediate plans or funding to conduct goose management efforts, the City's partners will benefit from having this Plan available to help them conduct goose management activities within the City of Duluth.

Wild Rice (Manoomin in Ojibwe) is both culturally and ecologically significant to our community and to the St. Louis River Estuary. It is a sacred symbol for the Ojibwe, and provides important habitat and food for animals, fish, and people. Wild rice also helps maintain high water quality in the Estuary by storing sediments and absorbing excess nutrients. Once abundant throughout the Estuary, industrial activity, varying water levels and other factors have reduced wild rice to a few remnant stands.

Restoring wild rice beds in the Estuary is a high priority for many local, state, Tribal and federal agencies and organizations as it is an important component of improving fish and wildlife habitat in the Estuary and in restoring an important cultural resource for Tribal communities. As such, there have been multi-agency efforts to re-establish wild rice beds in suitable areas of the St. Louis River Estuary. Unfortunately, the success of these efforts is being significantly hampered by Canadian goose herbivory (browsing).

St. Louis River Estuary	2015	2016	2017	2018	2019	2020	2021	totals	
Rask Bay	2085	1650	1647	0	1530	3349	0	10,261	
Duck Hunter Bay north	2165	948	953	0	1642	2805	0	8,513	
Duck Hunter Bay south	1642	1935	2006	0	1151	2306	0	9,040	
North Bay	1666	718	707	0	379	1534	0	5,004	
Radio Tower Bay	946	750	767	0	701	1499	0	4,663	
Walleye Alley Bay	0	1247	850	0	592	1105	0	3,794	
Landslide Bay	0	553	425	0	419	812	0	2,209	
Oliver-Bear Island	0	2120	1341	0	743	130	0	4,334	
Mud Lake northeast	0	2089	1788	0	0	0	0	3,877	
Clough Island east	0	508	0	0	0	0	0	508	
Foundation Bay	0	0	0	0	285	101	0	386	
Red River	0	0	0	0	180	175	0	355	
totals:	8,504	12,518	10,484	0	7,622	13,816	0	52,944	x \$5/lb. = \$264,720
Clough Island east	500		550	400	1500	500		3,450	
Allouez Bay	1932			500			363	2,795	
Kingsbury Bay							500	500	
totals:	2432		550	900	1500	500	863	6,745	

Pounds of Wild Rice planted by location and year in the St. Louis River Estuary.

The MN DNR is the permitting authority for managing nuisance animals, including within the City of Duluth. In order to obtain a permit, an entity or an individual must provide valid reasoning for removing or relocating an animal, and must try all available non-lethal techniques for managing the animal before resorting to lethal techniques.

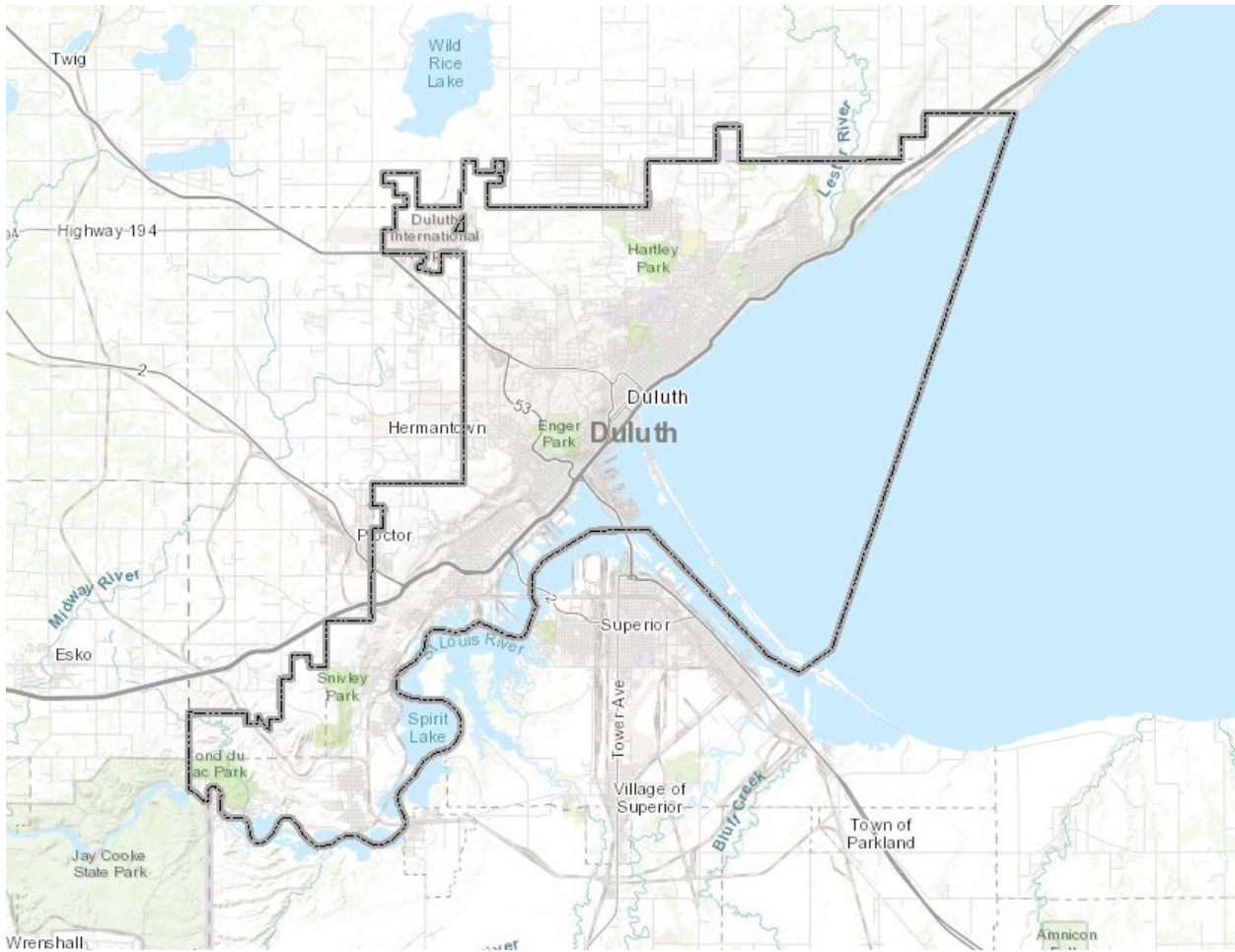
Wild Rice professionals have tried many non-lethal methods to deter Geese from browsing on new plantings within the Estuary including egg addling, hazing with both kayaks and dogs, mylar tape, swan decoys and installing metal or plastic fence goose exclosures. These efforts have been costly and time-consuming and largely unsuccessful. In light of the continuing loss of wild rice plantings, and the sheer vastness of the project area, the WI DNR and its partners have been using geese round-ups to control the geese population near wild rice plantings. With this control method, geese are corralled to location and humanely euthanized. Roundups must be conducted by an entity licensed to conduct such work. Please see Appendix A for further information about this method of goose management. Being able to use property on the Minnesota side of the Estuary would make these round-ups more efficient and more humane, hence the development of this Plan.

The City has been an active partner in restoring the Estuary and the St. Louis River Area of Concern (AOC) with its partners for many years. In the interest of supporting its partners' commendable efforts to restore wild rice and to protect the significant investment that has been and will continue to be made in restoring wild rice in the Estuary, the City has funded and contracted with Tom Keefe, with Canada Goose Management, Inc. to assist with the development of this Plan. While the initial focus will be on the Estuary and protection of wild rice, this Plan will apply City-wide, making it easier to obtain permits to control Canadian geese in other areas of the City in the future, if desired. Any goose management activities that are undertaken by the City would require a permit and further public input.

1.1 Canada Goose Habitat Use

Duluth is Minnesota's third largest city, located on the southwest corner of Lake Superior. The City extends along the shoreline of the lake with most of its residential areas located on the steep hills and shoreline of Lake Superior. Duluth has 86,000 residents encompassing 87 square miles and is a major international trade port and tourist destination.

Duluth's geography of steep hills and defined shorelines does not provide abundant wetlands or storm water ponds found in most urban communities with goose conflicts. Therefore, the majority of Canada Goose nesting and rearing habitats are limited to the St. Louis River Estuary and public green spaces in the city.



City of Duluth, MN

1.2 Population Estimates

Estimates of Canada goose populations within the City and the St. Louis River Area of Concern are listed below. Formal goose population surveys are not conducted in Duluth, so estimates are based on pre-existing and anecdotal information. This Plan includes the provision to conduct new population surveys as needed.

Sites	Estimated Summer Goose Populations	Estimated Spring/Fall Goose Populations
St Louis River (MN/WI)	500-1500	3-5000
Soccer Fields	25-50	100
Green Spaces/Parks	TBD	TBD
Golf Courses/Others	TBD	TBD

1.3 Concentrated Habitat Use and Human Use Conflicts

This Plan specifically provides management options to reduce Canada Goose impacts on the wild rice restoration efforts in the St. Louis River Estuary. In the future, this Plan may support goose management in other areas within the City where geese negatively impact habitat, water quality, public safety or public property.

1.3.1 St Louis River Estuary and Area of Concern

The St. Louis River's ecosystem was severely damaged around the turn of the 20th century due primarily to the dumping of industrial waste and wood waste from lumber mills located on and around the river. These impacts were so significant that in 1987, the lower part of the St. Louis River watershed was designated By the U.S. Environmental Protection Agency as one of 31 U.S.-based Great Lakes Areas of Concern. As a result, restoration of this area and its ecosystems has been a priority for federal, state, and tribal agencies in the hopes of removing this designation by 2025.

The St. Louis Area of Concern has nine Beneficial Use Impairments (BUIs). BUI #9 is loss of fish and wildlife habitat. Four of these BUIs have already been addressed thanks to years of hard work by a multi-agency effort. Once all nine BUIs are removed, the St. Louis River Estuary can be removed from the Federal Great Lakes Area of Concern List. Planting and nurturing wild rice plantations helps address BUI #9 by providing food and habitat for native species.

1.3.2 Duluth Urban Areas

Areas where human / goose conflicts within the City green spaces have been documented included the following:

- Bayfront Festival Park
- Brighton Beach
- Chambers Grove Park
- Enger Park and Golf Course
- Fond du Lac Campground
- Minnesota Park Point Recreation Areas
- Lake Superior Zoo
- Minnesota Point Beaches
- Wade Stadium
- Wheeler Athletic Complex

The primary concern with geese in urban areas is the fecal material. A single goose can produce over two pounds of fecal waste per day. Fecal material can carry harmful bacteria, including E. coli, that can lead to aquatic use impairments in our streams and beaches. Many local beaches and streams are currently on Minnesota's impaired waters list for bacteria including several popular City of Duluth beaches.

Geese can also cause conflicts in urban areas due to their aggressive behavior. Chasing people, being present on roads and potentially interfering with aircraft are all potential concerns that arise when geese become overpopulated in an urban area.

2.0 Canada Goose Management Recommendations

2.1 Goals and Measures

The goal of this Plan is to ensure the success of wild rice restoration efforts in the St. Louis River Estuary and provide information and direction on management of Canada geese conflicts within the City of Duluth. This Plan will also meet requirements set forth by the Minnesota Department of Natural Resources for acquiring goose removal permits. The goal is not to eliminate Canada geese from Duluth or the Estuary, but rather, to reduce goose numbers and conflicts to a level that will allow for the natural propagation of wild rice within the Estuary.

This plan is congruent with the goals and purpose of City's newly approved Natural Resource Management Program, which prioritizes and supports the restoration of the Estuary.

2.2 Geographic Scope

Management needs are divided into two major areas of Duluth - the area adjacent to and including the St. Louis River Estuary and the rest of the City. Goose management techniques can be implemented by public and private landowners or managers to address conflicts. Conflicts that occur on public lands shall be addressed by the public agency responsible for the land and private landowners will be responsible for implementing management techniques on their properties. Having a City-Wide Plan will allow the City to apply for permits to remove geese from other areas of the City that are being negatively impacted by an overpopulation of geese including aesthetic impacts to our ball fields, soccer fields and public gathering areas, and in our local streams and beaches that are impaired for E.coli and bacteria.

2.3 Management Techniques

Management techniques for goose management fall in two major categories - non-lethal and population management. Non-lethal techniques discourage use of an area by geese, but do not reduce goose production or localized populations. Population management techniques reduce goose production and populations in an area. An integrated approach using a variety of techniques is recommended to address most conflicts. Federal and state permits are required for egg addling, summer removal and shooting permit management techniques. City of Duluth ordinances may limit fencing or barrier construction, and do not allow for firearms use within City limits.

Non-lethal techniques work best for small areas or conflicts involving only a small number of geese. Population management techniques are proven to be effective in larger areas or in responding to conflicts with growing goose populations. Documenting goose numbers, locations, and impacts prior to and after implementation of management techniques is recommended to determine outcomes. The MN DNR has a Management Activity Tracking Form that should be used

by permittees to document management activities (see Appendix B). Implementation of techniques will require an adaptive and integrated approach based on the nature and duration of the conflict in order to ensure successful outcomes.

2.3.1 Non-lethal Techniques

Non-lethal Techniques include habitat modification, barrier placement, and redistribution of geese. A summary of these techniques is listed below. Further detailed information can be found at: Living with Geese at [Geese | Minnesota DNR \(state.mn.us\)](https://www.dnr.state.mn.us/geese/) and “Managing Canada Geese in Urban Environments, A Technical Guide” at <http://ecommons.library.cornell.edu/handle/1813/66>.

Habitat Modification

Geese are vegetarians that depend on high protein vegetation for food. Lush green lawns, aquatic plants and crop residue are preferred food sources. During the brood rearing and molt periods, when adult geese are unable to fly, they prefer a source of food adjacent to or on a water body in order to minimize energy for foraging and because water offers cover during this period of limited mobility.

Habitat modification can be used to deter geese from using certain areas and redirecting them to areas with less conflict. The primary modification is placement of vegetative buffers around water bodies or along shorelines to deter geese from accessing the area. The wider the buffer the more effective it will be. However, alternative feeding areas must be available otherwise geese will walk through or around buffers to access the food source. Vegetative buffers can consist of allowing growth of existing vegetation, planting of tall vegetation or shrubbery.

Temporary or Permanent Physical Barriers

The deployment of temporary or permanent fencing or barriers can prevent geese accessing an area like vegetative buffers. Types of barriers include:

- wire fences with and without electric powered wires
- snow or woven wire fencing
- mylar or bird scare tape

Mylar or bird scare tape is the first recommendation for property owners to try. It is cheaper and easier to install. The tape can be temporarily strung across a lawn with wooden stakes. The movement and sound of the tape in the wind, causes geese to avoid the area.

Redistribution Techniques

Redistribution techniques are used to harass geese or make an area unattractive. They require ongoing management or efforts to ensure geese do not become accustomed to the technique. These techniques should be used prior to geese becoming accustomed with the area.

Redistribution techniques include:

- Human and dog disturbance, chasing geese and presence of a dog (viewed as a predator) can be effective. It does require ongoing and timely disturbance to be effective. Dogs (i.e., border collies) are used frequently on larger areas such as golf courses to harass local geese.
- Predator Decoys particularly ones that move with the wind can discourage geese but should be moved around to increase effectiveness. Geese will acclimate to decoys if left stationary.
- Pyrotechnic rounds or noise makers can be effective in rural areas but have limited use in urban areas.
- Lasers and flashing lights, either handheld or stationary on land or water, have proven to deter geese. Consideration of impacts to adjacent landowners or the public needs to be considered prior to implementation.
- Liquid repellants are available that can be applied to grass to inhibit geese from eating the grass. Application of repellents can be expensive and does require ongoing applications as grass is mowed. A suggested use would be to protect high public use areas (i.e., football or soccer fields) during spring or fall goose migrations.

To be effective, non-lethal techniques require alternative (feeding) habitat for geese to utilize in the area. This alternative might be a neighbor's yard, another beach, or water body. It is very important to ensure any method used is permitted or supported in the area.

2.3.2 Population Management

Population Management techniques are used to reduce local populations of resident geese and/or dispersion of migrating geese. Techniques include egg addling, summer removal and hunting or shooting by permit. Hunting or shooting permits are typically utilized in rural areas. Egg/nest treatment and summer removal are used extensively in urban areas. Egg addling and summer removal has been used to control goose populations in the Twin Cities metro area for 40 years with high success.

Egg Addling

Egg addling requires locating the nests and treating the eggs. The eggs are treated by covering them with corn oil and placement back in the nest. The geese will continue to attend the nest and not re-nest. The oiling prevents air exchange to the egg and stops development. Access to nests is a key requirement including landowner permission, and feasible access by a person.

Further information on egg/nest treatment is provided by the US Dept. of Agriculture's Wildlife Services (APHIS) at [canada_goose.pdf \(usda.gov\)](#) and the US Humane Society at [Canada Goose Egg Addling Protocol 2020.pdf \(humanesociety.org\)](#).

A Federal and state permit is required to conduct egg/nest treatment. The Federal permit can be obtained online at [RCGR - Resident Canada Goose Registration Login System](#)

fws.gov). The state permit can be obtained by contacting the MN DNR Area Wildlife Manager (AWM). See [Office Locator | Minnesota DNR \(state.mn.us\)](#).

Summer Removal

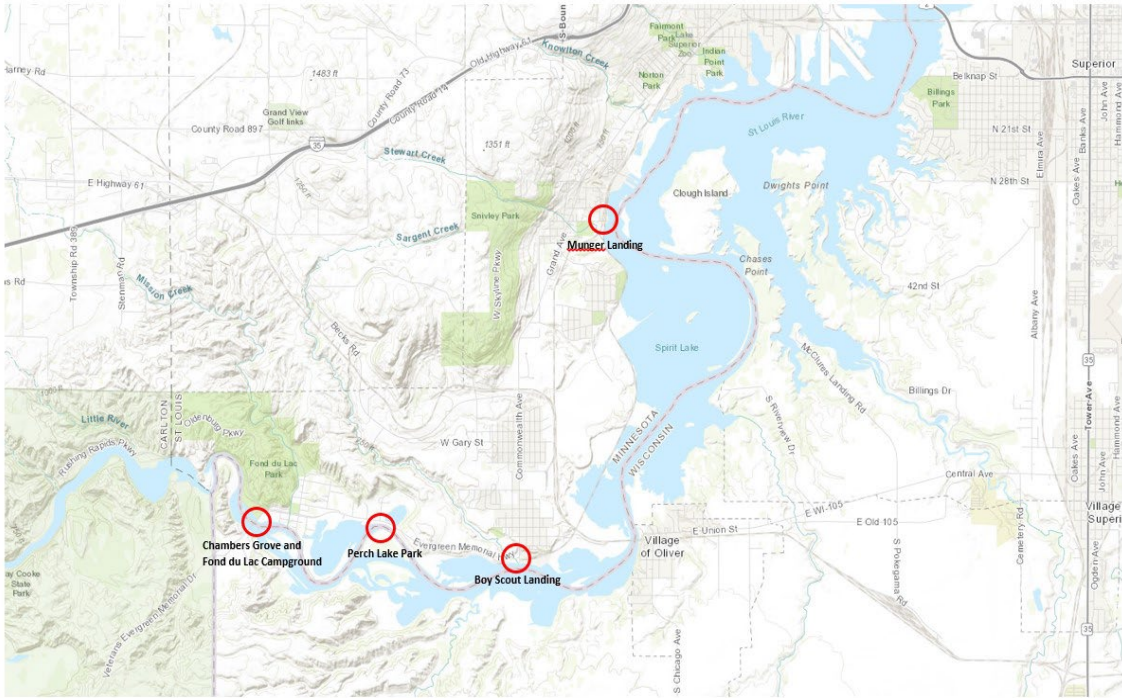
Geese, along with all waterfowl, lose all of their wing flight feathers in early summer and re-grow them back in about four weeks. This is called the molting period, when the adults are flightless, and the gosling have not grown complete flight or wing feathers yet. Geese may nest over a diverse area, but they will congregate with goslings to sites that provide adequate food and water during this time. It is during this period that most conflicts arise as the geese have limited mobility. Summer removal is conducted during this molting period when geese are flightless.

Geese are typically surrounded on land or water and herded during this period to suitable location that has a temporary pen and fencing that allows the geese to be collected in a catch pen. Once captured in the pen, the geese are removed. Relocation of geese to other areas is prohibited by state resource agencies due to the abundance of geese and existing conflicts in most suitable habitat.

Captured geese are euthanized and donated to non-profits for animal food. The Lake Superior Zoo has taken the goose meat from Wisconsin DNR round-ups in the past. Adult goose meat can be processed and donated to food shelves if funding and an approved poultry processor is available.

The key advantage of summer removal is immediate relief from goose conflicts, and long-term population control with the removal of adult geese. Summer removals in the Twin Cities typically remove 98% of the geese at a site. Other geese will often return or move into the area later, so ongoing monitoring and removal efforts in years following are sometimes needed.

The MN DNR requires an approved Canada Goose Management Plan to be in place prior to issuing a summer removal permit. Once a Plan has been approved by local authorities and the MN DNR, an annual permit can be issued yearly as needed.



Anticipated goose capture sites relating to the protection of wild rice.

Hunting/Shooting

Providing goose hunting opportunities can reduce resident geese populations and is very effective in discouraging geese use of an area during fall migration. MN DNR has created extended Canada Goose seasons in late summer and fall, along with generous bag limits for hunters to reduce overall goose numbers in the state.

Shooting permits are available to landowners experiencing Canada Goose depredation. These permits can be issued outside of the normal hunting seasons. Application information is available from the MN DNR Area Wildlife Manager. Currently, the City of Duluth has a local firearms ordinance that prohibits the discharge of all firearms within the city limits. The St. Louis River Estuary is within the City limits and hunting is not permitted on the MN side of the river. Hunting is legal and common on the WI side of the river. Allowing limited firearm waterfowl hunting in the estuary could be discussed as a future management option and would require a change to City ordinance.

2.3.3 St Louis River Estuary

The restoration of wild rice is a major objective of the St. Louis Estuary restoration efforts with the City of Duluth. Summer goose depredation on wild rice seedlings in the area has been well documented (see Appendix A). Such depredation has severely limited the growth and expansion of wild rice beds in the Estuary. The goal of this effort is to keep geese away long enough for the wild rice to mature, and to start re-seeding naturally. Once this occurs, the wild rice beds will become so dense that geese will not enter due to the difficulty of maneuvering within the dense vegetation.

The implementation of round-ups on the Wisconsin side of the Estuary by the WI DNR has proven to be successful in protecting the wild rice beds. Once this plan is approved, the MN DNR, WI DNR, Tribes or other agencies and entities can request a summer removal permit and coordinate with other restoration partners to conduct removals on both sides of the River. Round-ups are anticipated to be used for only a few years, until goose herbivory has been reduced significantly enough to allow restored wild rice beds to become established.

With the support of the City, these partner agencies could review goose management needs annually and plan as needed for management for the following year. It should be noted that the City is under no obligation to provide coordination or funding for the goose management activities of our partner agencies and tribes, but will support their efforts in the continued restoration of the Area of Concern.

2.4 Public Information

Informing the public about Goose Management activities occurring within City limits is an integral part of a successful Goose Management Plan. An informational public meeting was held by the City of Duluth on May 23, 2022 to provide an opportunity for the public to learn about the Plan. In addition, information on the development and implementation of the Plan can be accessed on the Duluth City website under the Progress in the Parks page: <https://duluthmn.gov/parks/parks-planning/progress-in-the-park/>. News releases and social media posts can also be issued to inform the public of ongoing goose management activities, as determined by the City.

Implementation of population management techniques in the St. Louis River Estuary will be communicated by the City's partner agencies, as needed. All entities performing management activities will provide the public with accurate and thorough information on the objectives of the activity.

2.5 Partner Relationships and Permit Requirements

The City of Duluth is under no obligation to coordinate, provide funding for or otherwise participate in any goose management activities performed by entities other than the City under this Plan. Any businesses, agencies or organizations intending to use the City's Plan to support a goose management permit application to the MN DNR must comply with all federal, state and local laws and must independently acquire all required federal, state and local licenses and permits to conduct the proposed activity. All permit holders will operate independently from the City and will comply with all permit requirements including the submittal of required reports and logs of management activities to the MN DNR.

3.0 Summary

This Plan was developed and approved by the City of Duluth to provide direction on management of Canada Geese within the City of Duluth. The Plan provides the City, and its citizens, with information on managing Canada Goose conflicts. It also addresses the MN DNR requirement of having an approved Goose Management Plan for issuance of a Canada Goose Takings Permit.

This Plan was approved by the Duluth Natural Resources Commission on June 1, 2022 and by the Duluth City Council on June 13, 2022.

References

APHIS. (2009). *Management of Canada Goose Nesting*. canada_goose.pdf (usda.gov)

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Appendix A

Wild Rice Restoration and Canada Goose Management in the St. Louis River Estuary – 2021 Goose Roundup Report



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Wisconsin Department of Natural Resources

Updated: 21 July 2021

PROJECT SUMMARY

The Wisconsin Department of Natural Resources (WDNR) conducted a Canada Goose (*Branta canadensis*) roundup as part of on-going efforts to restore wild rice (*Zizania palustris*) in the St. Louis River Estuary. Once abundant throughout the estuary, wild rice has been reduced to a few remnant stands and areas where restoration efforts have been implemented. Research in the estuary has determined that Canada goose herbivory is the most significant impediment to successful establishment of self-sustaining wild rice beds. A variety of techniques have been used to reduce the impacts of geese that include hazing, egg addling, mylar flashing, swan decoys, and exclosures without a sufficient reduction in herbivory. Wildlife professionals from the WDNR and Animal and Plant Health Inspection Service (APHIS) implemented the goose roundup at strategic locations in the estuary in proximity to wild rice restoration sites. A total of 187 geese were removed over the course of the two-day roundup effort.

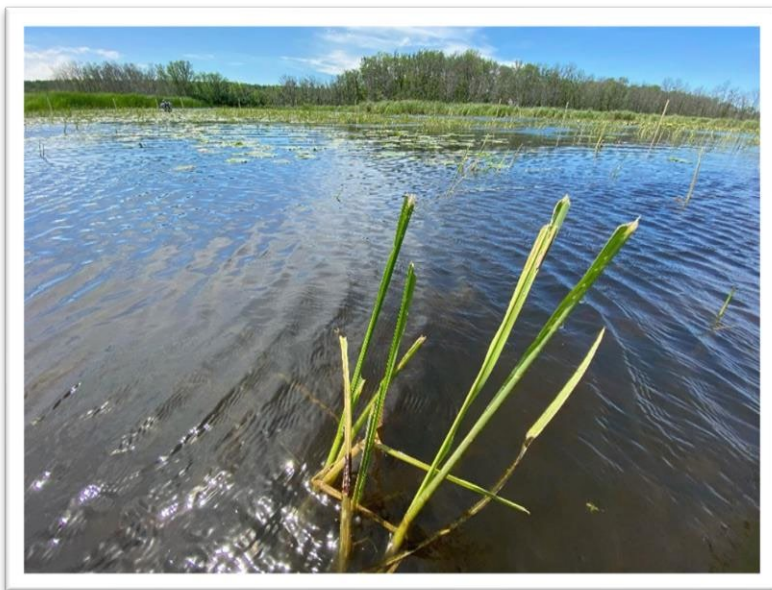
PROJECT BACKGROUND

Wild Rice Restoration Goals -- The restoration of wild rice (*Zizania palustris*) in the St. Louis River

Estuary is of cultural and ecological significance. Restoration goals developed in the Wild Rice

Restoration Implementation Plan for the St. Louis River Estuary ("Wild Rice Plan"; Minnesota Department of Natural Resources 2014) include the establishment of 275 acres of self-sustaining rice beds. This work was conducted with funding provided by the Great Lakes Restoration Initiative and administered by the U.S.

Environmental Protection Agency. These efforts will contribute to the removal of beneficial use impairments for the St. Louis River Area of Concern (BUI 9 – Loss of Fish and Wildlife Habitat).



Canada Goose Herbivory -- Wild rice restoration efforts in the St. Louis River Estuary are hampered by Canada goose (*Branta canadensis*) herbivory (Figure 1). Monitoring data, camera traps and anecdotal observations have documented heavy browse by Canada geese during late spring and summer months when wild rice is in the floating leaf and early emergent stages of its life cycle (Schwartzkopf 1999; Figure 2). This important phase of the wild rice life cycle coincides with an abundance of molt migrant

Figure 1. Sign of Canada goose herbivory on wild rice in the St. Louis River Estuary (Photo Credit: WDNR).

and resident nesting geese (and their offspring) occupying wild rice sites in the estuary. Efficient foraging by geese inhibits wild rice flowering and seed head production.

A variety of techniques have been implemented to reduce the impacts of Canada goose herbivory (e.g., adapting restoration techniques, hazing, egg addling, mylar flashing, swan decoys, and goose exclosures). Despite these efforts, the impact of Canada goose herbivory has not been sufficiently reduced to allow for the establishment of self-sustaining wild rice beds.



Figure 2. Canada goose exclosure experiments have identified goose herbivory as the primary impediment to wild rice restoration in the St. Louis River Estuary (Photo Credit: Lake Superior National Estuarine Research Reserve).

Canada Goose Roundup -- The WDNR, in partnership with the City of Superior and the Animal and Plant Health Inspection Service (APHIS) – Wildlife Services, coordinated a Canada goose roundup on the Wisconsin side of the St. Louis River in July 2021. Personnel from WDNR, APHIS – Wildlife Services, Minnesota Department of Natural Resources (MNDNR), 1854 Treaty Authority, Superior Police Department, and the Lake Superior National Estuarine Research Reserve (LSNERR) participated in the goose roundup effort at five locations within the estuary (Figures 3 - 6).

We deployed motorboats and kayaks to locate and herd geese towards designated capture sites where APHIS – Wildlife Services personnel captured and processed geese following standardized control methods. Geese were euthanized using carbon dioxide, a method of euthanasia approved by the American Veterinary Medical Association. All geese were donated to the Lake Superior Zoological Society in Duluth to be utilized as food for resident carnivores.

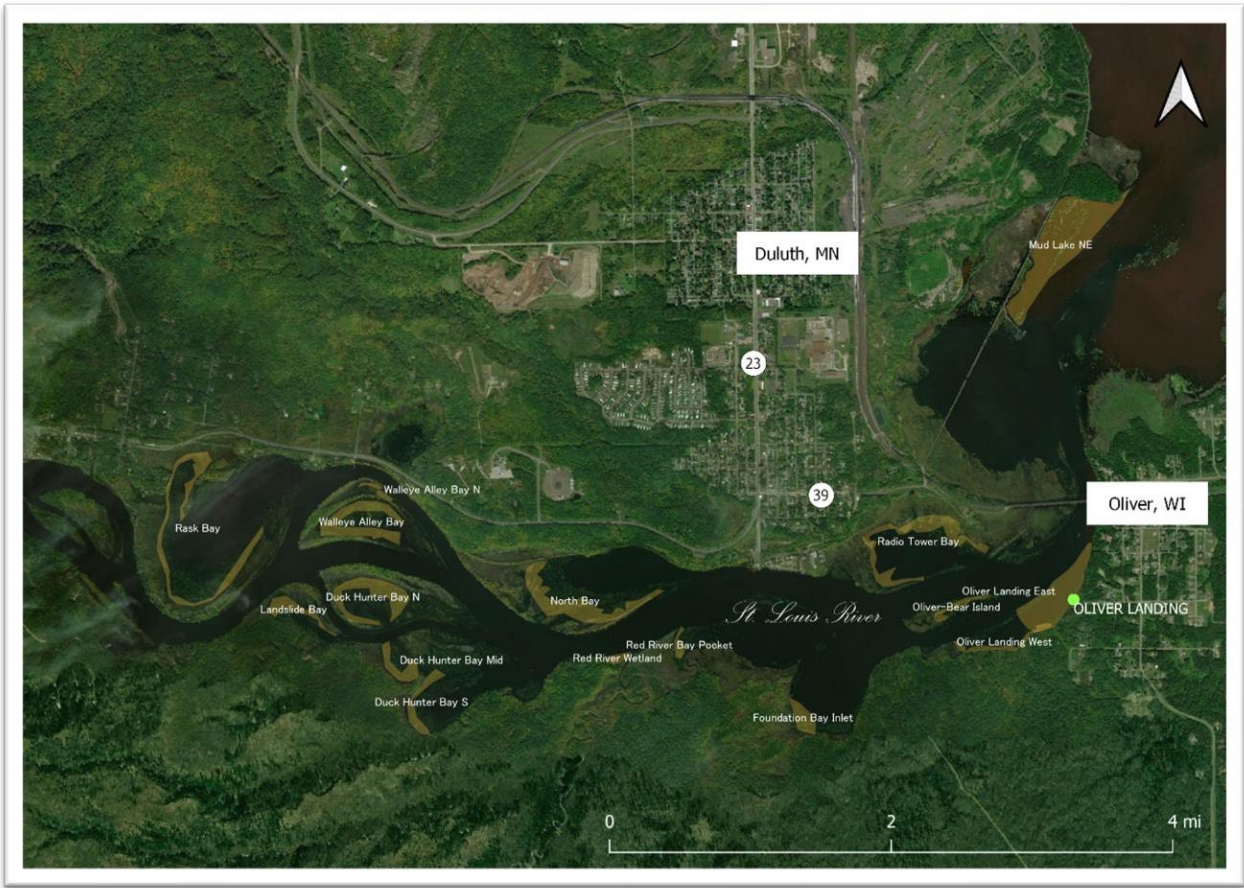


Figure 3. Wild rice restoration sites near the 2021 Canada goose roundup location at Oliver Landing.



Figure 4. 2021 Canada goose roundup locations near the Clough Island wild rice restoration site.



Figure 5. 2021 Canada goose roundup locations near the Allouez Bay wild rice restoration sites.

PROJECT OUTCOME

Canada Goose Roundup -- A total of 187 Canada geese were removed from the St. Louis River (Table 1). Captures in Allouez Bay ($n = 98$) comprised a significant proportion of geese that inhabit the wetland areas of the bay that are likely to browse planted rice. Upriver sites west of Oliver Landing proved to be more difficult in terms of locating and successfully herding geese to the capture location. Considerable effort was made to roundup geese from areas near Foundation Bay and Oliver-Bear Island sites.

Table 1. Canada goose capture results during the July 2021 roundup.

Date	Location	Site	Adult	Juvenile	Total
7/1/2021	Arrowhead	Arrowhead Landing & Hendrick's	8	14	22
7/1/2021	Allouez bay	Power Squadron	35	16	51
7/1/2021	Upriver	Oliver Landing	34	0	34
7/2/2021	Upriver	Oliver Landing	13	0	13
7/2/2021	Allouez Bay	Plover Site	15	32	47
7/2/2021	Upriver	Oliver Landing	20	0	20

Although we had some success at these “upriver” sites ($n = 67$), there is a substantial number of geese that evaded capture. We also captured geese ($n = 22$) from Arrowhead Landing and a nearby residential site (i.e.,

“Hendrick’s”), a site that is approximately 2 miles (3.22 km) from the nearest wild rice restoration site on the eastern side of Clough Island (Figure 3).

CONCLUSIONS & NEXT STEPS

General Conclusions -- This first effort at rounding up Canada geese from the St. Louis River Estuary was a success. Personnel from multiple organizations came together to implement a direct management action that will benefit wild rice restoration. In addition, we verified that this type of management action can be done efficiently and effectively. The roundup was conducted discretely, was met with strong support from members of the public that were encountered and will likely improve the likelihood of successful wild rice seed production.

Quantifying the Impact of Removal -- We will not be able to quantify the impact of removing 187 geese on wild rice seed production until monitoring efforts are completed in the fall of 2021. We hope to observe monitoring locations with greater biomass, density and seed production. Similarly, we expect to see fewer monitoring locations with evidence of goose browse when the monitoring results are made available. Heavily browsed vegetation was observed prior to the roundup. It is likely that wild rice restoration sites in closer proximity to roundup location will experience a greater reduction in goose herbivory than sites which are more distant to roundup locations. We intend to examine monitoring data to evaluate this first year’s impact.

Expanding to Minnesota -- Many of the prime round up locations in the upriver sections of the project area are located on the Minnesota side of the river. Future capture efforts will be more effective at reducing goose herbivory on upriver restoration sites when capture operations can be conducted in Minnesota as well as Wisconsin. The City of Duluth is currently exploring the development of a city-wide goose management plan that would allow the MNDNR to permit specific management actions to reduce impacts to wild rice and other resources. Until the MN plan is in place, round up efforts will take place exclusively on the Wisconsin side of the river.

Continued Management -- Effective goose management that benefits of wild rice restoration relies on cooperation among a diverse group of stakeholders each of whom plays an important role. Opportunities to educate the public on the cultural and ecological importance of wild rice will help garner continued support for goose management. Higher seeding rates (~200lbs/acre) combined with goose exclosures and annual round ups will go a long way towards achieving the wild rice restoration goals established in the “Wild Rice Plan” (MNDNR 2014). We anticipate that goose roundups will be implemented in subsequent years and that management triggers for Canada goose roundups will be incorporated into a future Wild Rice Plan revision. However, we believe that as restoration goals are met, Canada goose roundups in the St. Louis River Estuary will end. Continued monitoring will inform the effectiveness of these tools and the need for future action.

Research Opportunities -- There are a few key research questions that have been developed in the process of planning for, and carrying out, this initial round up effort.

1. How much time are geese spending in wild rice restoration sites compared to other locations in the estuary? Is the amount of time spent in a restoration site proportional to the amount of rice present?
2. How far will geese move within the Estuary to access wild rice restoration sites? Do restoration sites near capture locations see a greater benefit than sites more distant (e.g., improved biomass seed production, higher density rice stems, etc.)?
3. Is there a wild rice density and/or patch size where rice beds become more resilient to goose herbivory? Can we establish a set of metrics that define a resilient stand of wild rice in the St. Louis River Estuary?

REFERENCES

Minnesota Department of Natural Resources. 2014. St. Louis River Estuary wild rice restoration implementation plan. Division of Ecological and Water Resources. Duluth, Minnesota.

Schwarzkopf, L. 1999. St. Louis River – wild rice restoration project. Prepared for Richard Greenwood, Great Lakes National Program Office, U.S. EPA/Region V, Chicago, IL.

Appendix B

MN DNR MANAGEMENT ACTIVITY DOCUMENTATION FORM

DATE	Time	Name	Activity/Method	Location	Notes