



Bald Eagle Nesting During Construction



(Jothika Thivakaren, Alaska DOT&PF)

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Prepared for:

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Alaska DOT&PF and US Fish and Wildlife Service Alaska Region partnered to collect eagle nesting data during DOT&PF road construction work in various locations in Southeast Alaska during the summers of 2015-2018. Control nests located outside of any nearby construction activities were also monitored to compare the occupancy and productivity to nests located near road construction projects. Locations were chosen based on current eagle monitoring permit requirements for DOT&PF road construction projects. The preliminary results from this project suggest that bald eagles within Southeast Alaska have adapted to the human landscape and the impact to nest occupation and productivity near highway construction areas is not as significant as once assumed.			
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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS					APPROXIMATE CONVERSIONS FROM SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol	Symbol	When You Know	Multiply By	To Find	Symbol
<u>LENGTH</u>					<u>LENGTH</u>				
in	inches	25.4	mm	mm	millimeters	0.039	inches	in	
ft	feet	0.3048	m	m	meters	3.28	feet	ft	
yd	yards	0.914	m	m	meters	1.09	yards	yd	
mi	Miles (statute)	1.61	km	km	kilometers	0.621	Miles (statute)	mi	
<u>AREA</u>					<u>AREA</u>				
in ²	square inches	645.2	millimeters squared	cm ²	mm ²	millimeters squared	0.0016	square inches	in ²
ft ²	square feet	0.0929	meters squared	m ²	m ²	meters squared	10.764	square feet	ft ²
yd ²	square yards	0.836	meters squared	m ²	km ²	kilometers squared	0.39	square miles	mi ²
mi ²	square miles	2.59	kilometers squared	km ²	ha	hectares (10,000 m ²)	2.471	acres	ac
ac	acres	0.4046	hectares	ha					
<u>MASS (weight)</u>					<u>MASS (weight)</u>				
oz	Ounces (avdp)	28.35	grams	g	g	grams	0.0353	Ounces (avdp)	oz
lb	Pounds (avdp)	0.454	kilograms	kg	kg	kilograms	2.205	Pounds (avdp)	lb
T	Short tons (2000 lb)	0.907	megagrams	mg	mg	megagrams (1000 kg)	1.103	short tons	T
<u>VOLUME</u>					<u>VOLUME</u>				
fl oz	fluid ounces (US)	29.57	milliliters	mL	mL	milliliters	0.034	fluid ounces (US)	fl oz
gal	Gallons (liq)	3.785	liters	liters	liters	liters	0.264	Gallons (liq)	gal
ft ³	cubic feet	0.0283	meters cubed	m ³	m ³	meters cubed	35.315	cubic feet	ft ³
yd ³	cubic yards	0.765	meters cubed	m ³	m ³	meters cubed	1.308	cubic yards	yd ³
Note: Volumes greater than 1000 L shall be shown in m ³									
<u>TEMPERATURE (exact)</u>					<u>TEMPERATURE (exact)</u>				
°F	Fahrenheit temperature	5/9 (°F-32)	Celsius temperature	°C	°C	Celsius temperature	9/5 °C+32	Fahrenheit temperature	°F
<u>ILLUMINATION</u>					<u>ILLUMINATION</u>				
fc	Foot-candles	10.76	lux	lx	lx	lux	0.0929	foot-candles	fc
fl	foot-lamberts	3.426	candela/m ²	cd/cm ²	cd/cm ²	candela/m ²	0.2919	foot-lamberts	fl
<u>FORCE and PRESSURE or STRESS</u>					<u>FORCE and PRESSURE or STRESS</u>				
lbf	pound-force	4.45	newtons	N	N	newtons	0.225	pound-force	lbf
psi	pound-force per square inch	6.89	kilopascals	kPa	kPa	kilopascals	0.145	pound-force per square inch	psi
These factors conform to the requirement of FHWA Order 5190.1A *SI is the symbol for the International System of Measurements									

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The following DOT&PF staff helped with the project:

Ben White, Taylor Horne, Jane Gendron, Hilary Lindh, John Barnett, Pat Carroll, Dane Palmer, Jim Scholl, Willow Gaber, Art Dunn, Chris Shelb, Cheryl Benson, Nina Horne, Emily Haynes, Christy Genteman, Steven Thater, Ben Storey, Megan Daniels, Melissa Goldstein, Carolyn Morehouse, and Janelle White.

Executive Summary

The Alaska Department of Transportation & Public Facilities and the United States Fish and Wildlife Service monitored eagle nest success on eighteen different road projects. Project monitoring started in early summer 2015 through late summer 2018. The construction activities included: guardrail driving, paving, grinding, general excavation and placement of embankment.

Eagle nests with active eagle permits were monitored using helicopters. Control nests were monitored during each flight to compare occupancy and nest productivity. Control nests are nests which are not located near road construction activities and are meant to have similar access to food and water resources. The same data was collected for control nests and nests located near an active construction project.

The preliminary results from this project suggest that bald eagles within Southeast Alaska have adapted to the human landscape and the impact to nest occupation and productivity near highway construction areas is not as significant as once thought (limited to activities within the study).

CHAPTER 1 - INTRODUCTION AND RESEARCH APPROACH

Introduction

The USFWS developed the National Bald Eagle Management Guidelines to apply nationally, to advise when and under what circumstances the protective provisions of the Bald and Golden Eagle Protection Act (BGEPA) may apply to activities on public and private lands and to help people minimize their impacts on bald eagles. The Alaska Department of Transportation and Public Facilities (DOT&PF) commissioned a research project in cooperation with the United State Fish and Wildlife Service Alaska Region (USFWS) to monitor bald eagle nesting success during road construction activities (see Appendix A).

Studies of reproductive rates for eagles can be valuable in assessing their success. From May 2015 through August 2018, the USFWS and DOT&PF conducted eagle nest surveys for productivity and occupancy. The nests were located near road projects which required an eagle permit. Productivity surveys provide an estimate of nesting success in an area. Occupancy surveys provide evidence that a nest is being used for that season. Evidence includes recently built or repaired nests which may be occupied by an eaglet. Productivity surveys for this project were flown between May through June and occupancy surveys were flown from July through August.

Locations from around southeast Alaska were chosen for the study based on current eagle permit requirements. Each of the following road projects required an eagle monitor:

- Craig to Klawock Highway Guardrail
- Haines Ferry Terminal Road
- Hydaburg Road
- Juneau Brotherhood Bridge
- Juneau Egan 10th to Mendenhall Loop
- Juneau Fritz Cove Road
- Juneau Fritz Cove to Seaview
- Juneau Glacier Highway Lena to Tee Harbor
- Juneau North Douglas Highway
- Juneau Salmon Creek
- Juneau UAS Multi-use path
- Kake Keku Road
- Ketchikan Collins Road Guardrail
- Ketchikan Shelter Cove Road
- Ketchikan Water Street
- Sitka Halibut Point Road
- Sitka Sawmill Creek
- Wrangell Evergreen Road Improvements



Figure 1: Map of Southeast Alaska

Research Objectives

Permitting time takes between one and three months, adds project costs for multiple aerial surveys (two per year, for each year of project plus one year), and adds uncertainty for contractors if previously unidentified nests are discovered during construction. Additionally, if the research results in USFWS issuing guidance on certain activities that do not affect bald eagles in Southeast Alaska, then DOT&PF will have less risk of Bald and Golden Eagle Protection Act (BGEPA) violations.

The research objective is to compare nest occupancy, productivity, and fidelity between impact and control nests. If significantly different, determine at what distance impacts occur. If not significantly different, USFWS may recommend DOT&PF not obtain bald eagle permits for certain activities.

This research has the potential to reduce the bald eagle permitting burden on many DOT&PF projects. If the permitting requirement is eliminated for certain projects, or the impact distances are reduced, there will be a reduction in time, effort and money needed to complete the environmental permitting process for projects located in bald eagle habitat. Currently, Southcoast Region applies for 10 bald eagle permits per year.

Background

In May 2007 the USFWS established new National Bald Eagle Management Guidelines as a result of the bald eagle being de-listed from the Threatened and Endangered Species list under the Endangered Species Act in all areas except for the range of the Sonoran Desert bald eagle population. On September 11, 2009 the USFWS published new regulations which included a new bald eagle permit take process and two take permits (disturbance and mortality) that could be requested prior to construction projects that may impact bald eagles or their nests. Take permits can be issued by the USFWS for removal, relocation or destruction of eagle nests. USFWS initially limited permit issuance to only 5% of Maximum Sustainability Yields for bald eagle populations. Population estimates in Alaska were based on fewer data points than those in the lower 48 states. Alaska has a large population of bald eagles, and Southeast Alaska in particular has some very densely populated areas.

As with any new permit process or regulations there are some process issues that need to be evaluated during implementation. Initially the new regulations and permits were difficult to follow and the permits were time consuming and difficult to obtain. Monitoring for 3 years may be required for permits, and there will be an annual reporting requirement.

Study Plan

The study was designed to compile eagle nesting success near locations which have DOT&PF road construction activities present during critical nesting times of the year and compare them to 'control' nests. Control nests are eagle nests which are located further away from roads or buildings in more isolated areas with no construction activities.

Data Collection Plan

Data collection included weather conditions, GPS coordinates, nest number, occupancy data and DOT&PF project number. Trip reports were compiled by each DOT&PF staff member and are included in Appendix B.

DOT&PF Construction Project Surveys

DOT&PF flew two survey flights per year during construction (eagle occupancy rate and nest productivity) and a fidelity survey the year following construction completion. All surveys used for this research were conducted by helicopter. Flight staff included a representative from the USFWS and one or more DOT&PF personnel for each trip.

An occupancy survey is completed in early May to monitor a nest where young were raised, eggs were laid, or an adult was observed sitting low in the nest. A productivity survey is completed in late summer to observe any fledging (young). The nest success is computed by looking at the number of successful nests / number of occupied breeding areas.

Control Nest Surveys

Control nests were monitored during each flight to compare occupancy and nest productivity. The nests selected as control nests are meant to have similar access to food and water resources. The same data was collected for control nests as was nests located near an active highway construction project.

Afterwards, data collected was compared for occupancy and productivity rates between the nests to see if there was a measurable difference.

Methods

Overview

Bald eagle nests are quite large, averaging the size of a typical hot tub with a depth of 3 to 4 feet. To support this size, the nests are most often found in large trees, built about 2/3 to 3/4 up the height of the tree.

https://www.fws.gov/pacific/eagle/all_about_eagles/bald_eagle_nests.html

Occupancy eagle nest surveys occur before May 31st of each year to ensure the most data can be gathered of occupied nests. Each year, eagles spend the spring searching for the nest they will occupy for the nesting season. The eagles lay and incubate eggs from this point until hatching. Occupied nests are identified by an eagle sitting in the nest, assumedly incubating at least one egg.

The eagle nest productivity surveys occur between July 15 and July 31st of each year and surveys are only conducted on nests previously identified as occupied during that year's occupancy survey. At this point, chicks have hatched and are preparing to leave the nest.

Chicks still in the nest during the productivity surveys are most likely going to continue to grow and successfully fledge. Eagle chicks are somewhat difficult to spot as there is no noticeable white head to spot (as adults have) and the chicks tend to lay flat in the nest. There is always the concern of getting too close to the nest and scaring the chick, causing it to prematurely depart the nest and potentially die on the fall.

The fidelity eagle nest surveys occur only on impact nests and are conducted at the same time as occupancy surveys but with the goal of documenting whether or not eagles returned to nests after construction has occurred nearby.

2018 Monitoring Trips - Sitka Occupancy Survey

DOT&PF and USFWS conducted an aerial survey for three projects in Sitka on May 17, 2018. The flight was based out of Juneau and weather conditions were clear with sunny skies. The proposed Katlian Bay Road (DOT&PF Project #Z676720000) project was flown first. Since the road had not been constructed, we surveyed the entire valley and searched near likely food sources (Katlian River and Katlian Bay) for nests. We identified four nests: new nest- unoccupied; new nest- unoccupied; new nest- occupied with one eagle; and new nest- occupied with one eagle.

After completing the survey of the proposed Katlian Bay Road area we surveyed the Sitka Sawmill Creek Rd. Resurface: (DOT&PF Project #SFHWY00064) and Sawmill Creek Rd. Resurfacing & Ped Improvements (DOT&PF Project #Z681000000) projects. The team flew southeast along the project corridor and identified one new nest adjacent to the Sawmill

Creek Road resurface project. We flew northwest to observe the nest and were able to identify that the nest was unoccupied.

Juneau Occupancy Survey

On May 22, 2018 the DOT&PF chartered a flight with Coastal Helicopters to fly the occupancy survey in Juneau, Alaska. The survey started in Douglas at West Juneau then towards South Douglas, and then across the channel to Thane. From Thane, the researchers flew along Glacier Hwy toward the Mendenhall Valley and Auke Bay.

Aerial surveys were flown for both impact and control nests. GPS was used during flights to locate existing nests and mark new nest coordinates. Nest coordinates were marked after the pilot was able to position the helicopter hovering over the nest as close as possible.

Nest comments, Douglas:

- One new occupied nest was observed and marked.
- One adult eagle was observed in the nest on Mayflower Island near Sandy Beach.

Nest comment, Mendenhall Valley and Auke Bay:

- Nest ED4 Impact Nest was unoccupied and in very poor condition.
- Control nest Brockman New Nest was Unoccupied. Marked coordinates during occupancy survey were inaccurate for Brockman New Nest and have been corrected. Brockman New Nest coordinates and data were verified with USFWS.

Haines Occupancy Survey

On May 23, 2018, the research team departed from Skagway to conduct aerial eagle surveys in Haines. Many of the trees in the Haines area are deciduous and at this time of year, are completely leafed out. If a nest is regularly used, it is likely brighter green in color as the previous years' droppings act as a fertilizer. With a green nest and green leaves, the nests can be difficult to spot.

The Haines Highway survey is made more difficult because there are many historical nests in this area. Survey sheets provided by USFWS noted nests found in 1987 which the team attempted to locate. To find nests, the pilot circles the approximate location until either the nest is located or it is agreed that the coordinates are significantly inaccurate or the nest no longer exists. Unless eagles regularly repair the nests by building it back up, the nest will eventually fall into disrepair and become unidentifiable.

Overall, fourteen nests were found during this monitoring trip. Control nests were difficult to find. The researchers attempted to locate twenty-nine total, but thirteen of those nests were not found. The survey took a total of four hours which included three stops at the Haines Airport.

Wrangell/Kake Occupancy & Productivity Surveys

On May 18, 2018, the research team departed from Wrangell to conduct aerial eagle surveys in Wrangell and Kake. Nests are normally located high in trees with a clear view of the surrounding area and near the water. Much of the shoreline has been developed and many of

the most opportune nesting trees were easily identifiable – singular tall, somewhat bare, with clear views of the water. All impact and control nests for Wrangell were located within thirty minutes.

While all five nests were occupied in July, only two were considered to still be occupied and “productive” during July. The pilot in this survey was significantly more apprehensive than any other survey flown and data was very difficult to gather. One nest could not be determined to be occupied or not because of the incredible distance the pilot kept.

Keku Road in Kake was not included as part of the research project but nests were easier to spot than Wrangell. The trees in Kake were smaller and more “bushy” than the nest trees in Wrangell. The survey lasted only 20 minutes and seven nests were found.

The follow-up productivity survey in Kake showed two of the three occupied nests were no longer occupied – the eagles had abandoned the nest.

Ketchikan Productivity Survey

On July 27, 2018, the research team conducted the aerial eagle survey in Ketchikan. Nests were easier to locate as updated coordinates were provided from occupancy surveys and there is no need to search for new nests – only surveying previously-found and occupied nests. However, the survey requires the use of binoculars to spot chicks which are tricky to learn to use while moving somewhat erratically in a helicopter.

Many of the nests, 11 out of 15 – had chicks visible in the nests with one nest housing two chicks. The survey was conducted without issues and with great success.

Juneau Productivity Survey

On July 24, 2018, the DOT&PF chartered a flight with Coastal Helicopters to fly the productivity survey for one active construction project: DOT&PF Project #Z684710000 JNU Glacier Hwy Reconstruction Fritz Cove Road to Seaview Avenue. The same data collection method was used.

CHAPTER 2 - FINDINGS

Data Summary & Analysis

The goal for data collection was to compare the nest occupancy and productivity located near typical DOT&PF road construction activities to nests located away from road construction activities.

The eagle nest data has been summarized below and more detailed data with maps are included in Appendix B:

Survey Year	Survey Type	Group	Results	Percentage
2015	Occupancy	Impact	18 of 31	58%
		Control	17 of 70	24%
	Productivity	Impact	13 of 18	72%
		Control	11 of 17	65%
2016	Occupancy	Impact	6 of 25	24%
		Control	17 of 36	47%
	Productivity	Impact	5 of 6	83%
		Control	10 of 17	59%
2017	Occupancy	Impact	6 of 14	43%
		Control	20 of 39	51%
	Productivity	Impact	5 of 6	83%
		Control	15 of 20	75%
2018	Occupancy	Impact	21 of 42	50%
		Control	19 of 48	40%
	Productivity	Impact	4 of 11	36%
		Control	8 of 14	57%

Nest ID, latitude, longitude and substrate data was collected during each trip. The results show whether an adult eagle, an egg(s) or a chick(s) were found in the nest. The raw data can be found in Appendix B.

In 2015 and 2018, the impact nests had a higher occupancy rate than the control nests. In 2017, the impact nests and control nests had a very similar occupancy percentage. In 2016, the control nests had a higher occupancy rate than the impact nests. Once the determination of occupancy had been established, the success of productivity was evaluated. In 2015, 2016 and 2017, the impact nests had higher percentage of productivity when compared to the control nests. In 2018, the productivity of the control nests had a higher percentage than the impact nests. The results of this study indicate no significant impact to Bald Eagle nesting activities due to highway construction activities in the Southeast Region of Alaska.

Maintenance/Construction Activities

The eighteen road construction projects included the following construction activities:

- Guardrail Driving
- Paving

- Grinding
- General excavation/embankment

Conclusion

The intent of this project was to determine the impacts of certain DOT&PF highway construction activities on bald eagle nesting. With changes to the National Bald Eagle Guidelines, regulations and permitting process there was significant delay in advancing projects to construction. Alaska DOT&PF has applied for over 50 bald eagle permits since 2010. The preliminary results from this project suggest that bald eagles within Southeast Alaska have adapted to the human landscape and there does not appear to be as significant of impact to nest occupation and productivity near highway construction areas (limited to activities within the study). This project's results support the Alaska Region USFWS Office establishing reduced buffer zones around active bald eagle trees in areas already impacted by the human landscape. This research will also assist the USFWS in developing new Alaska-specific Bald Eagle Guidelines and policy for Region 7 for the management of bald eagles, as well as a reduction in the number of bald eagle permits required for Alaska DOT&PF highway construction projects in Southeast Alaska. Once the revised Alaska Bald Eagle Management Policy has been developed, then DOT&PF and the Alaska Region USFWS will develop a programmatic agreement permit based on the research and data collected as part of this study.

Suggested Research

Further research analysis is being completed by the USFWS using the data from this study. Statistical analysis will be used to quantify differences in occupancy, productivity, and fidelity between groups. In-house biometricians are being used to ensure methodology is consistent.

APPENDIX A

Research Need Statement

**Alaska DOT&PF Research, Development, and Technology Transfer
Research, Development, & T2 Needs Statement
(This is not a Research Proposal)**



Title: Bald Eagle Nesting During Construction Research

DOT&PF Project Champion(s): Taylor Horne

DOT&PF Project Sponsor(s): Taylor Horne & Jordan Muir (USFWS)

Proposed Technical Advisory Committee: Taylor Horne, Hilary Lindh, Jordan Muir (USFWS)

RD&T2 Plan Correlation (FY16)	X
Organizational Development	
Infrastructure Preservation	
Safety	
Mobility	
Environmental Compliance	

Problem Statement & Background:

The appropriateness of National Bald Eagle Management Guidelines (Guidelines) for DOT&PF projects has never been tested in the field. The U.S. Fish and Wildlife Service (USFWS) developed the Guidelines to apply nationally, to advise when and under what circumstances the protective provisions of the Bald and Golden Eagle Protection Act (BGEPA) may apply to activities on public and private lands and to help people minimize their impacts on bald eagles. There is anecdotal evidence that bald eagles in Alaska may not be adversely affected by certain DOT&PF activities within the activity impact distances described in the Guidelines.

Objective:

Test the appropriateness of Guidelines for DOT&PF projects. Compare nest occupancy, productivity, and fidelity between impact and control nests. If significantly different, determine at what distance impacts occur. If not significantly different, USFWS may recommend DOT&PF not obtain Bald Eagle permits for certain activities.

Potential Benefits:

This research has the potential to reduce the Bald Eagle permitting burden on many DOT&PF projects. If the permitting requirement is eliminated for certain projects, or the impact distances are reduced, there will be a reduction in time, effort and money needed to complete the environmental permitting process for projects located in Bald Eagle habitat. Currently, Southcoast Region applies for about 10 Bald Eagle permits per year. Permitting time takes between one and three months, adds project costs for multiple aerial surveys (two per year, for each year of project plus one year), and adds uncertainty for contractors if previously unidentified nests are discovered during construction. Additionally, if the research results in USFWS issuing guidance on certain activities that do not affect Bald Eagles, then DOT&PF will have less risk of BGEPA violations.

Relationships to the Existing Body of Knowledge:

A DOT&PF rapid research project was conducted during 2015 and provided preliminary results supporting reduced impact distances for bald eagles. However, more seasons of data collection are necessary to provide a statistically significant sample upon which USFWS can base potential policy decisions.

Tasks/Constraints: (List only tasks or conditions that are absolutely necessary, otherwise leave blank.)

- Identify which DOT&PF projects require a spring survey in April/May 2016
- Schedule additional flight time during survey to locate and survey control nests
- Invite USFWS to accompany flight to ensure correct control selection, survey methodology
- Repeat survey of project and control during second survey (July 2016)
- Repeat survey tasks for 2017
- Compile data
- Publish findings

Follow-on and Implementation Activities:

- Discuss and implement policy modifications with USFWS based on findings

Alaska DOT&PF Research, Development, and Technology Transfer
Research, Development, & T2 Needs Statement
(This is not a Research Proposal)



- Use information to determine if USFWS Eagle Take Permit is recommended for ADOT road maintenance activities.
- If permit is recommended, use information to determine at what distance permit needed.

Estimated Funding Requirements & Support:

Estimated Cost: \$150,000

The total cost includes the following costs:

\$70,000 for flight time for 2016 nest flights

\$30,000 for flight time for 2017 nest flights

\$50,000 to compile data and to prepare final report

Matching funds or In-Kind Services/Source? Jordan Muir stated that USFWS will fund \$140,000 for in kind services to fly along with DOT&PF personnel and to use for statistical analysis and assistance with report writing.

Submitted by: Taylor Horne, Statewide Environmental Manager

Date: March 7, 2016

For Additional Information:

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APPENDIX B

Collected Data & Project Maps

Location	Survey Year	Survey Date	Survey Type	Group	Occupied Nests	Adults	Eggs	Chicks
Fritz Cove Road	2015	5/13/2015	Occupancy	Impact	3 of 5	X		
				Control	5 of 6	X		
		7/27/2015	Productivity	Impact	3 of 3	X		X
				Control	2 of 5			X
Fritz Cove Road	2017	5/2017	Occupancy	Impact	1 of 1	X		
				Control	11 of 16	X		
		7/25/2017	Productivity	Impact	1 of 1			X
				Control	6 of 11	X		X
Fritz Cove Road	2018	5/22/2018	Occupancy	Impact	0 of 1			
				Control	2 of 4	X		
		7/24/2018	Productivity	Impact	N/A			
				Control	1 of 2			X
Brotherhood Bridge	2015	5/13/2015	Occupancy	Impact	2 of 3	X		
				Control	2 of 3	X		
		7/27/2015	Productivity	Impact	1 of 2			X
				Control	1 of 2			X
Egan_Salmon Creek	2016	5/12/2016	Occupancy	Impact	2 of 4	X		
				Control	3 of 5	X		
		8/1/2016	Productivity	Impact	1 of 2			X
				Control	3 of 3	X		X
Lena to Tee Harbor	2016	5/12/2016	Occupancy	Impact	0 of 3			
				Control	2 of 2	X		
		8/1/2016	Productivity	Impact	0			
				Control	0			
UAS MultiUse Path	2016	5/12/2016	Occupancy	Impact	1 of 2	X		
				Control	2 of 3	X		
		8/1/2016	Productivity	Impact	1 of 1			X
				Control	2 of 2			X
Wrangell	2018	5/18/2018	Occupancy	Impact	2 of 2	X		
				Control	3 of 3	X		
		7/31/2018	Productivity	Impact	0 of 2			
				Control	2 of 3	X		X
Haines	2018	5/23/2018	Occupancy	Impact	4 of 14	X		
				Control	4 of 16	X		
		7/26/2018	Productivity	Impact	1 of 4	X		X
				Control	0 of 4			
Craig Klawock Hwy	2015	05/12&13/15	Occupancy	Impact	9 of 15	X		
				Control	N/A			
		7/22/2015	Productivity	Impact	7 of 9	X		X
				Control	N/A			
Hydaburg Road	2015	05/12&13/15	Occupancy	Impact	4 of 8	X		
				Control	1 of 24	X		
		7/22/2015	Productivity	Impact	2 of 4	X		X
				Control	0 of 1			
Hydaburg Road	2016	5/20/2016	Occupancy	Impact	2 of 8	X		
				Control	1 of 5	X		
		7/28/2016	Productivity	Impact	2 of 2			X
				Control	0 of 1			
Collins Road	2015	05/12&13/15	Occupancy	Impact	N/A?			
				Control	2 of 8	X		
		7/22/2015	Productivity	Impact	N/A?			
				Control	2 of 2			X
Shelter Cove Road	2017	5/2017	Occupancy	Impact	2 of 6	X		
				Control	2 of 7?			
		7/27/2017	Productivity	Impact	1 of 2			X
				Control	2 of 2?			X
N. Tongass Illumination Upgrade	2017	5/2017	Occupancy	Impact	1 of 5			
				Control	3 of 8?			
		7/27/2017	Productivity	Impact	1 of 1			X
				Control	3 of 3?			
Shelter Cove Road	2018	5/8/2018	Occupancy	Impact	4 of 6	X		
				Control	0 of 1			
		7/27/2018	Productivity	Impact	2 of 4			X
				Control	N/A			

Location	Survey Year	Survey Date	Survey Type	Group	Occupied Nests	Adults	Eggs	Chicks
Shelter Cove Road	2015	05/12-13/15	Occupancy	Impact	N/A			
				Control	3 of 14	X		
		7/22/2015	Productivity	Impact	N/A			
				Control	4 of 3			X
Water Street	2017	5/2017	Occupancy	Impact	N/A			
				Control	2 of 5?	X		
		7/27/2017	Productivity	Impact	N/A			
				Control	2 of 2			X
Roosevelt and Franklin	2017	5/2107	Occupancy	Impact	2 of 2			
				Control	2 of 3?			
		7/27/2017	Productivity	Impact	2 of 2			X
				Control	2 of 2			X
Water Street	2018*	5/8/2018*	Occupancy	Impact	N/A			
				Control	1 of 6	X		
		7/27/2018	Productivity	Impact	N/A			
				Control	1 of 1			X
Deermont to Saxman control nests	2018*	5/8/2018	Occupancy	Impact	N/A			
				Control	1 of 4	X		
		7/27/2018	Productivity	Impact	N/A			
				Control	8 of 9	X		X
Roosevelt and Franklin	2018*	5/8/2018	Occupancy	Impact	1 of 1	X		
				Control	2 of 4	X		
N. Tongass Hwy.	2015	05/12&13/15	Occupancy	Impact	1?			
				Control	3 of 14	X		
		7/22/2015	Productivity	Impact	N/A			
				Control	2 of 3			X
N. Tongass Hwy.	2018	5/8/2018	Occupancy	Impact	3 of 3	X		
				Control	N/A			





Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

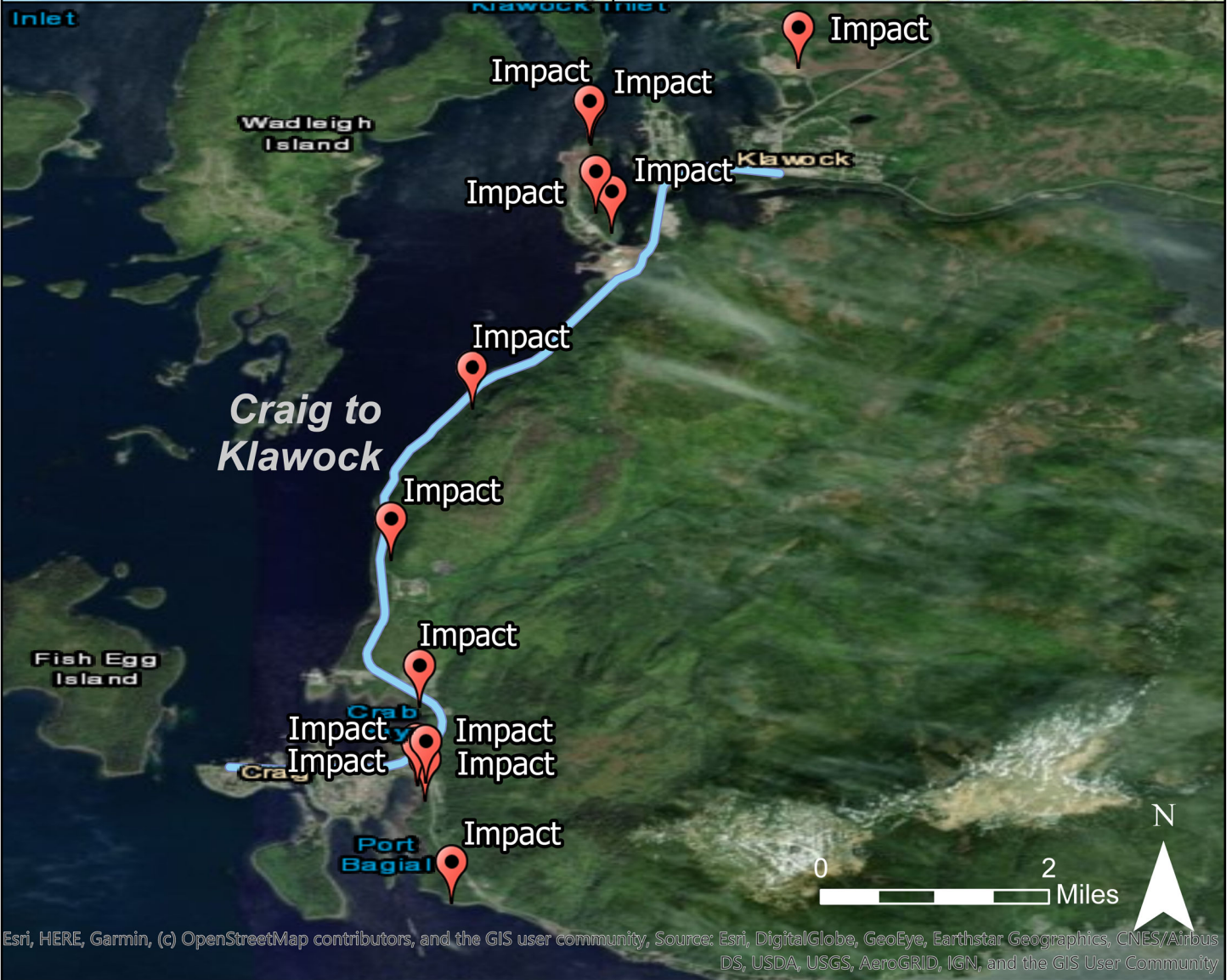
Legend

-  Brotherhood Bridge Project
-  Impact Nest



Brotherhood Bridge Replacement and Separated Multi-Use Path (Z679870000)

2015 Eagle Nest Survey

Located Nests



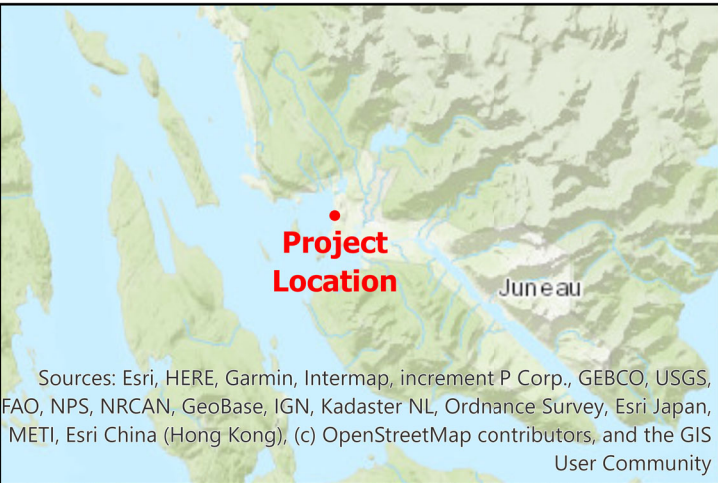
Legend

-  Craig to Klawock Project
-  Impact Nest

Craig-Klawock Highway Guardrail Improvement (Z678320000)

2015 Eagle Nest Survey

Located Nests



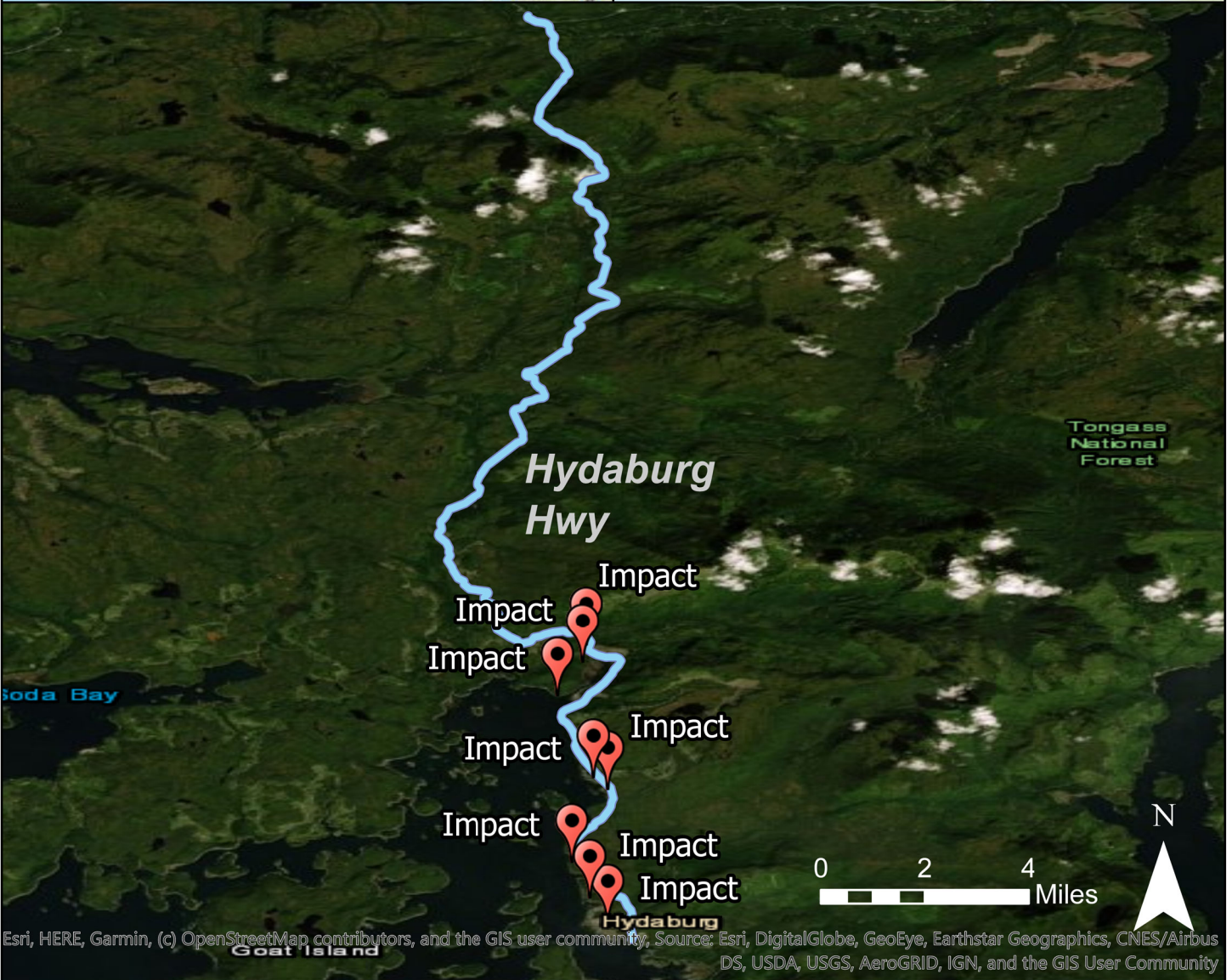
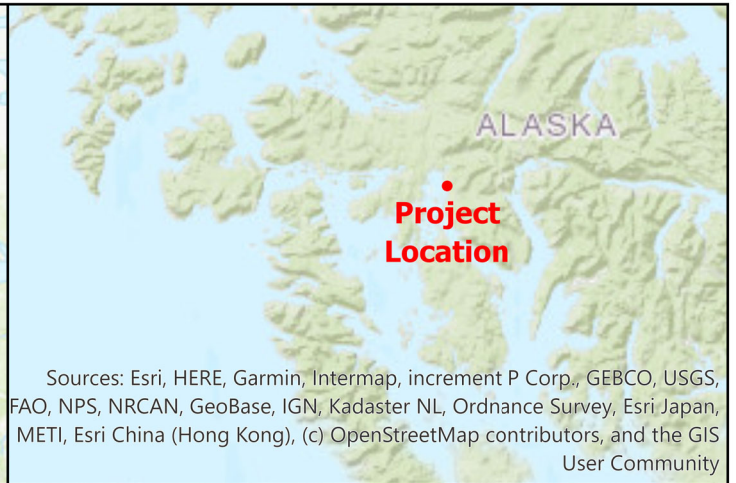
Legend

-  Fritz Cove Road Project
-  Impact Nest



Fritz Cove Road Rehabilitation and Repair (Z693970000)

2015 Eagle Nest Survey

Located Nests



Legend

-  Hydaburg Highway Project
-  Impact Nest

Hydaburg Highway Pavement Rehabilitation (Z675760000)

2015 Eagle Nest Survey

Located Nests



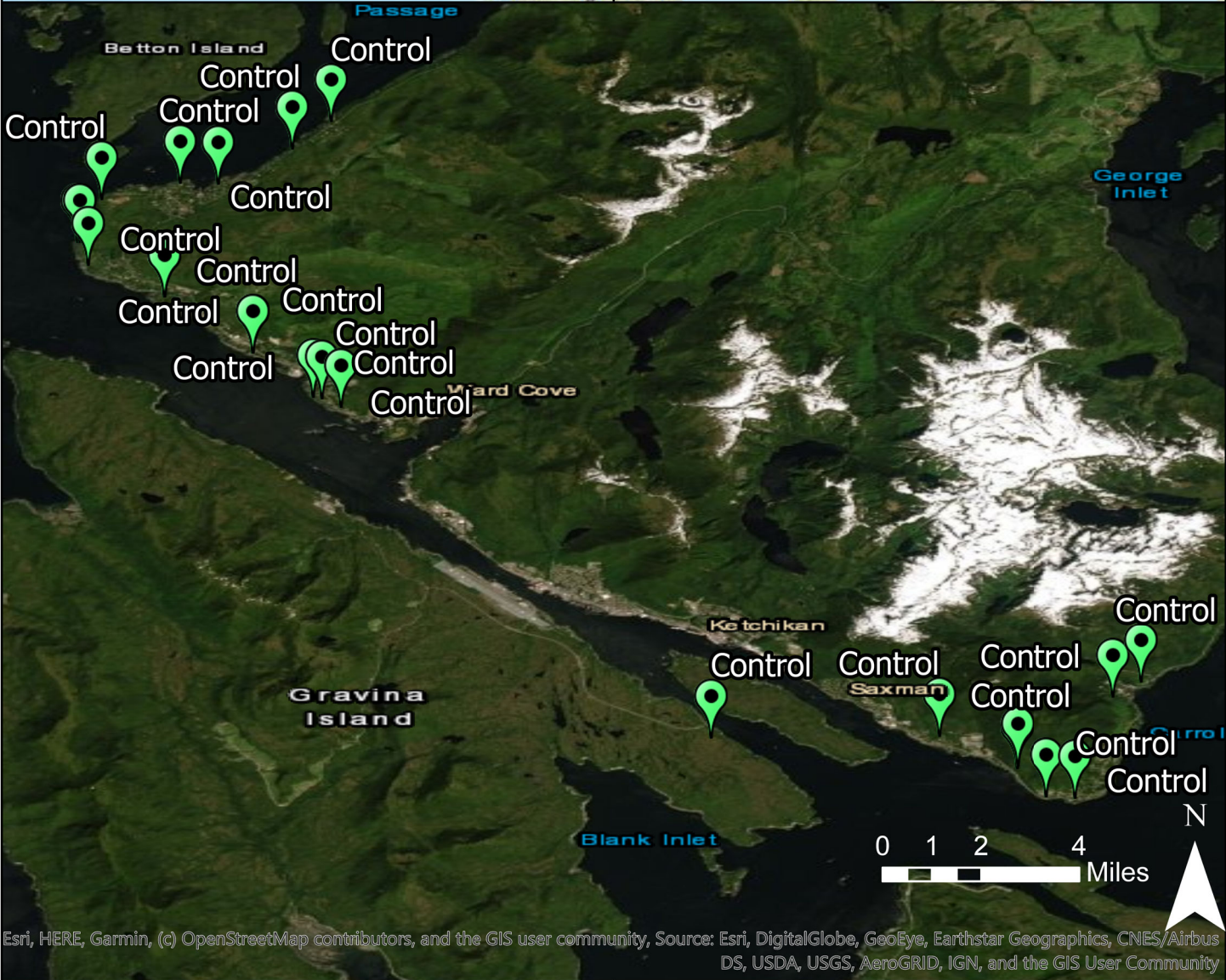
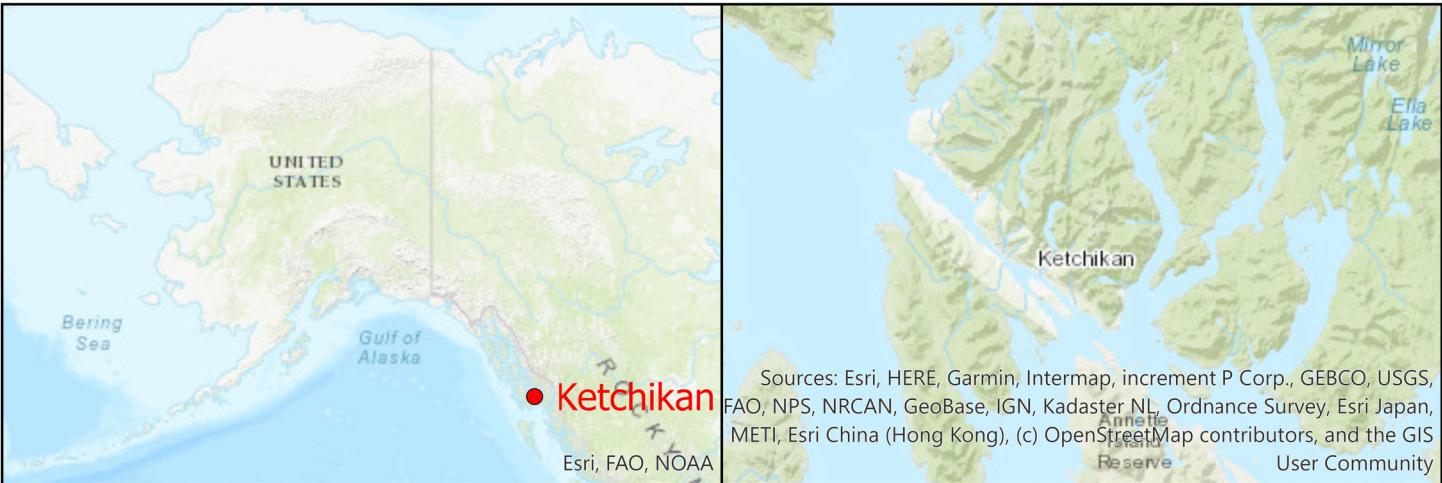
Legend

 Control Nest

Juneau Area

2015 Eagle Nest Survey

Located Nests



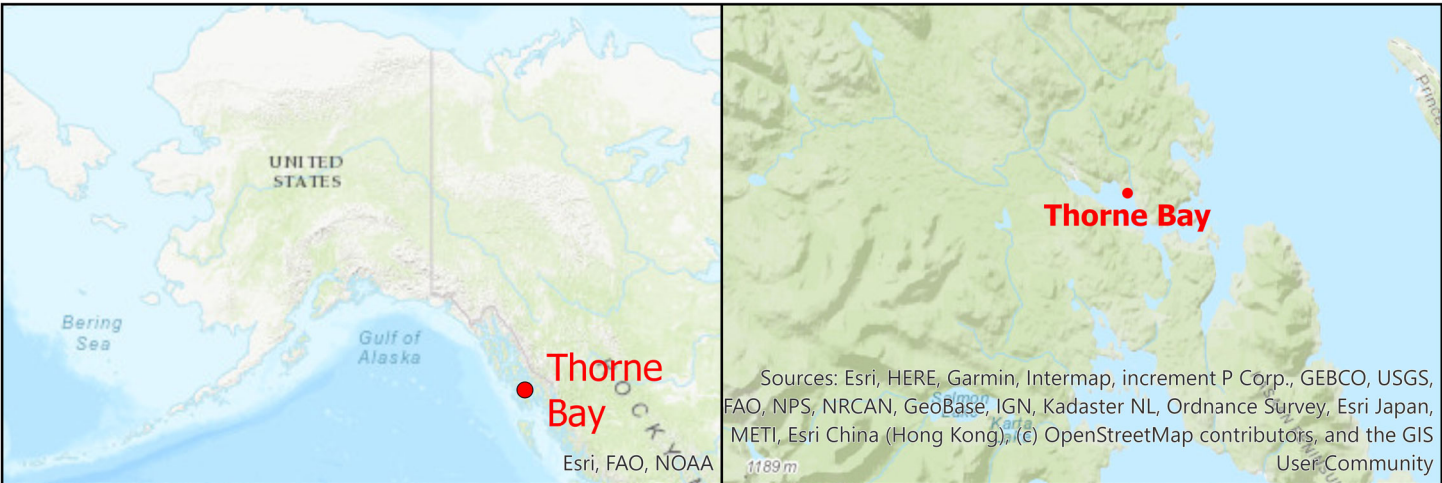
Legend

 Control Nest

Ketchikan Area

2015 Eagle Nest Survey

Located Nests



Legend

 Control Nest

Prince of Wales Area (Thorne Bay)

2015 Eagle Nest Survey

Located Nests





Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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Legend

-  10th to Loop Project
-  Impact Nest

Egan Dr Pavement Rehab 10th Street to Mendenhall Loop Rd (Z681290000)

2016 Eagle Nest Survey

Located Nests





Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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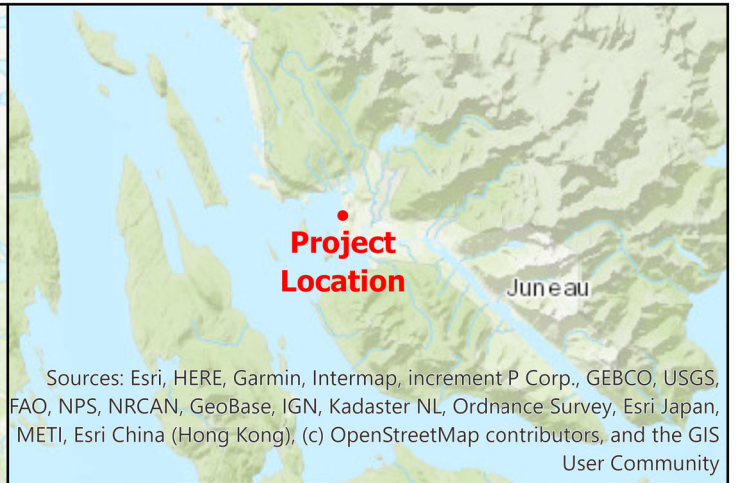
Legend

-  Brotherhood Bridge Project
-  Impact Nest



Brotherhood Bridge Replacement and Separated Multi-Use Path (Z679870000)

2016 Eagle Nest Survey

Located Nests



Legend

-  Fritz Cove Road Project
-  Impact Nest



Fritz Cove Road Rehabilitation and Repair (Z693970000)

2016 Eagle Nest Survey

Located Nests



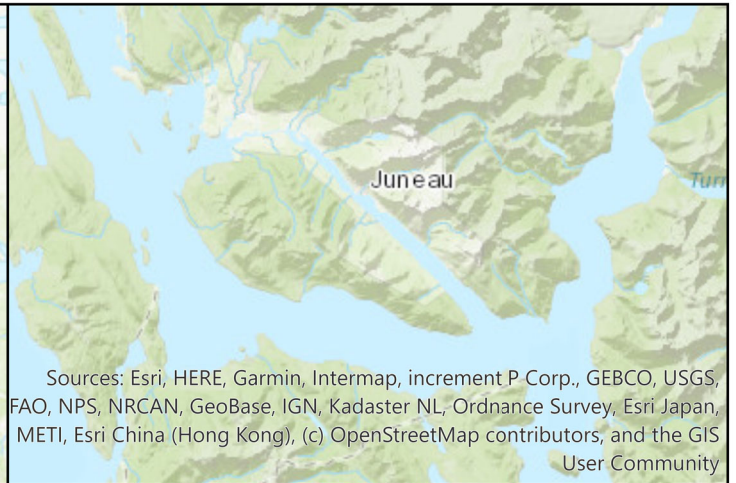
Legend

-  Hydaburg Hwy Project
-  Impact Nest

Hydaburg Highway Pavement Rehabilitation (Z675760000)

2016 Eagle Nest Survey

Located Nests




Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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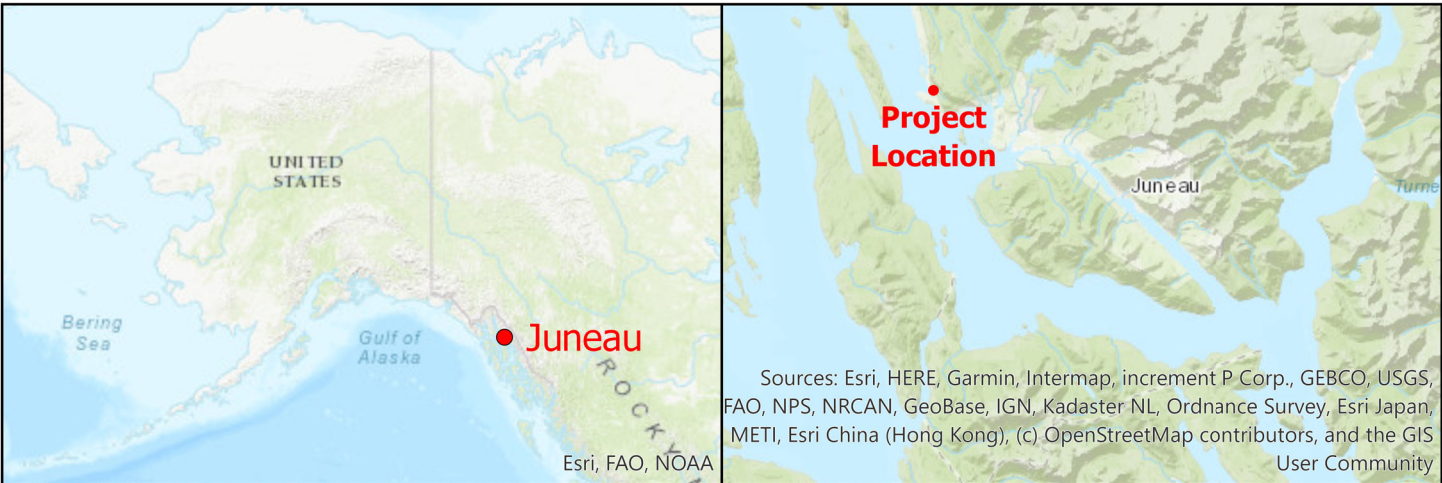
Legend

 Control Nest

Juneau Area

2016 Eagle Nest Survey

Located Nests



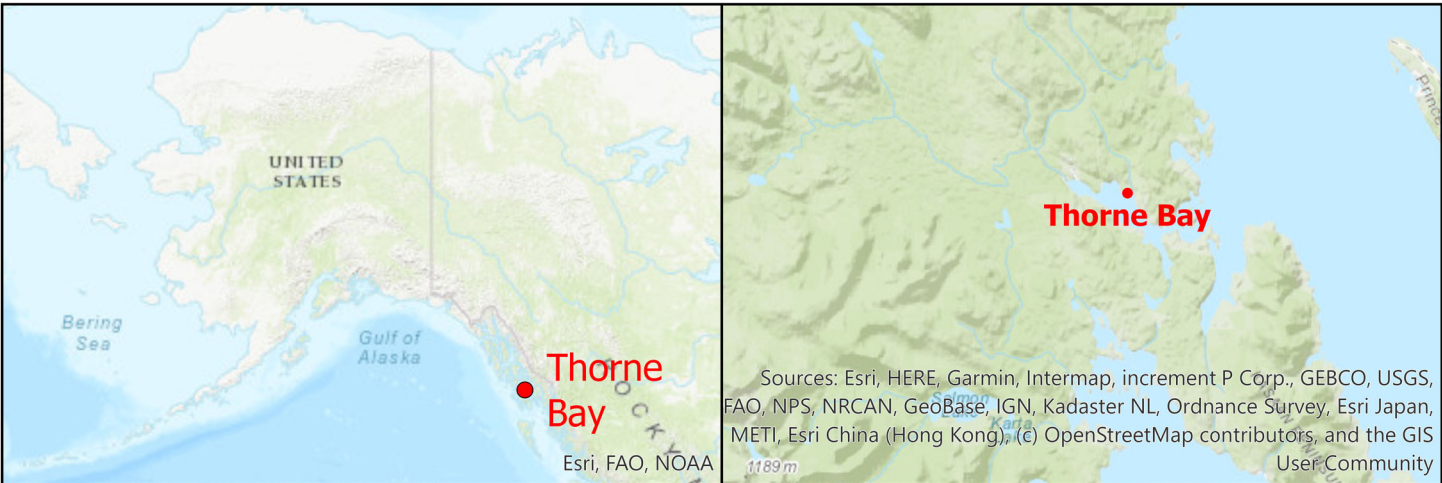
Legend

-  Impact Nest
-  Lena to Tee Project

Glacier Highway Reconstruction: Lena Cove to Tee Harbor (Z675640000)

2016 Eagle Nest Survey

Located Nests



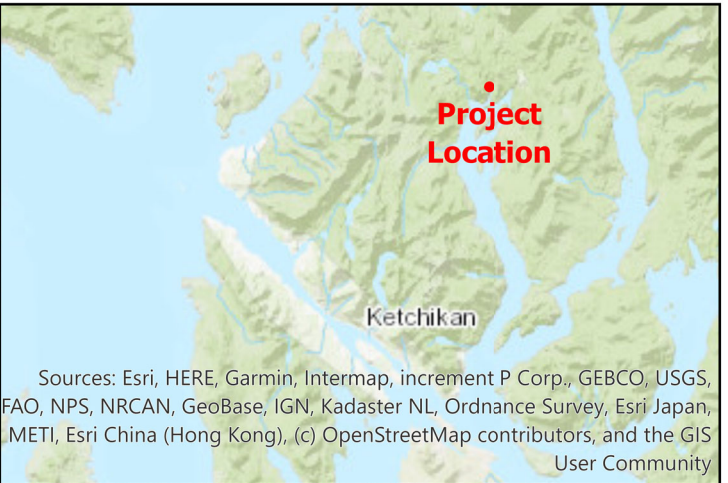
Legend

 Control Nest

Prince of Wales Area (Thorne Bay)

2016 Eagle Nest Survey

Located Nests



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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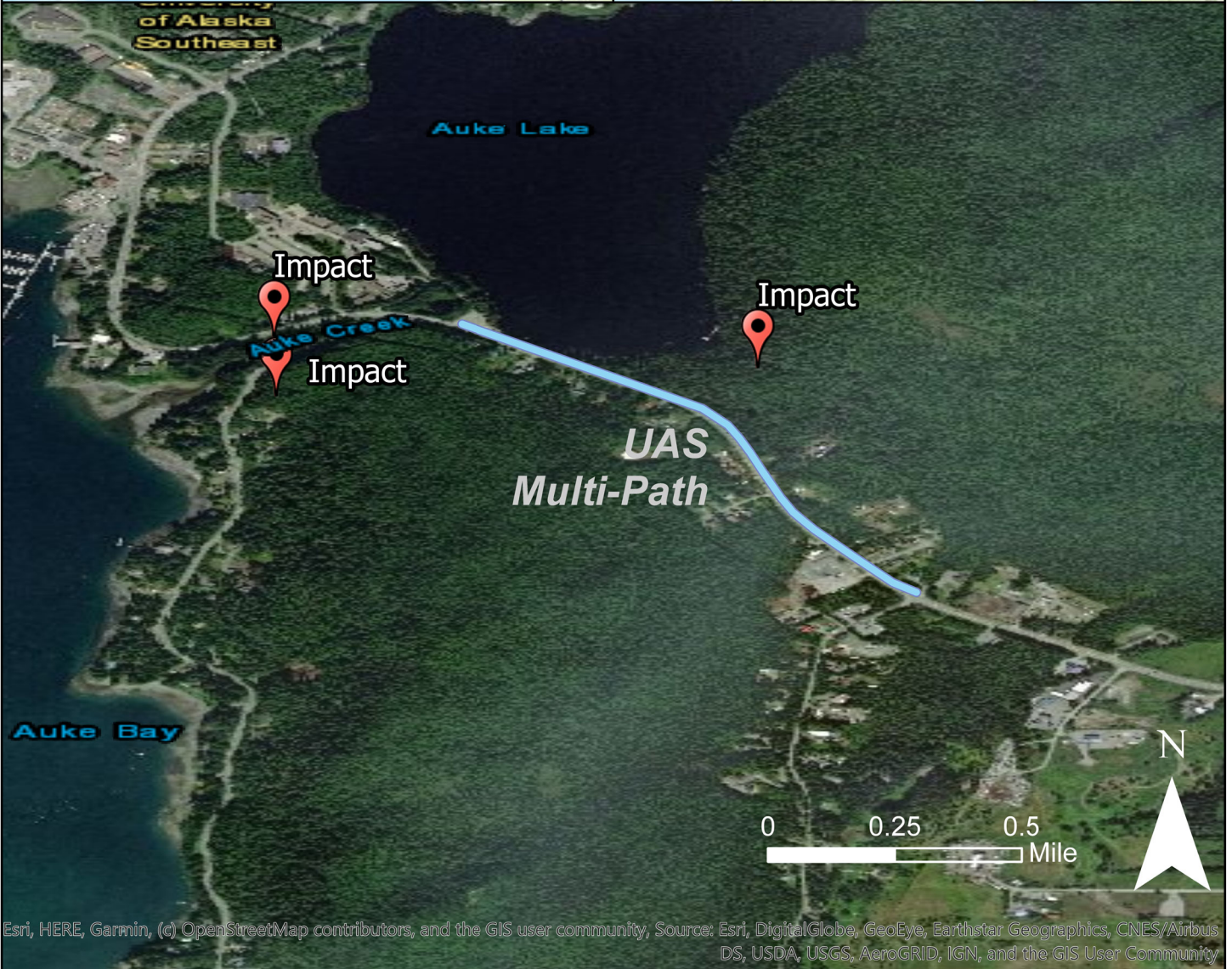
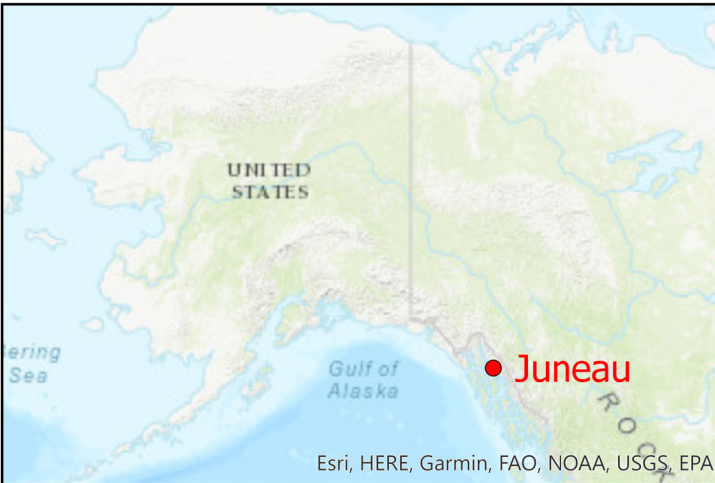
Legend

-  Shelter Cove Road Project
-  Impact Nest

Shelter Cove Road (SSHWY00044)

2016 Eagle Nest Survey

Located Nests



Legend

-  UAS Multi-Path Project
-  Impact Nest



Glacier Highway Separated Multi-Use Path to UAS (Z695000000)

2016 Eagle Nest Survey

Located Nests



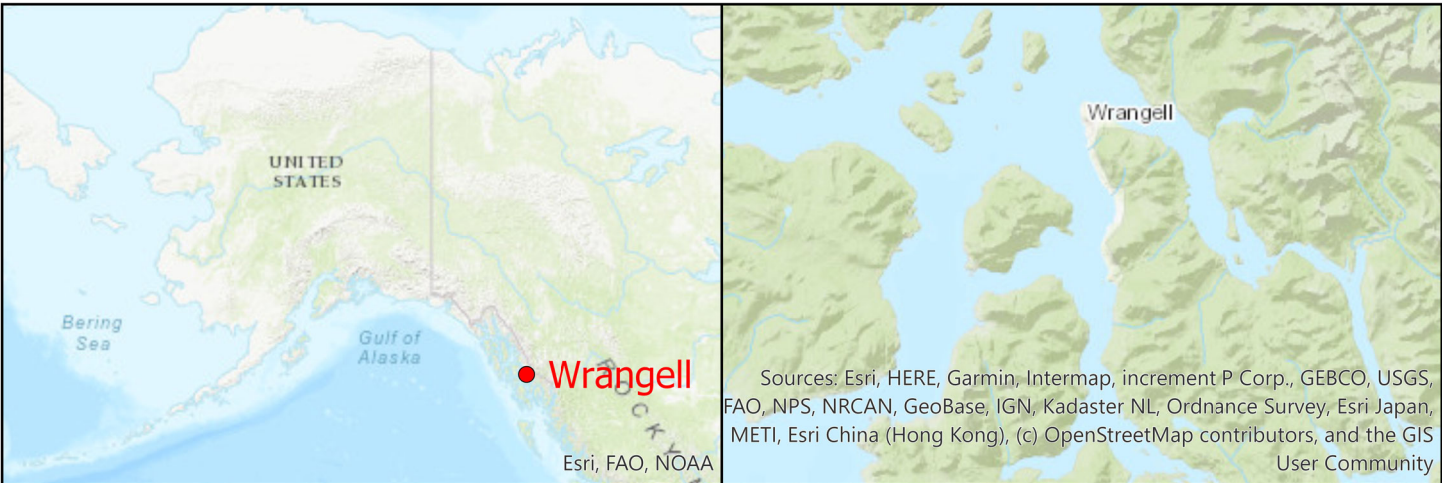
Legend

-  Water Street Project
-  Impact Nest

Water Street Rehabilitation/Replacement of Off System City Bridges (Z695340000)

2016 Eagle Nest Survey

Located Nests



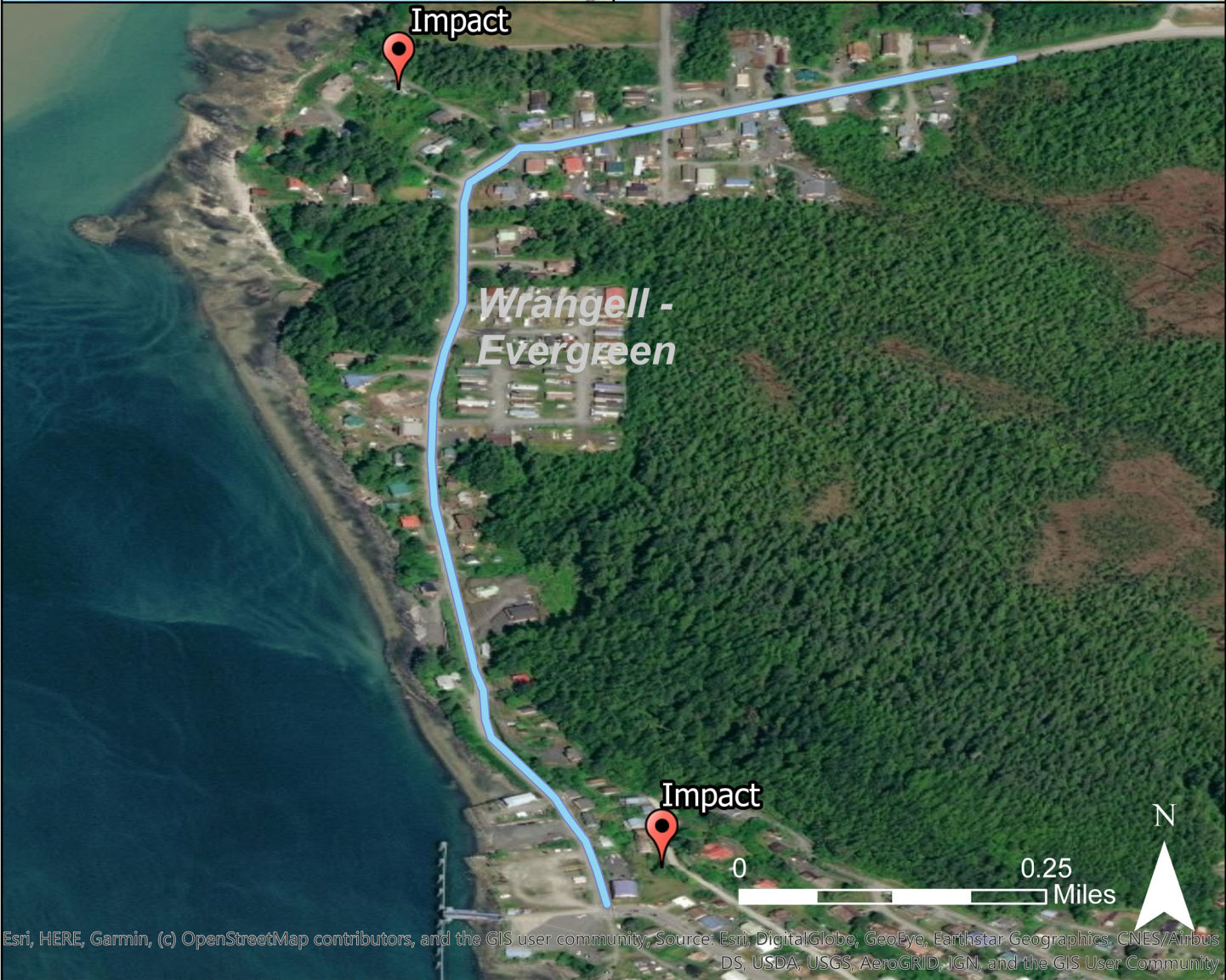
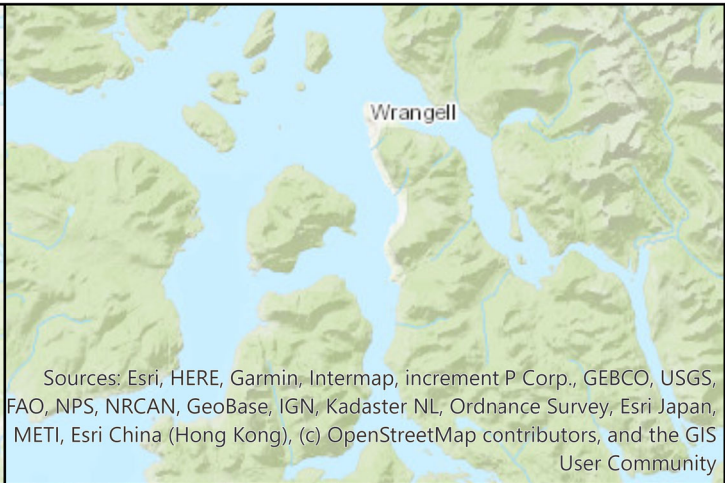
Legend

 Control Nest



Wrangell Area

2016 Eagle Nest Survey

Located Nests



Legend

-  Wrangell Evergreen Project
-  Impact Nest

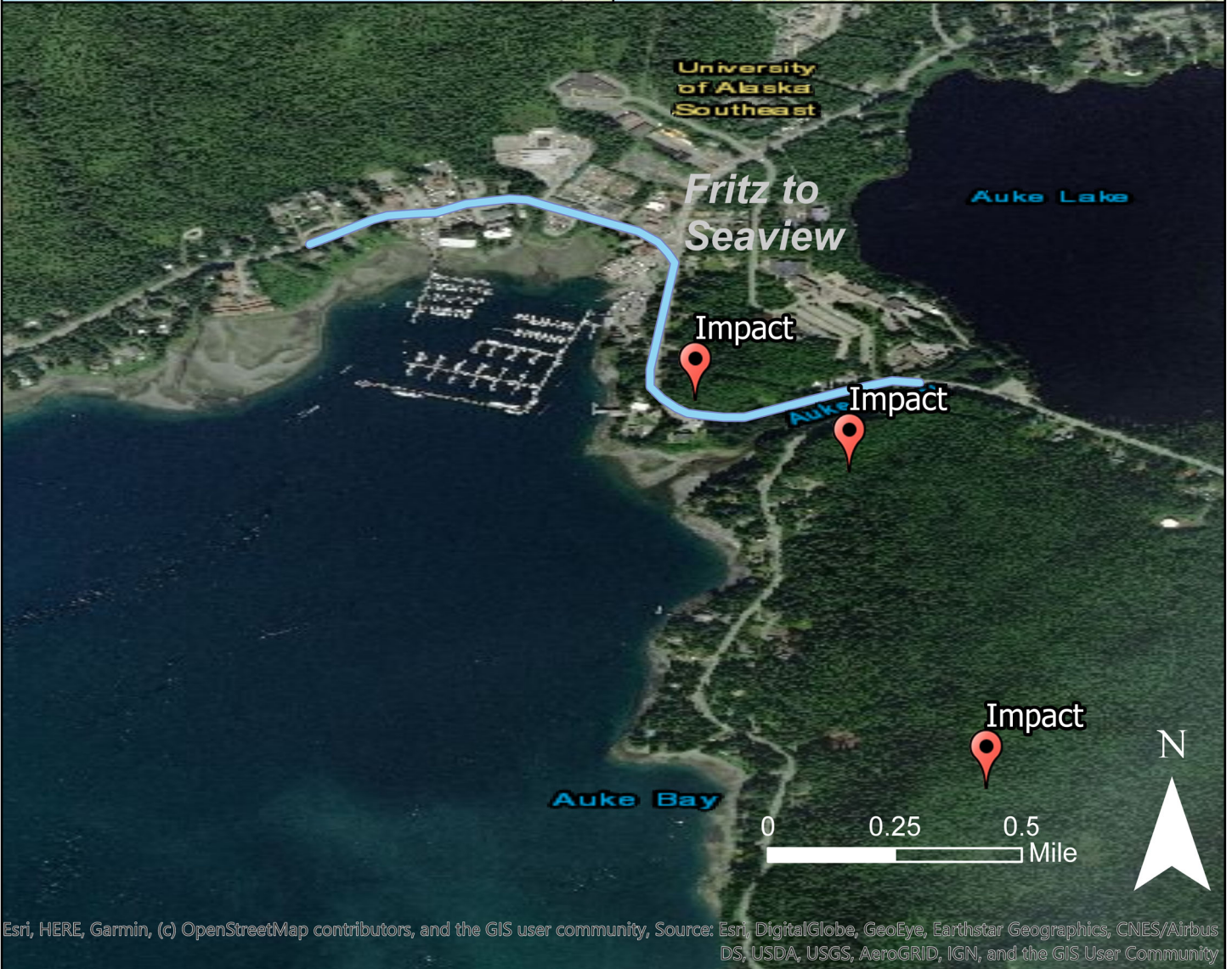
Wrangell - Evergreen Road Improvements & Pedestrian Access (Z680290000)

2016 Eagle Nest Survey



Located Nests

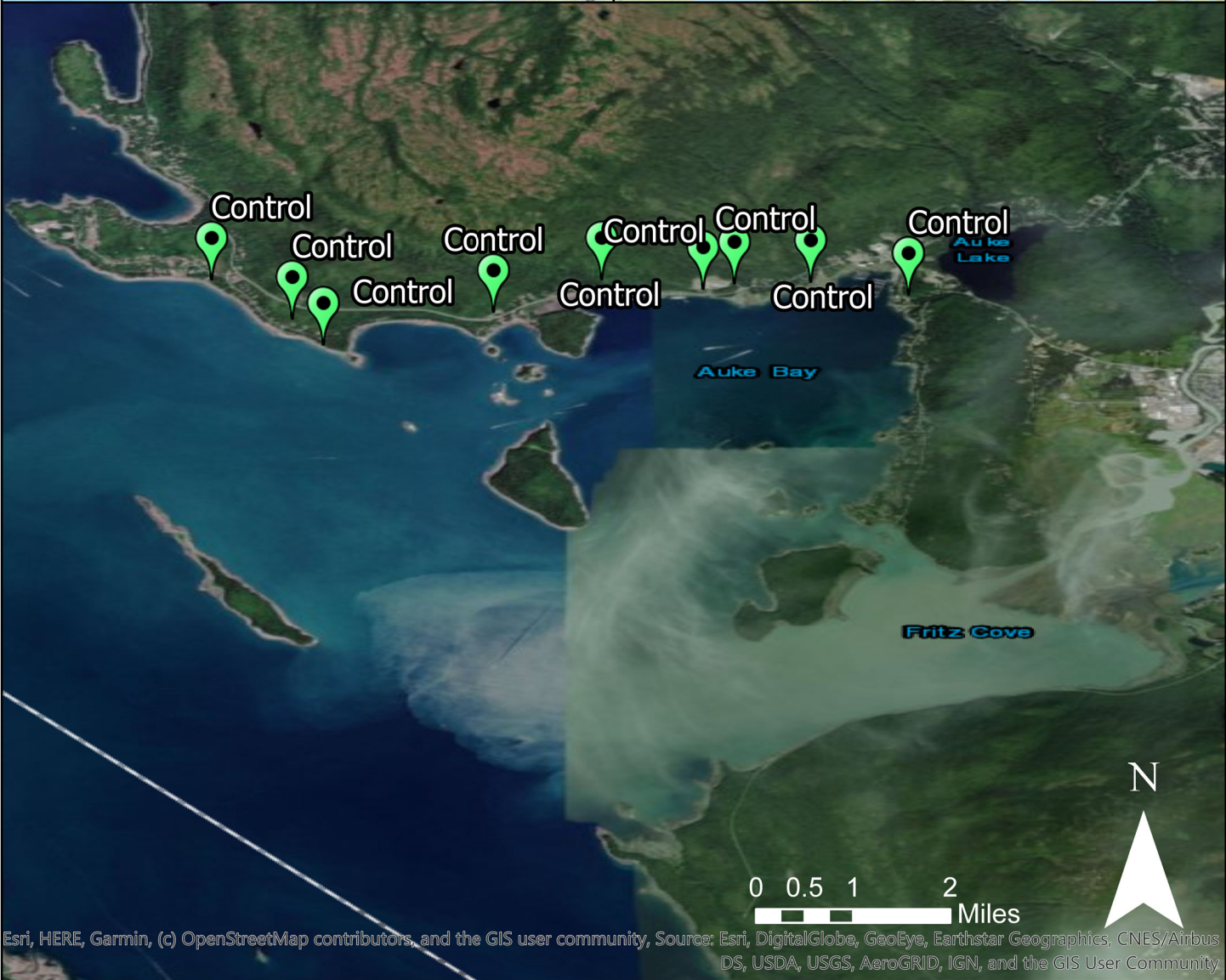
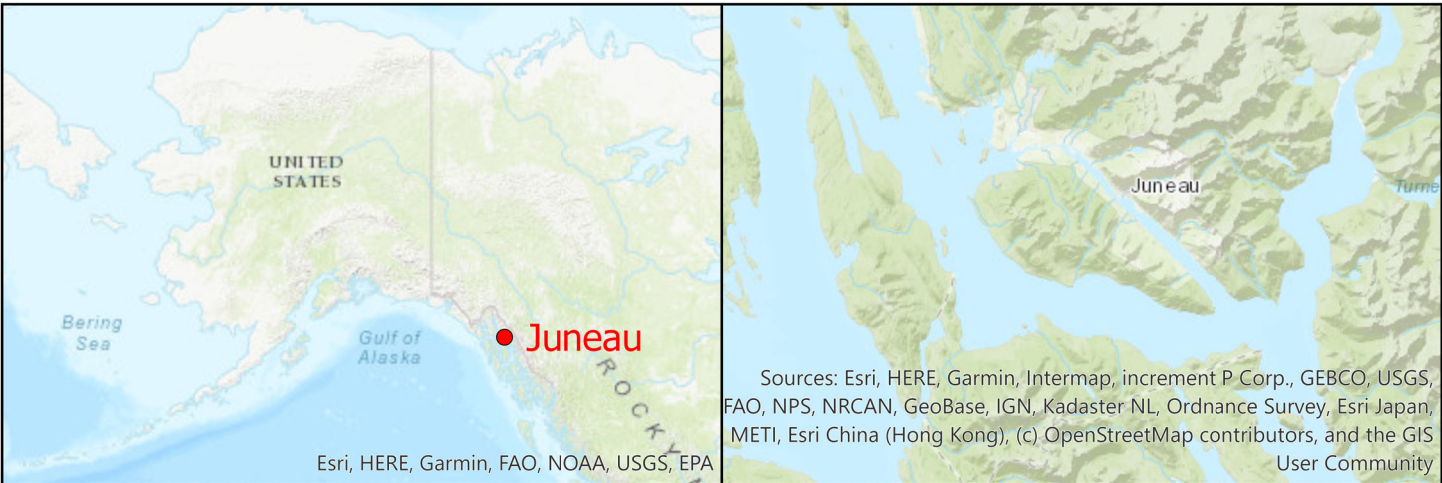


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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<p>Legend</p> <p> Fritz to Seaview Project</p> <p> Impact Nest</p>	<p>Glacier Hwy Reconstruction Fritz Cove Road to Seaview Avenue (Z684710000)</p> <p>2017 Eagle Nest Survey</p> <p>Located Nests</p>
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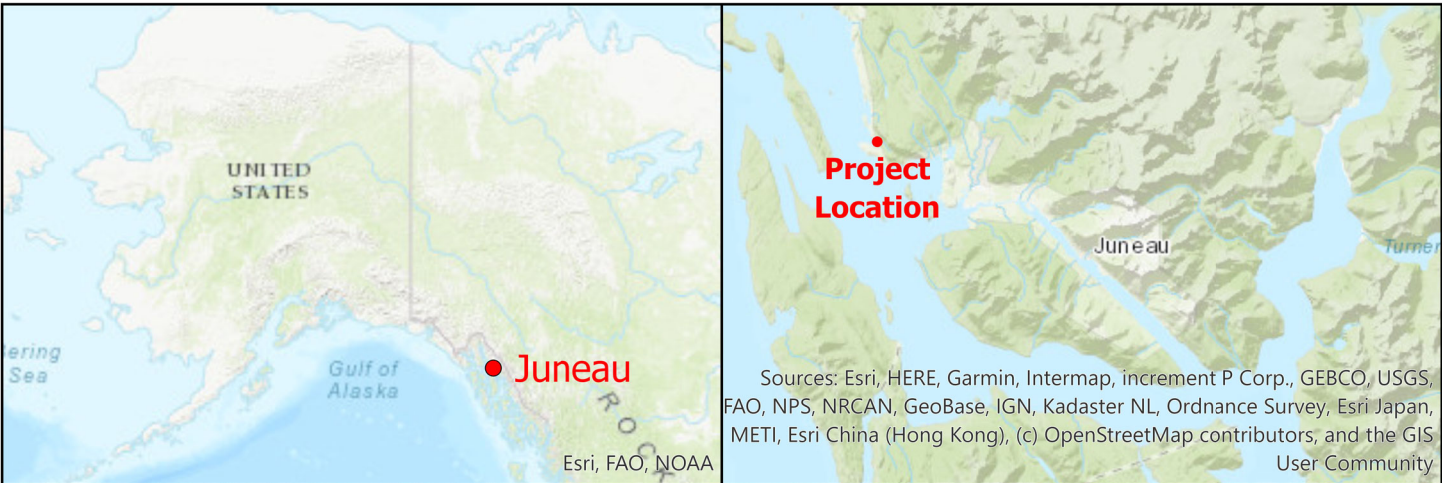
Legend



 Control Nest

Juneau Area

2017 Eagle Nest Survey

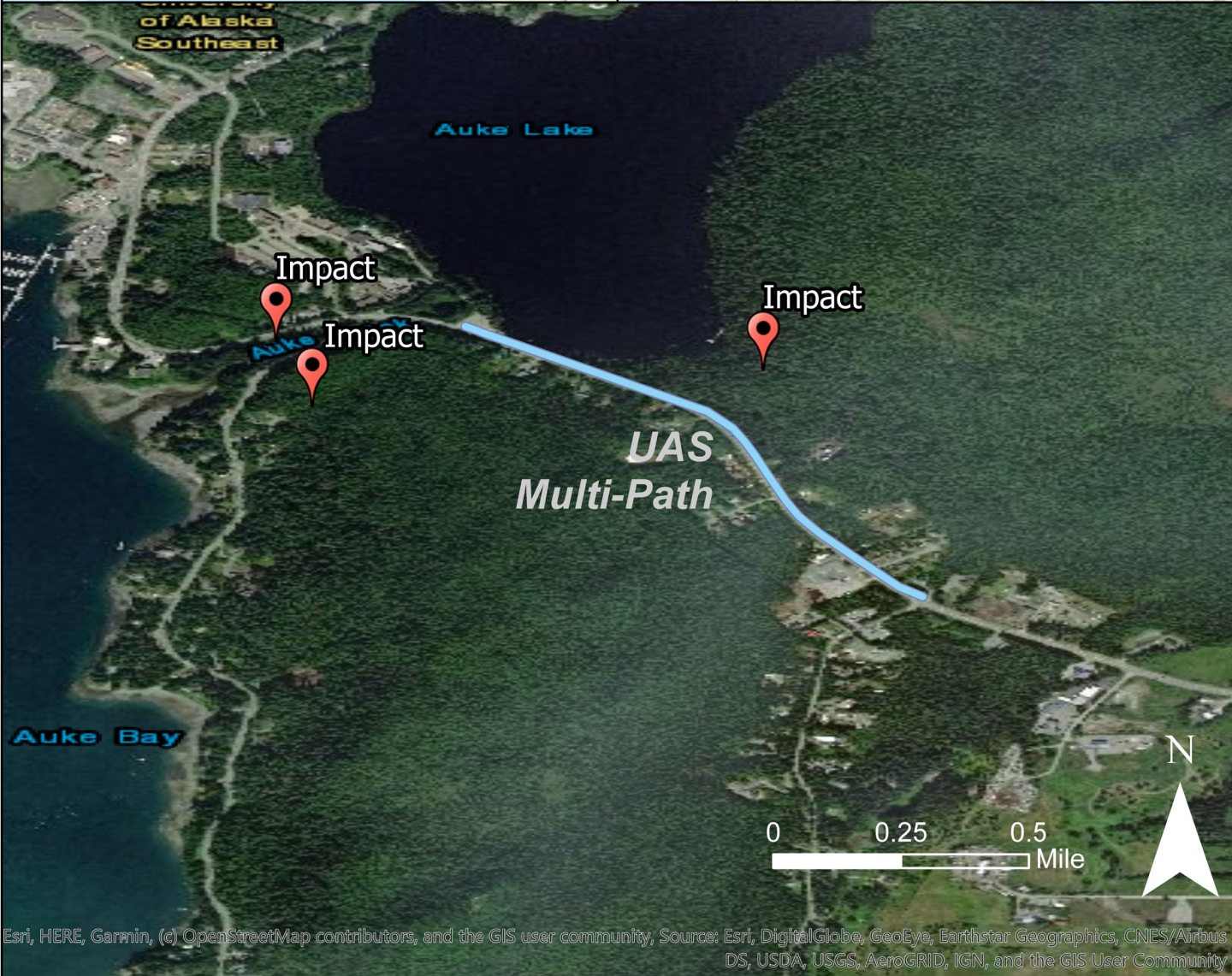
Located Nests



<p>Legend</p> <ul style="list-style-type: none">  Lena to Tee Project  Impact Nest 	<p>Glacier Highway Reconstruction: Lena Cove to Tee Harbor (Z675640000)</p> <p>2017 Eagle Nest Survey</p> <p>Located Nests</p>
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



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community



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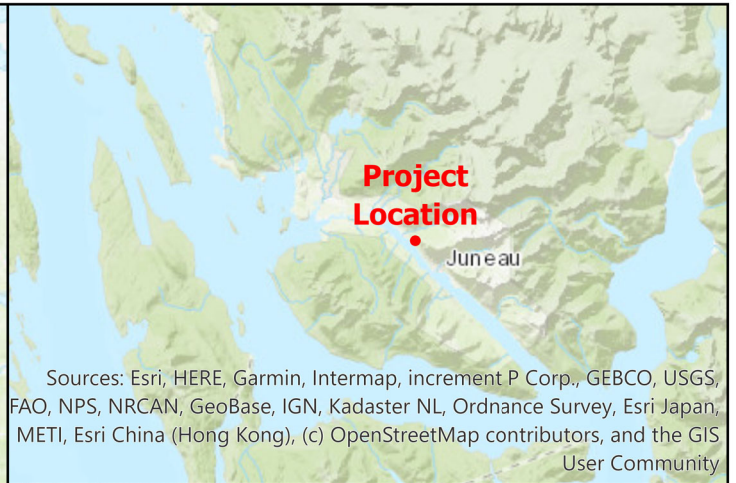
Legend

-  UAS Multi-Path Project
-  Impact Nest

Glacier Highway Separated Multi-Use Path to UAS (Z695000000)



2017 Eagle Nest Survey

Located Nests



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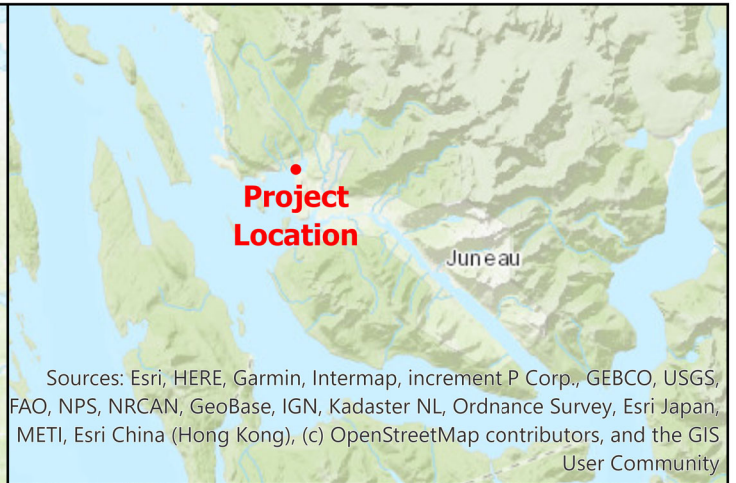
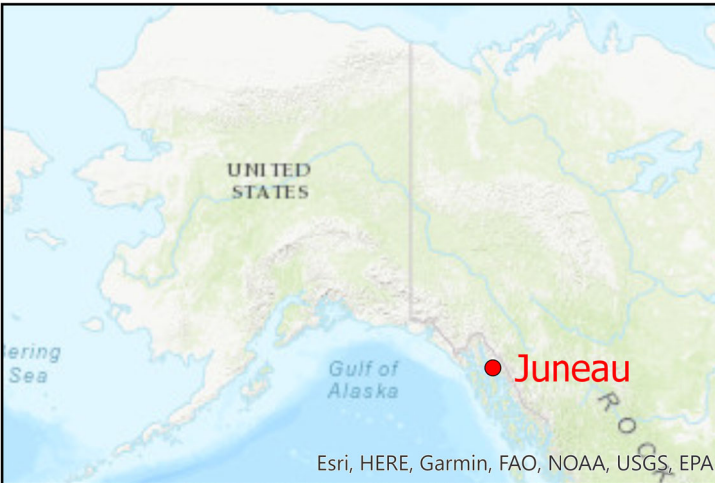
Legend

-  10th to Loop Project
-  Impact Nests

Egan Dr Pavement Rehab 10th Street to Mendenhall Loop Rd (Z681290000)

2018 Eagle Nest Survey

Located Nests



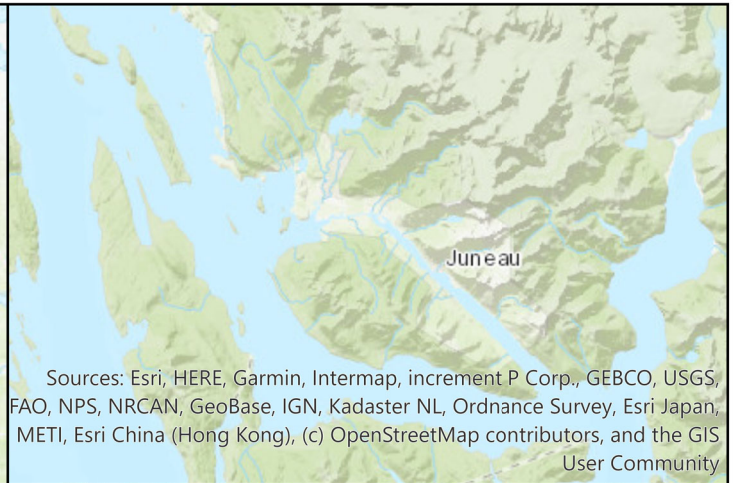
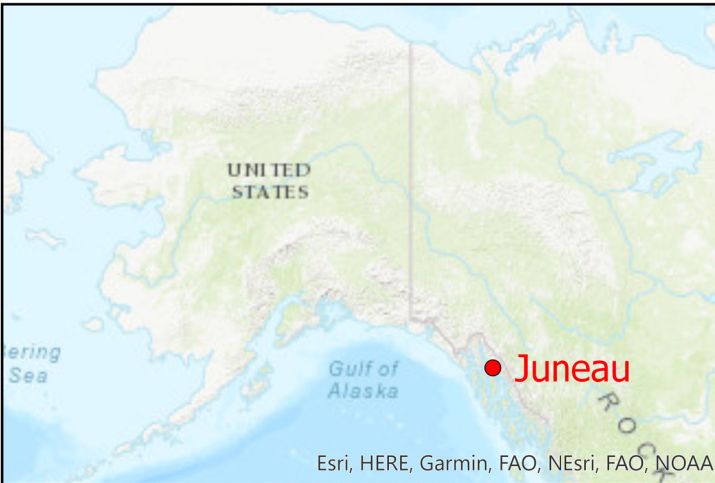
Legend

-  Fritz to Seaview Project
-  Impact Nests


Glacier Hwy Reconstruction Fritz Cove Road to Seaview Avenue (Z684710000)

2018 Eagle Nest Survey

Located Nests



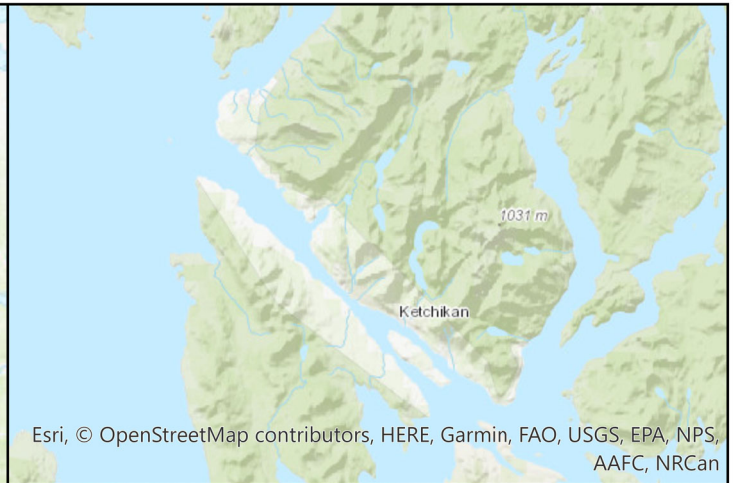
Legend

-  Control Nests

Juneau Area


2018 Eagle Nest Survey

Located Nests



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

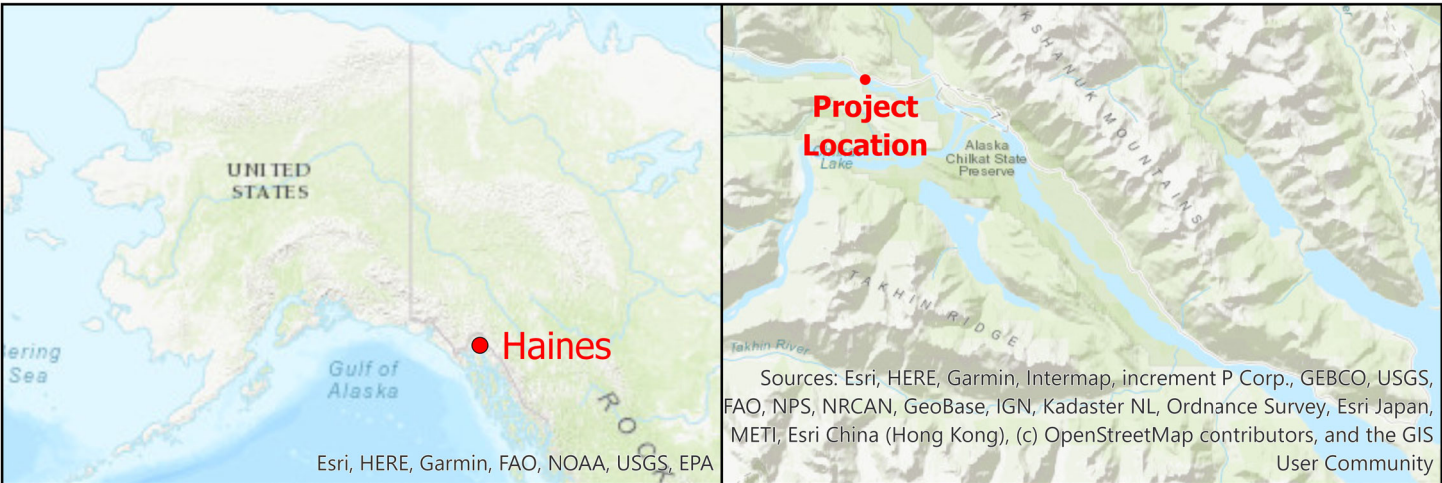
Legend


 Control Nest

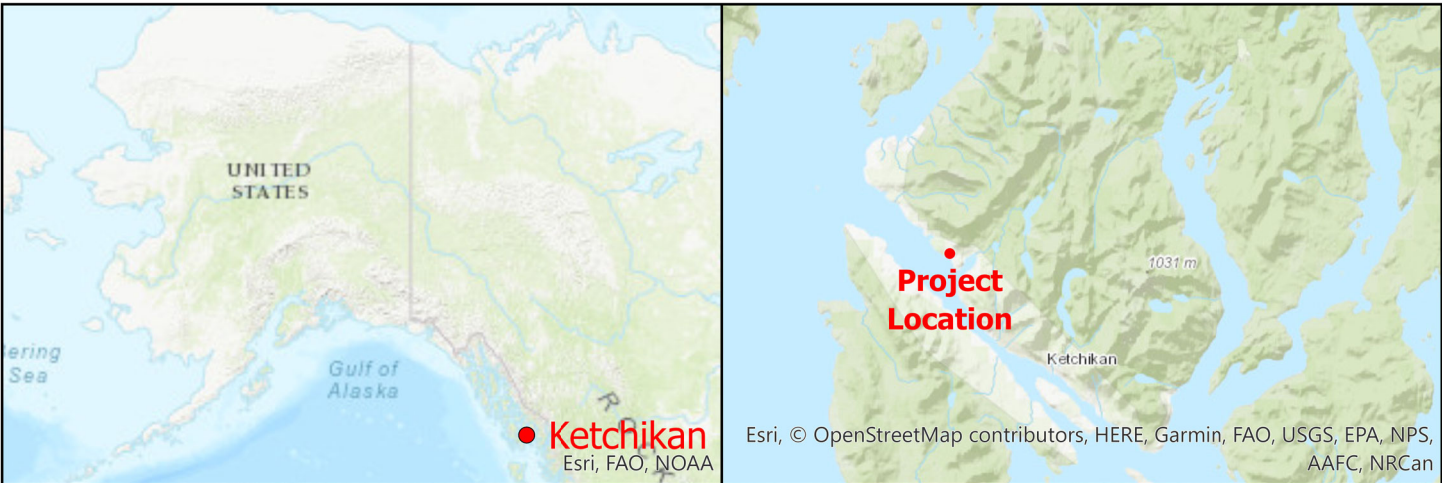
Ketchikan Area

2018 Eagle Nest Survey

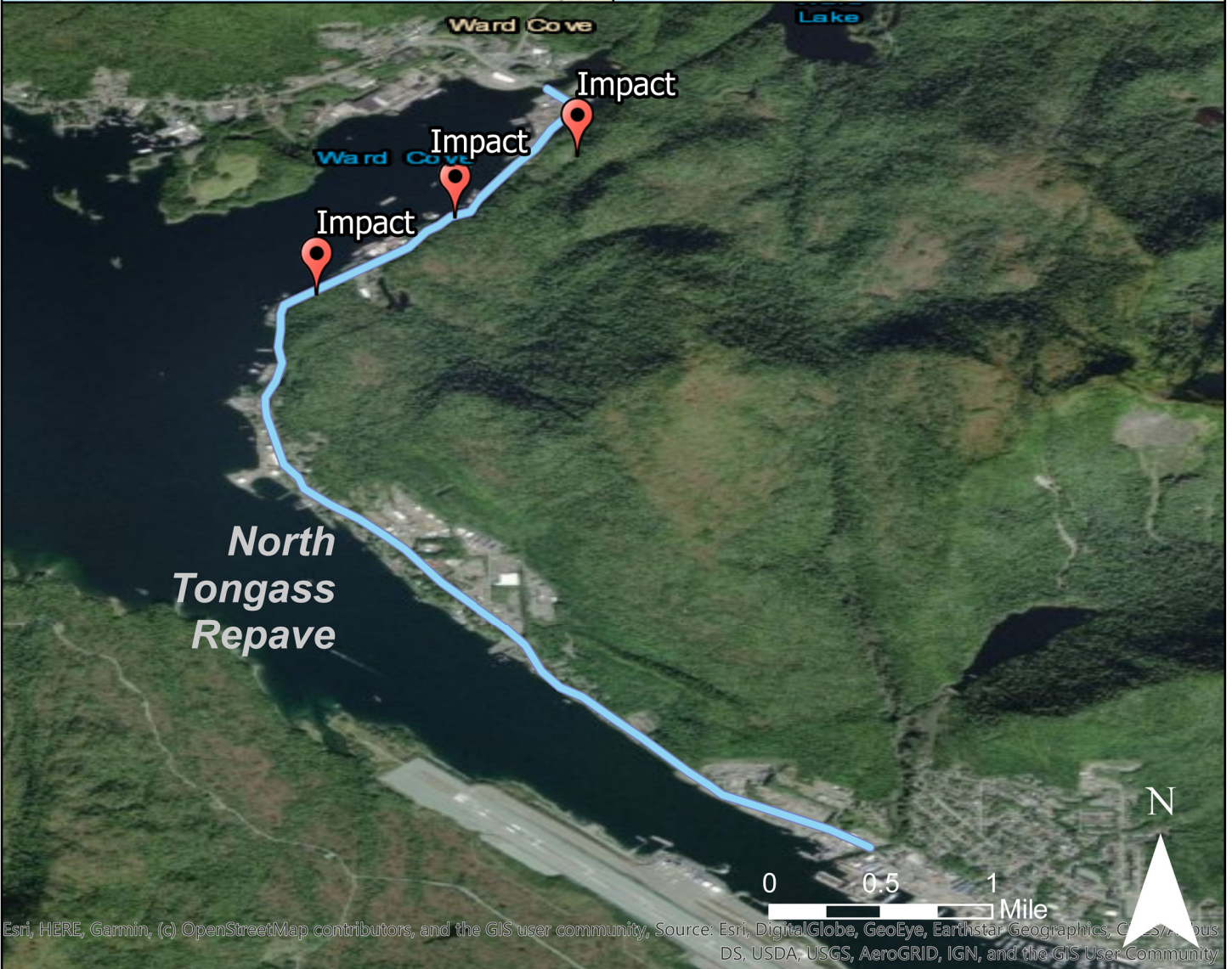
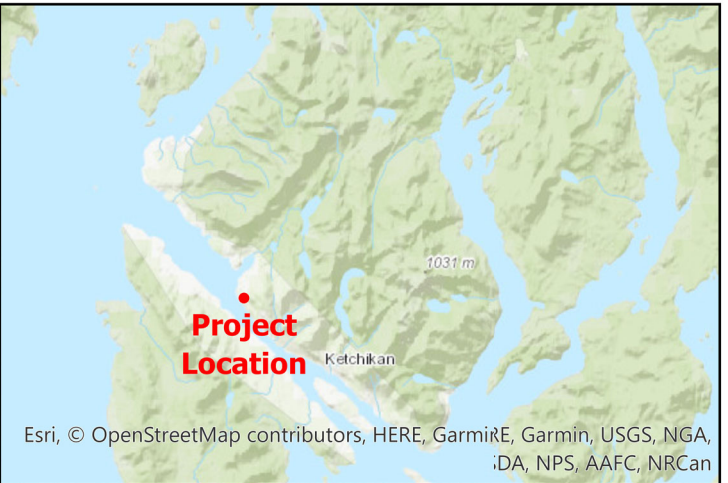
Located Nests





<p style="text-align: center;">Legend</p> <p> Klehini River Bridge Project</p> <p> Impact Nests</p>	<p>Klehini River Bridge (Z693770000)</p> <p>2018 Eagle Nest Survey</p> <p>Located Nests</p>
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<p>Legend</p> <p>— N Tongass Illumination Project</p> <p>📍 Impact Nest</p>	<p>North Tongass Highway Illumination (Z684130000)</p> <p>2018 Eagle Nest Survey</p> <p>Located Nests</p>
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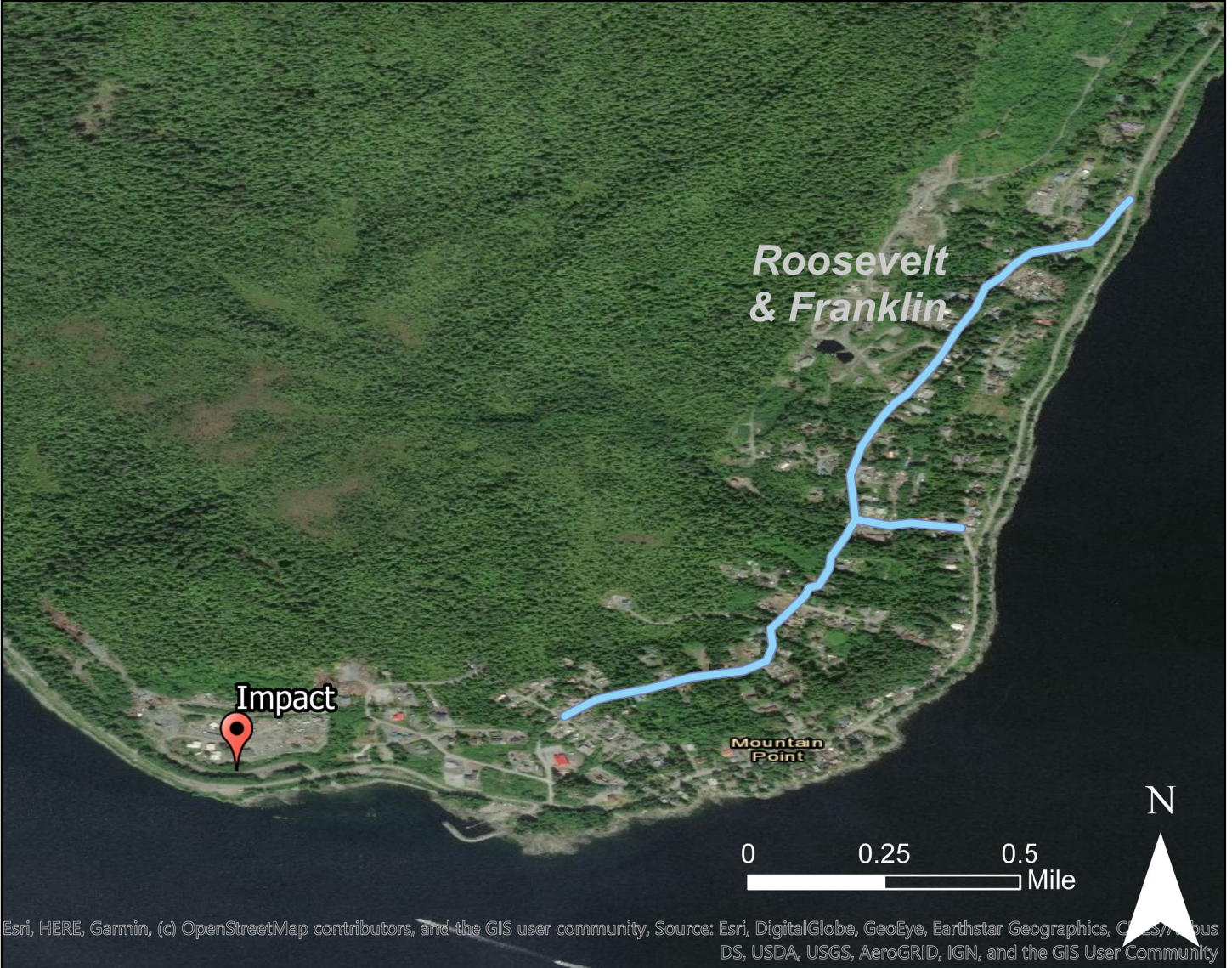
Legend

-  N Tongass Highway Repave Project
-  Impact Nest

North Tongass Highway Illumination (SFHWY00181)

2018 Eagle Nest Survey

Located Nests



Legend



-  Roosevelt & Franklin Project
-  Impact Nest

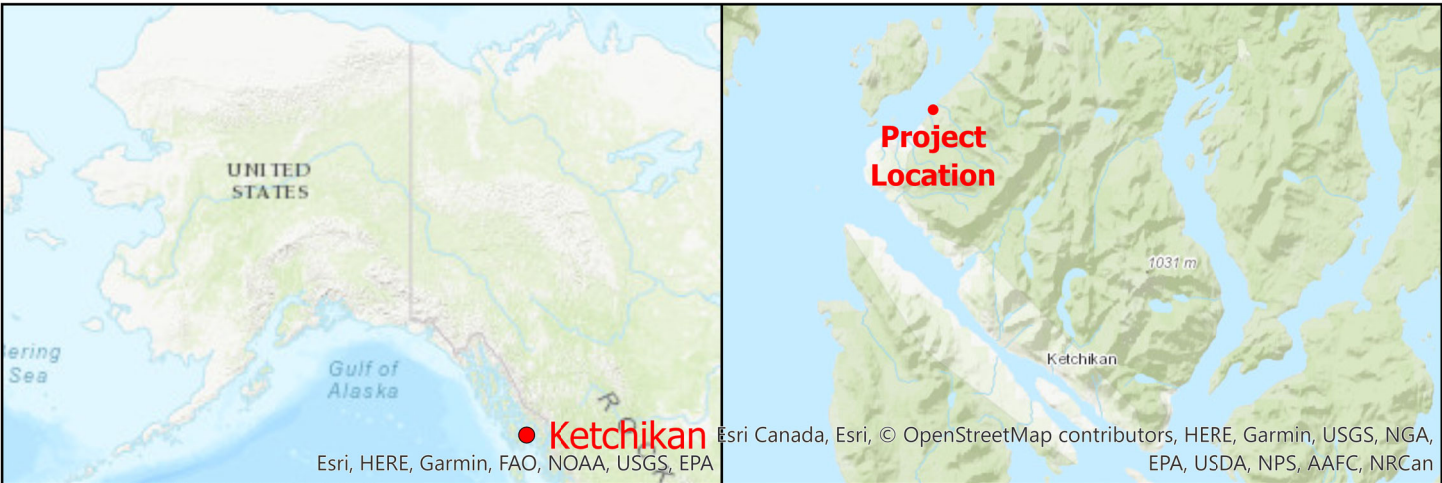
Roosevelt Drive & Franklin Road Pavement Rehab (Z686630000)

2018 Eagle Nest Survey


Located Nests



<p>Legend</p> <p> Shelter Cove Road Project</p> <p> Impact Nest</p>	<p>2018 Shelter Cove Road Project (SFHWY00044)</p> <p>Eagle Nest Survey</p> <p>Located Nests</p>
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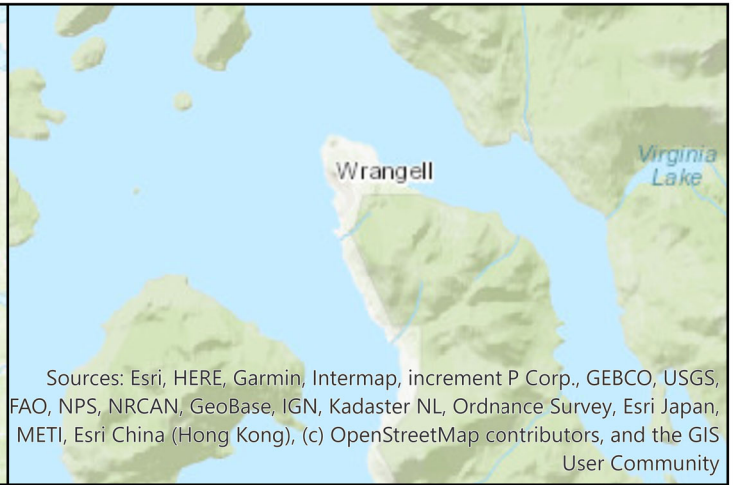
Legend

-  Waterfall Creek Bridges Project
-  Impact Nest


North Tongass Highway Bridge Improvements,
1st and 2nd Waterfall Creek Bridges
(Z682290000)

2018 Eagle Nest Survey

Located Nests



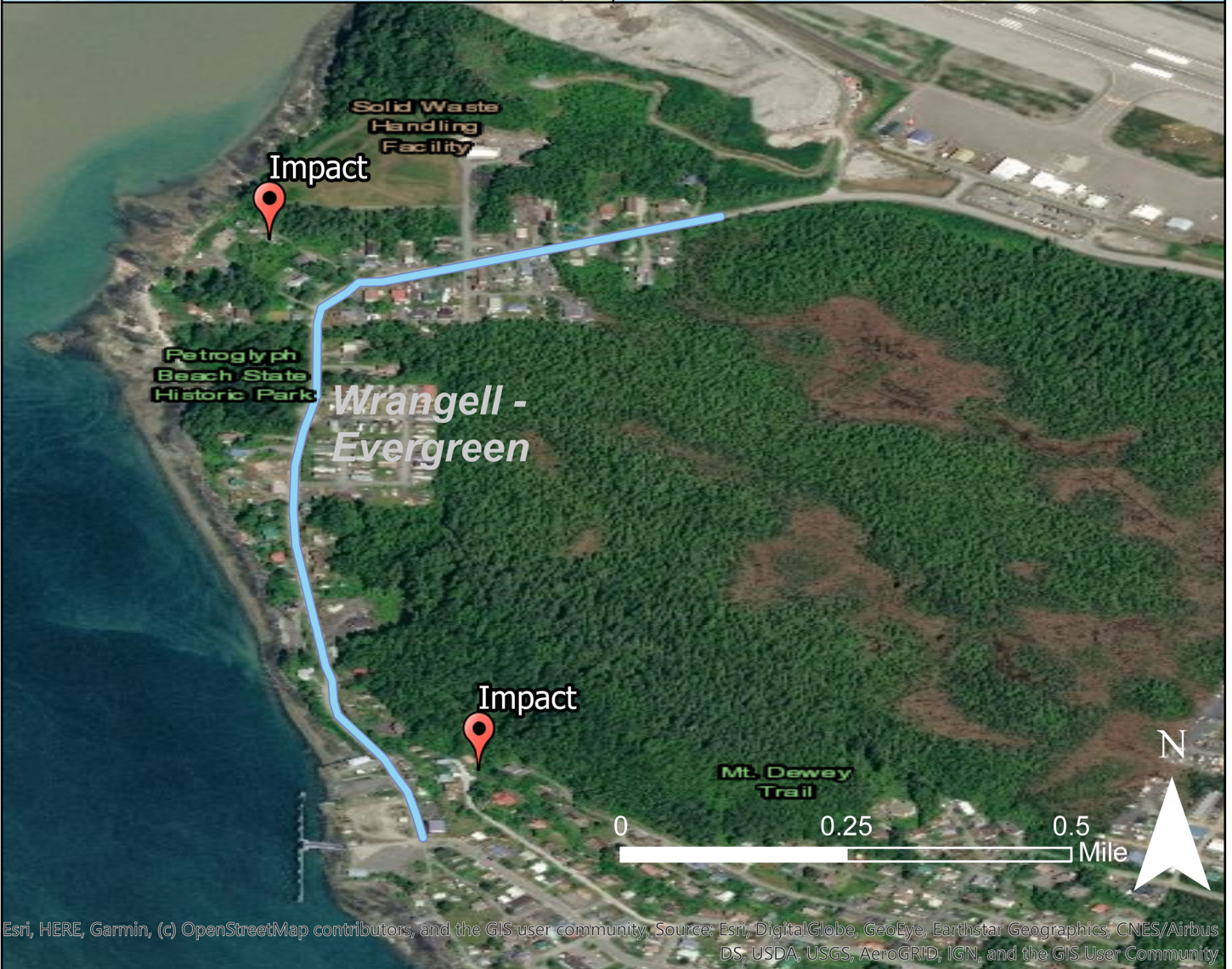
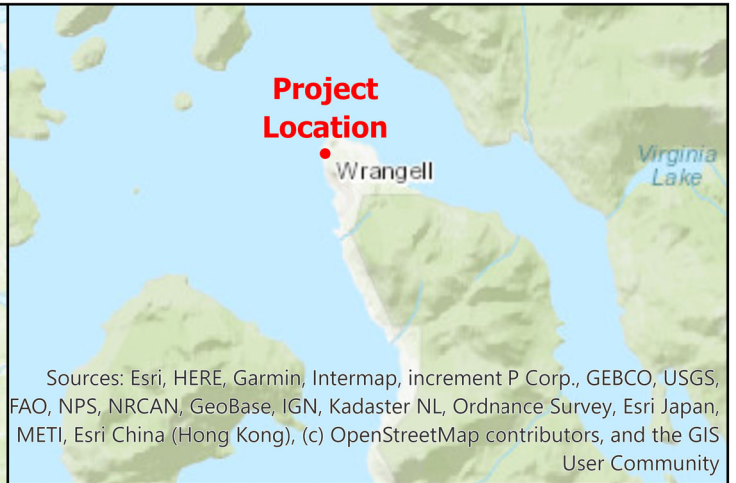
Legend

 Control Nests

Wrangell Area

2018 Eagle Nest Survey

Located Nests



Legend

-  Wrangell Evergreen Project
-  Impact Nest

Wrangell - Evergreen Road Improvements & Pedestrian Access (Z680290000)

2018 Eagle Nest Survey

Located Nests