



Petersburg Borough

12 South Nordic Drive
Petersburg, AK 99833

Meeting Agenda Borough Assembly Regular Meeting

Monday, May 16, 2022

6:00 PM

Assembly Chambers

You are invited to a Zoom webinar.
When: May 16, 2022 06:00 PM Alaska
Topic: May 16, 2022 Assembly Meeting

Please click the link below to join the webinar:
<https://petersburgak.gov.zoom.us/j/82687522990?pwd=RktqcHNnQUhYZZW1oMDZDSnFrUkJKQT09>
Passcode: 422221

Or Telephone:
(720) 707-2699 or (253) 215 8782
Webinar ID: 826 8752 2990
Passcode: 422221

1. **Call To Order/Roll Call**
2. **Voluntary Pledge of Allegiance**
3. **Approval of Minutes**
 - A. May 2, 2022 Assembly Meeting Minutes**
4. **Amendment and Approval of Meeting Agenda**
5. **Public Hearings**
 - A. Public Hearing for Ordinance #2022-07: An Ordinance Adopting the Budget for Fiscal Year July 1, 2022 Through June 30, 2023**

Any public testimony regarding Ordinance #2022-07 should be given during this public hearing. A copy of Ordinance #2022-07 may be found under agenda item 14C.
6. **Bid Awards**
7. **Persons to be Heard Related to Agenda**

Persons wishing to share their views on any item on today's agenda may do so at this time.

8. Persons to be Heard Unrelated to Agenda

Persons with views on subjects not on today's agenda may share those views at this time.

9. Boards, Commission and Committee Reports

A. Parks & Recreation Advisory Board Report on Trails Work Session

Parks & Recreation Advisory Board Chair Hayes will provide a report to the Assembly regarding an October, 2021 public work session regarding local trail development.

10. Consent Agenda

11. Report of Other Officers

A. Southeast Conference Report

Robert Venables, Southeast Conference Executive Director, will update the Assembly on current issues and activities happening at the organization.

B. Southeast Alaska Power Agency Report

Assembly Member and SEAPA Board Member Lynn and Utility Director and SEAPA Board Member Alternate Hagerman will provide an update on SEAPA activities.

C. Petersburg Housing Report

Assembly Member Tremblay will report on a May 3, 2022 meeting on housing in Petersburg.

12. Mayor's Report

A. May 16, 2022 Mayor's Report

13. Manager's Report

A. May 16, 2022 Manager's Report

14. Unfinished Business

A. Ordinance #2022-05: An Ordinance Updating Chapter 14.04.420 of the Municipal Code, Entitled "Water Rate Schedule and Fees" - Third and final reading

Adoption of Ordinance #2022-05 will increase water utility rates, which have not been updated since 2018. The ordinance was unanimously approved in its first and second readings.

B. Ordinance #2022-06: An Ordinance Updating Various Sections of Chapter 14.08 of the Municipal Code, Entitled "Sewer Utility" - Third and final reading

If adopted, Ordinance #2022-06 will increase sewer utility rates, which have not been updated since 2018. The ordinance was unanimously approved in its first and second readings.

C. Ordinance #2022-07: An Ordinance Adopting the Budget for the Fiscal Year July 1, 2022 Through June 30, 2023 - Second Reading

Adoption of Ordinance #2022-07 will set the Borough's FY 2023 budget. In the first reading of the ordinance, the draft budget was edited to 1) update the dollar amount in the Harbor Budget for the South Harbor Dredge project from \$500,000 to \$1.1 million; and 2) update the account description in the Parks & Recreation budget for account #506512 from Lap Pool Pump Replacement to Cemetery Security Cameras. Ordinance #2022-07, as amended, was approved in its first reading by a vote of 4-3, Members Fine-Walsh, Kensinger and Meucci opposed.

Utility Director Hagerman requests an amendment be made to the proposed FY 2023 Electric Utility budget due to an error in salaries and benefits. Director Hagerman's memo is attached.

Humanity In Progress (HIP) has submitted an application for \$40,000 in grant funds from the Borough through the Community Services budget. The application is attached.

15. New Business

A. Resolution #2022-08: A Resolution Encouraging the Prompt and Full Closure and Cleanup of the Tulsequah Chief Mine and Urging the B.C. Government to Oppose any Extension of the Receivership Process

If approved, Resolution #2022-08 will relay the Assembly's request for the government of British Columbia, Canada to oppose any extension of a court-ordered bankruptcy receivership process regarding the current owner of the Tulsequah Chief Mine, Chieftain Metals, and to move aggressively to take ownership of the abandoned mine, close it down, and permanently stop the acid mine drainage.

B. Mountain View Manor Assisted Living Services

Assembly Member Lynn requests the Assembly direct Manager Giesbrecht to research and enter into discussions with Petersburg Medical Center to share resources and combine efforts in providing services at the Borough's Mountain View Manor Assisted Living Facility.

C. Early Childhood Education Task Force Appointments

The Assembly shall appoint interested persons to the newly created Early Childhood Education Task Force. As of the date of publishing this agenda, letters of interest have been received from the following: Katie Holmlund, Denise Gubernick, Chad Wright, Jeff Meucci, Jessica Doril, Sharlay Mamoe, Becky Turland, Stephanie Payne, Chelsea Tremblay, Glorianne Wollen, and Hannah Flor.

D. Capital Projects Process Work Session

Assembly Member Meucci requests a work session to discuss updates to and the process for capital project needs lists (State of Alaska CAPSIS, ADOT Needs List, Federal Priorities List).

16. Communications

A. Correspondence Received Since April 28, 2022

17. Assembly Discussion Items

A. Assembly Member Comments

B. Recognitions

18. Adjourn



Petersburg Borough

12 South Nordic Drive
Petersburg, AK 99833

Meeting Minutes Borough Assembly Regular Meeting

Monday, May 02, 2022

12:00 PM

Assembly Chambers

1. Call To Order/Roll Call

Mayor Jensen called the meeting to order at 12:00 p.m.

PRESENT

Assembly Member Bob Lynn
Assembly Member Chelsea Tremblay
Assembly Member David Kensinger
Vice Mayor Jeigh Stanton Gregor
Assembly Member Jeff Meucci
Mayor Mark Jensen
Assembly Member Thomas Fine-Walsh

2. Voluntary Pledge of Allegiance

The Pledge was recited.

3. Borough Land Auction

A. Borough Land Auction: 700 Sandy Beach Road and 1015 Sandy Beach Road

Mayor Jensen directed the land auction. The 700 Sandy Beach Road property was sold to David and Tanya Somerville for \$122,000, and the 1015 Sandy Beach Road property was sold to Linda Millard for \$285,500.

4. Approval of Minutes

A. April 4, 2022 Assembly Meeting Minutes

B. April 18, 2022 Assembly Meeting Minutes

The April 4 and April 18 meeting minutes were unanimously approved.

Motion made by Vice Mayor Stanton Gregor, Seconded by Assembly Member Kensinger.

Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen,

Assembly Member Fine-Walsh

5. Amendment and Approval of Meeting Agenda

The agenda was approved as submitted.

Motion made by Assembly Member Meucci, Seconded by Vice Mayor Stanton Gregor. Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

6. Public Hearings

A. Public Hearing for Ordinance #2022-05: An Ordinance Updating Chapter 14.04.420 of the Municipal Code, Entitled "Water Rate Schedule and Fees"

No testimony was given.

B. Ordinance #2022-06: An Ordinance Updating Various Sections of Chapter 14.08 of the Municipal Code, Entitled "Sewer Utility"

No testimony was given.

7. Bid Awards

There were no bid awards.

8. Persons to be Heard Related to Agenda

Persons wishing to share their views on any item on today's agenda may do so at this time.

Becky Knight and Eric Lee spoke in opposition to S 3269, the Unrecognized Southeast Alaska Native Communities Recognition and Compensation Act.

9. Persons to be Heard Unrelated to Agenda

Persons with views on subjects not on today's agenda may share those views at this time.

No views were shared.

10. Boards, Commission and Committee Reports

There were no reports.

11. Consent Agenda

There were no items for the Consent Agenda.

12. Report of Other Officers

A. Petersburg Medical Center Update

CEO Hofstetter was unable to attend the meeting.

13. Mayor's Report

A. May 2, 2022 Mayor's Report

Mayor Jensen read his report into the record.

14. Manager's Report

A. May 2, 2022 Manager's Report

Manager Giesbrecht read his report into the record, a copy of which is attached and made a permanent part of these minutes.

15. Unfinished Business

A. Ordinance #2022-05: An Ordinance Updating Chapter 14.04.420 of the Municipal Code, Entitled "Water Rate Schedule and Fees" - Second Reading

Ordinance #2022-05 was unanimously approved in its second reading.

Motion made by Vice Mayor Stanton Gregor, Seconded by Assembly Member Meucci. Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

B. Ordinance #2022-06: An Ordinance Updating Various Sections of Chapter 14.08 of the Municipal Code, Entitled "Sewer Utility"

The Assembly unanimously approved Ordinance #2022-06 in its second reading.

Motion made by Assembly Member Meucci, Seconded by Assembly Member Tremblay. Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

16. New Business

A. Ordinance #2022-07: An Ordinance Adopting the Budget for the Fiscal Years July 1, 2022 through June 30, 2023

The draft budget was edited to 1) update the dollar amount in the Harbor budget for the South Harbor Dredge project from \$500,000 to \$1.1 million; and 2) to update the account description in the Parks & Recreation budget for account #506512 from Lap Pool Pump Replacement to Cemetery Security Cameras. Ordinance #2022-07 was approved in its first reading by a vote of 4-3.

Motion made by Assembly Member Meucci, Seconded by Assembly Member Lynn.
Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Vice Mayor Stanton Gregor, Mayor Jensen
Voting Nay: Assembly Member Kensinger, Assembly Member Meucci, Assembly Member Fine-Walsh

B. Fuel and Purchased Power Adjustment Charge

Implementation of the Fuel and Purchased Power Adjustment Charge, per PMC 14.16.720, for the diesel generator run during the annual SEAPA electrical line maintenance shutdown this summer was unanimously approved by the Assembly.

Motion made by Assembly Member Lynn, Seconded by Assembly Member Tremblay.
Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

C. Assignment of Lease from Patricia Magill Stevens and the Estate of Frederick S. Magill to Don Huse

The Assembly unanimously approved the assignment of lease from the Estate of Frederick S. Magill to Don Huse.

Motion made by Assembly Member Meucci, Seconded by Assembly Member Kensinger.
Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

D. S. 3269 Unrecognized Southeast Alaska Native Communities Recognition and Compensation Act

By a vote of 4-3, the Assembly approved to send a letter of opposition to our Federal Delegation regarding S. 3269.

Motion made by Vice Mayor Stanton Gregor, Seconded by Assembly Member Lynn.
Voting Yea: Assembly Member Lynn, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Mayor Jensen
Voting Nay: Assembly Member Tremblay, Assembly Member Meucci, Assembly Member Fine-Walsh

E. Parks & Recreation Advisory Board Appointment

Without objection, Mayor Jensen appointed Kacey Hammer to serve on the Parks & Recreation Advisory Board until the October, 2022 municipal election.

Motion made by Assembly Member Meucci, Seconded by Assembly Member Tremblay.

Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

17. Communications

A. Correspondence Received Since April 14, 2022

18. Assembly Discussion Items

A. Southeast Alaska Regional Dive Fisheries Association (SARDFA) Board Seat Nomination

Southeast Conference (SEC) is seeking nominations to fill one municipal board seat on the SARDFA Board. The appointment will be for a one-year term. Nominated candidates will be interviewed by SEC and the SEC Board of Directors will make the appointment. A nominee needs to officially represent our community and the seat is intended to represent municipal concerns/interests vs. industry needs/desires. If any Assembly Member has interest in the nomination, or knows of a community member who can represent Petersburg's interests, approval of a nomination can be an action item on a future agenda. The deadline for nominations is June 30, 2022. Nominations should include the candidates name, email and phone contact information, a brief statement of interest in the SARDFA Board seat and their qualifications.

The Assembly requested Clerk Thompson advertise for letters of interest from the community. Assembly Member Meucci mentioned he would be interested in the nomination

B. Assembly Member Comments

Assembly Member Tremblay shared there would be a housing discussion held on Wednesday, May 4, 2022 at 10:00 a.m. and encouraged interested parties to email or call her for more information.

Assembly Member Lynn reminded the Assembly of an upcoming work session with the hospital board to discuss a site selection for a future new hospital. The date for the work session has not yet be chosen.

Assembly Member Meucci inquired how to get more Borough-owned property into public hands. Manager Giesbrecht responded that the public may file application to purchase Borough-owned property at any time and the Assembly may vote to sell specific Borough-owned property at any time.

C. Recognitions

Assembly Member Stanton Gregor recognized Katie Holmlund and Becca Madsen, who work at Kinder Skog, for receiving Alaska After School Superhero awards. He thanked them both for their Superhero skills.

19. Adjourn

The meeting was adjourned at 1:43 p.m.

Motion made by Vice Mayor Stanton Gregor, Seconded by Assembly Member Tremblay.
Voting Yea: Assembly Member Lynn, Assembly Member Tremblay, Assembly Member Kensinger, Vice Mayor Stanton Gregor, Assembly Member Meucci, Mayor Jensen, Assembly Member Fine-Walsh

Final letter as approved unanimously at Petersburg Parks & Recreation Advisory Board meeting April 21, 2022

April 21st, 2022

To: Petersburg Assembly
CC: Petersburg Indian Association

Re: Trails Work Session & Public Support for Severson’s Connector Trail

To Whom It May Concern,

In October of 2021 the Petersburg Parks and Recreation Board held a public work session to take input on local trail development.

The work session was well attended on a week night with twelve participants from across the community as well as the then director of Petersburg Indian Association. Participants included families, retirees, business owners, cyclists, hikers, dog walkers, and volunteers interested in helping to build more trails.

The Parks and Recreation Advisory Board also received two emails from the public prior to the event.

Discussion at the work session included new input from attendees. Participants also discussed trail-related responses from the Parks and Recreation Department’s February 2021 community interest survey.

While the trails work session attendees and survey respondents contributed many helpful suggestions and ideas, a few rose to the surface repeatedly.

When asked about existing trails and trail development, the number one most common comment from the public was to please add more trails and trail connectivity in our community. People noted that many people exercise outdoors in Petersburg and our trails allow people to stay healthy and hike, run, and walk in the beauty of nature.

The number two most common public comment was to move forward with a crosstown trail connection, specifically the proposed trail link between Severson’s subdivision and the Fire Station/Post Office area of Haugen Dr. This request appeared in 16 different responses in our February 2021 community survey, more than any other new trail-related suggestion by a factor of 8. It was also the proposal most discussed by attendees of the October 2021 trails work session.

Emails to the Parks and Rec Board from business owner David Berg and Severson Subdivision homeowner Casey Knight were also in support of the Severson connector trail. Mr. Berg noted

such a trail would add activities for travelers including those from the harbor or drive down dock and suggested there may be visitor businesses who would partner with the community to construct the trail. Mr. Knight summarized via email and in person at the work session the existing proposal, work done on its behalf by Susan Harai at Petersburg Indian Association, and road blocks its boosters have encountered, namely from the Alaska Department of Transportation. Mr. Knight has collected resident signatures in support of the project and suggested the Parks and Recreation Advisory Board and Petersburg Assembly continue to advocate for the Severson's trail.

While road blocks to the Severson's trail proposal have been encountered in the past, it's clear that public support for the proposal is still broad and enthusiastic enough to warrant further work toward solutions amenable to all stakeholders.

The Petersburg Parks and Recreation Board therefore asks the Petersburg Assembly and Borough staff to increase or re-establish efforts to support the development of the Severson's trail through resolution, direction to staff, or in any way the Assembly finds prudent and effective.

Sincerely,
Petersburg Parks and Recreation Advisory Board

Summary of public comments on trails from the Parks & Rec Department public interest survey, February 2021

What Improvements would you like to see in EXISTING trails?

- 18 - Positive feedback about existing trails / statement of use / "great job"
 - 17 - Add more trails
 - 6 - Continue to improve Sandy Beach to City Creek trail / finish link to creek
 - 5 - More garbage cans/ dog poop signage at trail heads
 - 5- Feedback to improve/add more non-Borough trails south of town (partnerships)
 - 3- Increase cross town connectivity Seversons/south end of town to Airport Rd/Haugen/north end of town
 - 3- Plough sidewalks in winter to allow for non-motorized connections to trails
 - 2- More benches for resting
 - 2 - Increase trail maintenance
 - 2 - Clear Hungry pt trails of snow
 - 2- Expand Hungry pt to airport road/sandy beach
 - 1 - Add hand rail on bridge at Sandy Beach
 - 1 -More interpretive signs
 - 1- Expand Ravens Roost area trails
 - 1- More loop trails back to center of town/rec center
 - 1- Expand Sandy Beach to Frederick pt in gravel
 - 1 - Plan for motorized paths around airport road
 - 1- Link T-H Playground to Sandy Beach
 - 1 - Lighting that can add hours to trail use without bothering neighbors
-

What areas would you like to see prioritized in terms of NEW trail development?

- 16 - Cross town connectivity /kings row/Scow bay/Seversons/harbor/south end of town to Airport Rd/Haugen/grocery/north end of town (majority mention seversons)
- 4 - Sandy Beach / City creek completion
- 4 - More connectors at/from existing trails
- 2 - PIA/MVM to Hungry pt system (happening!)
- 2 - Sandy Beach connected across muskeg to town
- 1- Prefers new trails in wooded areas or muskegs, not along roads
- 1 - More trails close to town (rather than out road)
- 1 - Bench/outlook area right at Hungry Point, with developed trail between guard rail and road
- 1- Small gravel BMX loop for kids
- 1 - Water treatment plant to Ravens roots
- 1 - Netting on boards at Blind slough
- 1 - Creekside trail up City Creek
- 1 - Marine: connect the harbors
- 1 - Trails that benefit kids commuting to school or Xcountry team
- 1 - Clear signage, more benches for breaks

Petersburg Parks & Rec 2021 Public Interest Survey

Created on February 26, 2021

Hours of operation currently are M-F 6am-9pm and Saturday 7am-9pm. Do these hours work for your use of the facility?

129 answers - Average of 4.4 stars



How important to you is it that the facility be open Sunday and Holidays?

128 answers - Average of 3.3 stars



Volunteers have come forward willing to modernize the Rock wall to current safety and equipment. How important is it to you that we have an active rock wall in our gym?

128 answers - Average of 3.3 stars



Do you have any suggestions
regarding facility infrastructure?
(Sauna, fitness equipment, gym, etc.)

53 answers

keep weight room/cardio equipment better maintained

I'm impressed. a new elliptical would be nice.

2nd squat rack hooks for in wall/update sauna/update outside or add outside courts racquetball ect.

na

clean the pool locker rooms. there is algae growing on the shower floors and the whole place needs a deep clean. I saw a centipede crawling in there in January, that's a sign of moisture problems.

The pool is most important to me, water aerobics. Keep Alice working!

Come up with a plan to repair or replace equipment on a regular basis, using money from the property development fund or other sources

It would be nice if the second bench could be reinstalled in the sauna, and if the door was fixed so it actually closed tightly.

Please continue to plan for space for table tennis either in the raquetball or aerobics rooms or the community room adjacent to the men's shower is .

I feel we have good facilities but in the past there has been an issue with areas/spaces being dirty-dust bunnies, hair, dirty mirrors.....not very inspiring or healthy when you are down on a mat!

Pool noon lap swim - reinstate

Lifting equipment such as more deadlift trap bar, leg press, and machines that can hold plates.

Expansion of the weight room would be amazing- fixing the second barbell station (missing the bar holder piece). The weight room and barbell rack are always the busiest every time I go to the gym!

More availability to the gym. There has been private rentals for a year for some groups. Even when asked to rent it or create own programs the availability is slim. Not one open gym or kid themed gym time.

Better maintenance on the fitness equipment please.

None

More sauna reservation hours!

Cleanliness; upgraded exercise equipment

The gym equipment is in a different spot each season. Perhaps a section dedicated to equipment.

Like how the facility is currently set up with the weight machines in the room with the mirrors.

Men's locker room-return to original. Window or viewing area in raquetball court

I like the sauna. Better air filters? Don't know their status

I really want the fitness court free of the large machines.

Open back up for normal use

Sauna is super important. We are also primarily pool users.

The elliptical machines could use a little TLC

Would be nice to be able to reserve a treadmill

I rarely if ever use any of these facilities.

No

Please open up the noon hour lap swim

Just a dream, but some sort of childcare while parents workout would be excellent.

no

I would LOVE to have a rock wall that had auto-belay features, but failing that any rock wall improvements would be great.

More open swim for the kids

It would be nice if the showers provided hot water. Only some of the showers in the pool locker room have hot water. After open swim there isn't enough showers with hot water for everyone and many have to wait while cold.

None

Sauna important

More swim is needed. Facility should be open sundays. But not holidays

Have staff regularly test and maintain equipment.

I preferred the "free weight" weight machines as opposed to the current resistance weight machines... similar to the machines offered in the high school weight room

I would like to see cleaning schedules and record of cleanings for all equipment, including mats, weights and larger equipment. Also recommended cleaning protocols for after and before use posted.

Perhaps a way to see how full each facility is in real time?

would prefer a salt pool instead of chlorine

I think looking into a maintenance and replacement program for current machines/equipment would be great.

More open swim times

More weightlifting equipment and machines, bigger weightlifting area

No

Would be awesome if the potential multi use field was enclosed, similar to the Field House in Juneau

Ice skate rentals. TV and system to stream fitness workouts in fitness room.

Pool hours to include at least 30 minutes a day during lunch would bring more people to the pool as the current hours are a big turn off!

Sanitizer on walls; upgrade treadmills

More ellipticals and stair steppers would be great.

Have a child playroom so is single full time working mommas can work out!

How important is it to you that Parks & Rec work toward adding an All Weather or astro turf multi-use field? (Soccer field type)

126 answers - Average of 3.2 stars



In addition to our Programs and Community Events, Parks & Rec manages Parks and Playgrounds within the Borough. What changes or improvements would you like to see?

64 answers

would like to see a park that is open and w/grass for kids/adults to play frisbee ect

More playground @ office end of elementary school

Park bathrooms open during the day time all year.

I don't use the playgrounds to comment.

Love parks and rec!

Would prefer that no more trees be cut down at Sandy Beach Park

More local trails and low maintenance outdoor activity opportunities like horse-shoe pits, pickle-ball, make the baseball fields combined, multi-use fields so that infrastructure gets more use throughout the year.

Cleaning and maintenance.
Better use/maintenance of "ballfields" area. "Soccer" field/track for school and public use

Tennis Courts

The playgrounds are in disrepair. Two playgrounds have been removed over the past few years and little maintenance/improvements have been made to other existing structures. Funding needs to be put into maintaining and upgrading these facilities.

Would love more playground options including one right at the P&R facility. Sad when kids can't play basketball inside, so they're outside but younger siblings have to go to the other end of the school. A playground right outside the facility would be great. Also more options for outdoor events with more tables so like a birthday party can take place outside since we can't rent the facility

I like the current level of effort on the parks and landscaping.

More activities for kids -

Mico spikes for sale (or prizes to earn.) Mico spikes help people stay upright when it's slippery in snow.

The southern most park is Ira II.
It would be nice to have another park near the ferry terminal- Seversons area.

I'd like to see a playground out back in at the top of Howak

Playground added in Severson area.

Would love to see a playground in the Lumber St & Severson neighborhoods, perhaps at a new trailhead! This end of town has limited opportunities for hiking and recreating.

Outdoor obstacle course

All the playgrounds need upgrading and regular maintenance.

Mandate and enforce masks and volume of people in particular areas

Keep them. City parks are a great opportunity for kids in the neighborhood

Rest rooms available at playgrounds

Keep up and improve the playgrounds and trails

Parks rebuilt at sandy beach

More race type events and friendly competition. Softball leagues, bball leagues, anything that builds community through sports

The playgrounds are nice, but the ones with roofs are so dark- I wish they had some sun tuff or skylight areas for those dreary days.

My sons favorite activities are not with the equipment- he loves moving rocks and channeling water and other Kinder Sog like activities. I also wish there was more partnership and focus on the community garden and spaces to promote play with dirt, rocks, and water, etc. It would be awesome to have some big piles of sand and a play area for the preschool/kinder kids. Like a giant sandbox with a drainage area and permission to go nuts.

More playground equipment

Bathrooms year round at sandy beach and ball field. Also lights at ballfield so it can be used more in winter

Thank you for keeping them so clean and the trash picked up!

Covered seating areas at parks is very nice!

More trails and snow removal on trails. It was awesome to have Hungry Point loop cleared!!

Upgrade Hungry Point trail to be more accessible. Either hard gravel surface or boardwalk. Renew focus on neighborhood playgrounds. Prioritize replacement of aging infrastructure such as steps along North Nordic. Advocate for more bike/pedestrian paths along the Mitkof Highway. Explore the possibility of acquiring Mental Health beachfront along the highway to preserve open space.

T-H playground put back, or bird viewing park there.

I would like the old containers and gross pile of astroturf or whatever it is to be removed from the ball park near the 'skate rink'. Such an old old eyesore.

Involvement with the community garden for classes or volunteering with the school as a partner

It would be great to have a track for 5k running races/ practice.

none

We love when parks and rec is open! Cant wait for it to be open again! Would also love to bring back tot tim

Can't think of anything!

I love the flowers and up keep that Jesse does in the parks. Please keep it going.

Long term planning for all of these

get rid of masking

Put a wooden exterior around the metal storage hut at Sandy Beach or relocate it. It's ugly - and doesn't complement all the improvements to Petersburg's heritage park.

Better clean up/trash security. I know it's not people trashing the place because you can tell when you pick up some of it- it's totally animals. I wonder if the garbage cans had better lids would animals get into them as much?

More trails and playground upgrades, since we havent had access to the gym and pool

Nothing comes to mind. P&R manages a lot.

It would be nice for the playground on 4th to be covered, so kids can still play during yucky weather

I would like to see more access available for public restrooms.

No comment at this time

the parks & trails seem well-managed. thank you! please don't cut any more trees at Sandy Beach.

Right now in the next one to three years we need to focus on our current facilities and trails for maintenance and upgrade. Making too many changes at this time seems like a step away from deferred maintenance and up keep needed. Our parks/playgrounds and infrastructure should be updated.

Zumba or Jazzercisr

Open swim

I would love to see the continued development of additional playgrounds

Smokefree policies in collaboration with PIA Tobacco Program.

Keep them open

I would like to see the playground that used to up behind the grocery store re-establish. More general upkeep of playgrounds would be much appreciated

More swings

No masks

Would like to see different playground equipment. Maybe a tire swing. Other types of swings. A spinning type toy. Wrangell school has a lot of good stuff for example. More basketball hoops.

A playground on the south side of town

A track and field area

Kids play area for moms!

Petersburg Parks & Rec partners with Petersburg Indian Association to manage and create our local trails.

What improvements or changes would you like to see in existing trails?

64 answers

the trails here are very well maintained

more established hiking trails

one around the loop. more benches

more trails out the road and along creeks, more campgrounds in new places, 3 lakes road.....

i think you are doing a great job on trails, looking forward to completion of mt view manor to existing boardwalk. maybe more trail up in the raven roost access area

Keep up the great work and continue to expand trail system.

I love the city creek trail! continued improvements would be nice, but even how it is, it is great!

They are great!

More trails in the community

Very appreciative of existing trails!

Possibly install garbage cans at the beginnings and ends of the the trails.

Keeping up with maintenance. More reminders for people to clean up after dogs.

More trails out the road - south of town

continued growth in the non motorized connectivity across the community. Things like the hungry point trail, the bike path. Pathways linking neighborhoods and downtown area is greatly beneficial. Suggestions might be to plan for motorized paths on the airport road, connecting seversions subdivision into the airport road, branches off of the hungry point trail.

While PIA is open to listening to suggestions, ultimately, any funding that is spent from PIA on trails is the decision of the tribal council.

More trails the better! There are no trails passed town though, seeing some in other areas would be great too

I'm happy with the current trails. Maybe a little more upkeep on gravel trails.

Finish that connects from Sandy Beach to Cabin Creek.

Netting on boardwalk at Blind River Rapids

Trail system is awesome anything to expand it with loops back to rec center are great!

Sidewalks getting plowed in the winter to create an inner connected trail system of the trails that we currently have.

I would love to see the trail from sandy beach to city creek further improved

More.

Extensions to existing. Especially bike paths- extend further out the road

Loops from Severson's to PIA

Hand rail on bridge at Sandy beach boardwalk

Love our trails, doing a great job, few more sitting benches

N/a

The trails are awesome!! Maybe more destinations? Picnic spots or view points with info about the landscape and history

Really love our trails. We use the in town system a lot!!!

REALLY appreciate whoever is plowing the Hungry Point trail in the winter. Love the poop bag dispensers - as many trash cans as possible are nice so you don't have to carry the bag around forever.

Nothing- they are great!

I love the local trails, thank you and PIA for doing a spectacular job!

Love our trails, love this program, would love to see the completion of, or at least extension of, the trail from sandy beach to city creek.

See above. LOVE the trails and that they are starting to link together.

See above comment about Hungry Point trail. Continue to upgrade City Creek trail.

Another trail from old T-H playground to make another loop to 14th street or better yet towards Sandy Beach.

I hugely appreciate these trails and their upkeep. My ask would be to recognize the high levels of use on these trails and other outdoor recreational opportunities and support this partnership with gusto! For many of our citizens we use these trails and DO NOT USE THE INDOOR FACILITIES EVER! Indoor use seems to get the bulk of attention.

I love all the trails so far!

I love seeing the trails becoming more accessible!

none

Signs regarding picking up after dogs would be great.

I enjoy all of the trails in town and can't think of any changes at this time.

Important they have been doing a great job. Continue

they are good but we need more trails

Wonderful job - keep on doing what you are doing!

More trails. They all get a lot of use.

.

A partnership with a community member to officially clear the trails in the winter.

Love the trails, I think they are beautifully done

Not a trail issue necessarily but it would be great if the sidewalks were shoveled. Maybe a way to keep folks employed? It's a huge safety issue when folks are pushing strollers and walking dogs on the road because sidewalks are impassable due to snow.

More ! Especially for running. The current trails are awesome!

Love the trails!
Sandy beach to Frederick pt. With some gravel

If possible, it would be awesome to perhaps incorporate a disc golf course of some kind in conjunction with a trail

Ohmers creek trail has a portion that is always under water and difficult to cross. It's supposed to be a bridge

i personally like the rest of Sandy Beach trail rough as is (no further "improvements"), but i understand that the boardwalks & gravel trails get more people out. i can live with it. please don't cut any more trees along the trail. please shovel snow on sidewalks leading to Libby Strait trail.

Any additional trails are always great! Maybe an additional off shoot from the hungry point trail that goes back through the muskeg and connects to the airport bike path.

n/a

A maintenance schedule for existing trails, and a long term plan to add additional trails connecting neighborhoods. Snow removal would be nice too.

3 Lakes has some very muddy trail sections and could use boardwalk repairs in multiple locations.

More garbage pickup

N/a

Trail connecting south and north sides of town

None just more of them! They're great!

What areas would you like to see prioritize in terms of new trail development?

59 answers

along 3 lakes loop road

both directions sandy beach to downtown

the school track & field behind the school!!! Field of dreams! Ohmer Creek trail, three lake trail and more

see above

Tlingit & Haida subdivision to Sandy Beach

wooded and muskeg areas similar to city creek and ravens roost. nothing along roads.

More close to town like the one in construction progress.

Severson subdivision area to Haugen Drive and Hammer and Wikan shopping center

I would like to see a trail from Severson Subdivision, at the corner of Queen and Odin, across to Noseeum, up Pearl F, and then across to Haugen Drive (next to the fire hall). This would be a great benefit to the community. In addition, future extensions/improvements could be made from the south end of Severson Subdivision to McGill's trailer court, and even from there to the cemetery. Petersburg would truly have a crosstown trail system, like most developed towns in the nation.

In the beginning of 2020, before the pandemic, I circulated a petition for signatures in support of such a trail, and collected a few dozen. Almost everyone is strongly in favor of the idea.

We need a trail between the Severson Neighborhood, to the end of Lumber St. and over to the fire station. This would make Petersburg MUCH more pedestrian friendly. Really want to see this trail built!!!

Increase options and trail links for folks to walk from their neighborhoods to services and outdoor rec opportunities (the post office and grocery store , ball fields, airport hiking area, sandy beach). I would like to see a trail that links Severson to Lumber street to the Fire station area.

Although expensive upfront, a small gravel BMX loop would be great for our kids if possible at some point.

Continue developing new and inter-connecting existing trails.

anywhere and everywhere.

Doggie poop bags on Ravens Roost Trail

connecting seversions subdivision

Work towards completion of city creek trail. PIA Tribal Council determines what the priorities are for utilizing tribal transportation funds (that includes what trails they will design and construct). If the borough agrees with the development of the trail, it moves forward. Parks and rec does not drive the direction of PIA's transportation funding.

Severson to Haugen connection would be nice when funding is available.

Sandy Beach

Netting on boardwalk at Blind River Rapids

Connectors to existing trails like ravens roost

There was a proposal for a walkway on the inside of the island so people could walk to the harbor or ferry terminal to the grocery store? That sounded like a nice way to go!

The connection from Howkan to the existing trail from North 14th

Creekside trail up City Creek

Heavily support trail connecting Lumber St and Severson to the trail network, love the one that was proposed and delayed so far and would like to see us keep working to make that happen.

Boardwalk to main bike path behind the airport across from the dog park

Connect the harbors. Publish a map or work with the Pilot to add to visitors guide

No specific areas but close to town, longer trails, connected to various entry points like hungry point trail

To be usable in winter is it possible to have trail clearing from snow?

N/a

It would be nice if the trails punched through to Kings Row or Seversons. We live by the bike path which is nice, but I'd love to be able to connect the back way, avoiding the traffic. It would also be nice to have another trail out the road somewhere with an over look.

Make a loop connecting the trail by MVM to the boardwalk that heads toward the water treatment plant. Would be nice not to have to go along Sandy Beach Rd when going from the boardwalk to the gravel trail on the Hungry Pt. loop. Extend the elevated Sandy Beach Trail a bit, but not all the way - or maybe just upgrade the more rustic trail to avoid large mucky spots.

Trail across muskeg from Scow Bay Area to Post Office area!

Completion of the trail to city creek.

Near town

Improve the connection between the Elementary School boardwalk and the Hungry Point trail.

The above one or trail from Severson's to town.

I would very much like to see more trails offered around town (new ones not existing ones). A bike or hiking trail could be put in off the airport access road (closer to the end of the runway) as well as by the old ski hill in cabin creek rd.

Create a Short cut route up Ravens Roost from the one way by pass road near the water treatment plant. Could make a little parking zone at first turnout and allow a few people to park there to hike up to metal bench but along the muskeg-forest edge. It's an alternate route Not well known but people use it, it cuts off the whole route that people use with their dogs from Sandy beach to quickly access the FS trail if that's the destination. People can park at water treatment office building and access a cut off trail from there to the metal bench as another option. Another mini trail is to fix the route from the dog shelter to tie into the ravens trail. Right now it's a jumbled mix of slippery old boards. People use it but it's dangerous.

Lighting on some trails that won't disrupt the view for neighbors but would allow more use in winter.

Trail from Severson's to Post Office

Connector from fire hall to Severson's subdivision; connector from severson's to Scow Bay Waterline Access Road (around western end of airport runway)

None. the trails themselves are fabulous!

more of them

A bench/outlook at Hungry Pt. A walkway on the beach side from town out to Hungry Point - an informal one currently exists on the beachside of the guardrail.

Anywhere

Trails that connect with local trails and benefit kids walking to school and X-country team.

Create a gravel trail for the rest of the sandy beach to city creek. Less maintenance issues with gravel and easier access to the beach. Also think it would be great to consider a campground in city limits.

Hilly areas. An additional trail system on ravens that approached from hungerford side.

A trail above the Frederick pt road back to dump hill road so z Az person could walk a loop

Clear signage and the ability to take breaks during walks with strategic benches

trail network connecting neighborhoods (Kiseno, Lumber, Kings Row) to airport bypass road & fire station

Trail to connect

Not sure.

A trial connecting the haul road (behind airport) to Severson' Sub and Haugen Drivem.

Broken trail and boardwalk areas repaired on 3 Lakes.

N/a

South side of town

Areas by water

Youth Basketball grades K-6
87 answers - Average of 4.1 stars



Youth Volleyball grades 6-8
84 answers - Average of 4.1 stars



Indoor Soccer grades 3-5
83 answers - Average of 4.0 stars



Outdoor Soccer grades 3-5
80 answers - Average of 3.9 stars



Is there another Program you would like to see offered at Parks & Rec?

55 answers

karate, kickboxing, for adults and children

yoga

na

I don't have knowledge of the kids programs to comment. But I believe having programs like those for kids are very important.

More fitness for seniors.

n/a

Martial arts or personal self defense geared toward school-aged active resistance to bullying.

climbing

Tennis

Gymnastics

Kids jump rope, gymnastics, after school open gym

I didn't know there has been soccer- would be great if there is. Also unfortunate that there is no middle school activities such as basketball. They are the grades most susceptible to peer pressure and starting to get into trouble. Most aren't interested in swimming anymore, would be great to have basketball.

Karate

Cycling; summer swim program; activities during summer

Gymnastics

Gymnastics and more tots or children's yoga

Cheer Camp

Bring back yoga and kick boxing on weekends

Gymnastics, martial arts, hockey

Flag football

Tae Kwon Do

I wish I could opt out of this section about kids programming- because I don't have connections with them at this time.

Gymnastics

Martial arts like karate, judo, jujitsu, or even just self defense. All ages or just for kids.

Fun game play for kids on Sat and Sunday with camp counselor types leading them

More youth programs that are not court based. Such as summer camps. More nature-based programming. Partner with Library to leverage resources. Reinstate regular Red Cross babysitter classes. Activities for visitors such as guided walks.

Physical activity mini action course for youngsters. Small hurdles, fence climbing, tire hopping, rope climbing, etc. any eye, hand feet, actions...could compete in teams.

Martial arts. I have an adolescent son that is very interested.

Would be great to make it less formidable for individuals to conduct classes at the center. The community gym is a great place for group aerobics, yoga, Zumba, etc., yet instructors have expressed discouragement at being able to hold classes there.

Nature and art

Noon lap swim

no

Tball, youth baseball, and soccer for the younger kids ages 3+! I know the parents would step up to help make it happen

Youth Wrestling

Flag football, CrossFit games

Tumbling, gymnastics

Gymnastics would be wonderful,

baseball for all ages and adults

Pickle ball

Bring youth soccer back. And indoor gyms for tots

N/A

FOOTBALL!!

Online exercise classes! Pay the instructors for classes.

After-school programs for k-5 in partnership with school maybe?

Outdoor disc golf

Gymnastics, kid zumba,

Not sure.

Water polo. Keep building open mostly

More programs for K-3, indoor/outdoor soccer for that age would be awesome

Lacrosse

Golf or frisbee golf, kids love frisbee golf!

Tennis, gymnastics, Zumba, hockey.

Kids Zumba, Gymnastics

More for Kinder's and first graders!

Soccer for older kids past Grade 5.

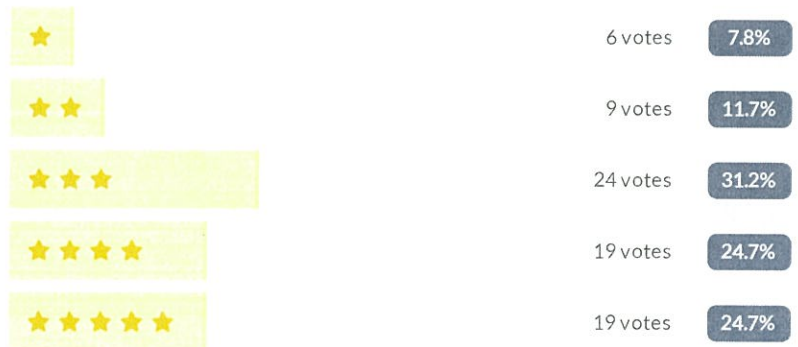
Adult Master Swim

85 answers - Average of 4.0 stars



Adult Volleyball

77 answers - Average of 3.5 stars



Fitness Classes for Seniors

83 answers - Average of 4.1 stars



Zumba

80 answers - Average of 3.8 stars



Yoga

90 answers - Average of 4.1 stars



Water Volleyball?

74 answers - Average of 3.4 stars



Pickle Ball?

74 answers - Average of 3.4 stars



Fitness Class

92 answers - Average of 4.1 stars



Do you have any Programs you would like to see started?

43 answers

it has been awhile since able to go to any classes. racquetball a program that connects team players with each other. a way to meet players/partners.

Make it easier for instructors to teach-insurance? we have great instructors, seems the insurance issue or what ever caused many to quit offering classes.

Love to try pickle ball.

n/a

Tennis

Strength training and HIIT classes. Scheduled adult basketball or open gym time (mate does not need to be a program but a time slot)

Water volleyball and pickle ball would be fun

TRX

The swim program masters starting is excellent.

Frisbee golf corse!

Piyo

Adult leagues- basketball, softball, volleyball- something to build community and give us options

Fencing

N/a

More water aerobics!!

Water volleyball? Waterpolo, yes, but there aren't enough adult swimmers. Speaking of that- I think a push for adult swimming lessons is very appropriate. Learn to lap swim, etc. Also, there used to be underwater speakers- miss those.

And organized city league for adult basketball and volleyball

Tai chi

Martial Arts

TRX

Reinstate fitness classes.

Love the deep water aerobics class! Maybe add a shallow water aerobics like they had in the past. Warm water pool yoga, walking and stretching especially for those with limitations. Would have to be small classes.

I've never heard of Zumba being offered there. Are we rating based on interest, or??? I would LIKE to see it there...

Fitness designed for seniors or those with back issues

Would love to have any of these programs back and available now.

CrossFit games

None

Summer youth programs

group meditating

Wilderness education programs for the youth and adults.

.

N/A

Spinning

I would like to see aqua Zumba again. Low impact for good movement not initiating pain of joints. Water helps where gravity is a hindrance.

Not a program BUT it would be nice to have a play area w/caregiver for children while parents utilize the weight room or attend a class. I would gladly pay a fee and sign up ahead of time. My 3 year old is the only thing that stops me from attending regular classes...

Adult basketball is one program I'm very interested in; however, I currently prefer to withhold my participation until after the pandemic

Coed Adult kickball or softball

Beginners fitness class, low impact fitness classes, small group fitness.

A cross fit or HIIT

Not during working hours or right at 5 PM.

I'd love late at night or early in the AM classes

Spin

CrossFit

More adult basketball for men and women.

I hope that when fitness classes start up again they are structured so that instructors are able to easily meet the necessary requirements to teach.

Would you be interested in leading a fitness class or Program? Please list what you would be interested in doing.

15 answers

would be interested in tennis court construction/maintenance and trail building

n/a

Yes- strength and HIIT

Boxing w focus mitts (no sparring)

A get in shape outdoor fitness class/club would be great - group walks/hikes/bike rides and outdoor "boot camp" style exercises.

No

Yes, rehab yoga

I have taught and coached swimming here (and elsewhere) in the past. I could teach short bursts of lessons occasionally. I am not interested or able to do a long series at this time. I think more needs to be done to collect waitlist type info- so scheduling can include some interested folks vs. setting something up and then trying to publicize etc. I enjoy doing waterbabies, adults, and lessons really, but I am not looking for a job doing that right now. I'd also be happy to help talk about lesson programming and setting up/training swim teachers, but I've let all my training licenses lapse.

Possibly a warm water limited class for seniors that focuses on stretching, yoga, breathing and some walking. Maybe even a dry one!

No

N/A

NA

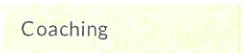
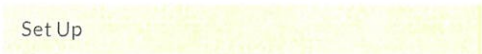
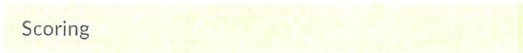
Perhaps...I have prior experience with adult basketball but I would need to re-evaluative after the pandemic

No.

Maybe kids basketball.

Many of Parks & Rec Programs involve coaching, scoring, set up etc. Would you or your family members be interested in volunteering to help with any Programs?

129 answers



The Aquatic Center offers multiple time slots for use. Of these activities which ones would you like more opportunities to participate?

89 answers - 143 votes



Is there any suggestions you would like to give the Parks & Rec Director and Advisory Board to consider offering to our community?

50 answers

Thank you for allowing the public to use this facility for free during the pandemic
more flower sit down areas

kids swimming 3x a week is too little!! 3-5 yr old kids should have time every day.

Outdoor volleyball-maybe create a sandy beach like spot open to anyone. our kids and teenagers need more activity option in the evenings outdoors.

Please make an outdoor tennis court. Really like how clean facility is now.

water aerobic often conflicts lap swimming in the mornings. lap swimmers show up at 6 and there are often more than lane space. and then the water aerobic participants show up and want the lap swimmers to move. if the changed the footprint for the aerobics to take up a narrower band of the whole length of the pool instead of one quadrant, or provided additional lap swim hours on the days that aerobics is held, this conflict could be improved.

Keep going! These programs are going great and vital for our community. I love that youth is free, and seniors pay more. Seniors have more assets than kids do!

Hire a consultant to come up with a long term plan for regular maintenance repair and replacement of existing facilities and equipment. The borough will eventually own a great deal of land and will be able to fund things with the property development fund. Prepare for that and prioritize the top needs for replacement and repair in anticipation of having that money to spend.

Thank you for all you do!

More trails!

Keep asking the community for input, even if you don't get much response, you never know when a gem of an idea may come up! Thank you all for giving us a chance to share our opinions and I'm looking forward to seeing our Parks and Rec dept. flourish under Ms. Payne's leadership!

Keeping a balance of opportunities and use for all members and interests in the community

Please reopen on Sundays! It would be great to have another weekend day to use the gym and attend open swim. An afternoon and evening session each day would be great! Also, with Monday holidays 2 day gym closures are a bummer! Also if family's could book an open swim time for bday parties, on a limited basis, that would be awesome.

More time in the gym for kids. Or just open gym availability

Consistent service in a clean facility. Stay with the basics and be a reliable fitness resource for the community. Thank you for reaching out to the community.

Wellness activities in collaboration with hospital.

Micro spikes available for sale

Regarding the question about Sunday and holidays. I would say Sunday's are a great option in town since there are little to no open facilities on Sundays. Closed holidays.

Thank you!

Charge for ski rentals

Yes- I no longer use the facility because people aren't wearing masks and crowd into workout areas. These things need to be monitored and enforced. I don't feel safe coming there and the pool volume of people needs to be controlled too. We're still in the middle of a pandemic

Thanks for reaching out to us

We really enjoyed and miss doing community kids time at the gym. We aren't feeling ready to go back in public spaces like that yet. One of the coolest random swim things I've seen was watsu. A massage therapist trained to do this relaxing stretching in the warm water therapy. I got to experience it during a parks and rec conference here years ago. Generally, I think building relationships with the public is super important. There were some big issues about a decade back during the shift to a new pool that had serious consequences on community trust and confidence. Other directors inherited some of those relationships and that has made things tough.

Thank you for your service to our community!

More gear rental!

Thanks for this outreach. I think Stephanie is the best thing to happen to P&R since Ryan left.

Consider reinstating Parks and Rec advisory board reports to the Assembly. It will help improve visibility of the Department and better represent community voices. Make sure advisory board meetings are well advertised and open to the public.

Just a big thank you!

In addition to the new trails I mentioned above, I'd like to see an additional beach area near 5 -6 mile as there are some open lots and it gets sun much later in the day. All that may be needed is some clearing, pullout parking and steps? A couple picnic benches too. Thank you! - Carissa Cotta

I have spoke with several friends and would love to discuss the possibility of a morning homeschool Open gym. I will call to discuss this more once the borough is no longer "in the red zone" but thought we could maybe try for a Wednesday or Thursday morning PE class for the home schooled children. Do a Max-capacity if needed with sign in sheet similar to what is used for sign-in with pool time. We could also wipe down/disinfect used equipment after the hour is up, prior to leaving.

Open at 5am or somehow allow access by means of a key card to just the fitness room/weight room

Nothing. Thank you for all you do for our community!

Very glad there is a board now. A longer comprehensive. Plan.

community picnics, any other activities that would be unifying.

The indoor adult hockey in the gym is ruining the maple floor the the hockey pucks are marring the walls and pads. I know at least one person has taken a puck right in the face when entering the gym. Move them outside in the covered basketballs area. Hockey is an OUTDOOR sport!

Additional focus and oversight on community parks including opportunities for new ones.

Don't cut trees. They are important to parks and recreation

.

Keep up the good work!

You're doing a fantastic job keeping activities going in spite of Covid.

I'd like to see some Sunday hours, even if it's a partial day. But holidays it's appropriate to be closed. Thank you for doing this! Our family cannot wait to get back to p&r.

Appreciate your effort, and your work

No other suggestions at this time; great job in continuing to improve all programs and being transparent with updates!

i'm glad to see the advisory board back. thanks for all you do (board and P&R staff)

I know people might be interested in new and more for our community center. Those ideas are grand on a five to ten year plan. Right now it seems the current facilities could use more in depth updating.

Sandy Beach bathrooms are great but if we could add diaper changing stations, better locks on the doors, and a outside wash facility.

Improving the sand volleyball court (we love using for birthdays and random outing). Would be a five year objective.

If PNR is involved with the stairs leading to the beach along N. Nordic, they need replacing or restructuring.

Community members are very interested in the pond at the ball field for ice skating. The pond was heavily used for the week we had frozen weather. Maybe work with Sig Burrell and others to allow for future use with potable lights so both the pond and ball fields could use the lights.

We have an amazing community center and over the years there have been hiccups. Yet every time there was a crisis, they have come back better than before. Investing in the community and making sure to charge fees where fees are needed is a step in the right direction to offset costs of maintaining and investing in the future.

I would really really like to see the pool and facility open again on sundays and open swims again on Saturday afternoons. It's nice to have a place for family activities on the weekends.

Larger cardio areas where there's more privacy for people to work out (I know this is a big ask and probably not possible).

Having the aquatic center open earlier during the week, limited hours on Sunday's, and being open some Monday holiday's would be awesome!

It about time that we think about golf. Our population is not getting younger, its getting older. We should start to think about adding a golf/frisbee golf course.

For swim you should not have people line up outside. Should have people call in to reserve their spot to swim and show up at a certain time that you give them. Like have some people come in 15 minutes before swim, then the next group comes in to get ready 10 minutes before and so on... and go inside not wait in line outside. Just require a mask. Makes more sense then everyone being right beside each other outside hoping to get in while in the cold with small children.

Great job guys!



Malena Marvin <malena.marvin@gmail.com>

Trails

David Berg <david@vikingtrvl.net>

Fri, Oct 22, 2021 at 10:31 AM

To: ParksRecreationAdvisoryBoard@petersburgak.gov

Nancy and I are going to be out of town for this meeting but I thought I would offer some input in respect to visitors using trails in town.

Some of the cruise ships use the drive down facility or the Petro Marine dock so they are out in that end of town and having a trail head up behind Severtson's would allow visitors to get on city trails and walk over towards the sandy beach or hungry point

Sometimes the cruise ships divert from Petersburg because they do not have a permit to use the trail on Kupreanof island.

Having an alternative in town would be appealing to them I think Lindblad might be a partner in this type of trail activity

Dave and Nancy Berg

Sent from Dave's E device



Malena Marvin <malena.marvin@gmail.com>

Trail from Severson's to Haugen Drive

Casey Knight <caseyaknight@gmail.com>

Mon, Oct 25, 2021 at 4:42 PM

To: parksrecreationadvisoryboard@petersburgak.gov

To Whom It May Concern:

In early 2020, I was interested in marshalling support for a trail from Severson Subdivision to Haugen drive. I wrote up a sort of petition letter, showed it to some people (around 50), and almost everyone signed -- mostly people from Severson's, but also people on the "other side" of the potential trail route. See the attached "Letter in favor of the trail" for a version of this letter. (I believe Sue Harai at PIA has the signatures that I collected. I gave it to her, she kept it -- maybe she has it filed away somewhere.)

PIA would build and maintain the trail. Indeed, in 2017 they were locked and loaded, ready to build it. The Borough Assembly had OKed it. But it died. I suppose it's a long story exactly why it died; I'll not summarize here. (For some of this history, see the attached "4.18.2017.Planning.Commission.Report", "10.25.2016.Planning.Commission", and "Borough.Draft Letter of Support for PIA trail".)

Later, a slightly different route from the first version of the trail was proposed (see the attached "Proposed.Trail.Route"), and this time the roadblock was the AKDOT. Briefly, the reason was that the trail route went across land that is currently used as a buffer between the airport fence and the top of Lumber Street/Hammer Slough.

Here's a recap of the events that occurred in February 2020 (or at least, the ones that I recall).

1. I talked with Sue Harai of PIA, and she was excited about getting that trail idea going again. She contacted DOT to see what they had to say.
2. Paul Khera of DOT wrote a formal letter to Sue turning down her request. See the attached "Khera.Letter.to.sue.harai".
3. After reading Khera's letter and doing a little research, I wrote up a reply to all the points Khera made. His points seemed to me to be poor excuses to turn down the request to build a trail. See the attached "Knight.Letter.about.paul.kheras.letter".
4. In my rebuttal of his points, I referenced the relevant documents to which he referred, viz., chapters 20 and 22 of the Airport Compliance Manual, and what is referred to as "the section 4(f) process" (see the attached "5190_6b_chap20", "5190_6b_chap22", and "Section 4(f)...").
5. And then COVID.

In any case, Sue Harai's thought was that if the Borough-plus-PIA came at them together we might have more success. I'm not sure where PIA is on this anymore; haven't really thought or talked much about it. When I talked to Assembly Member Stanton-Gregor about it in February 2020 his initial reaction was something like, "What?! I thought I already dealt with that. I thought that trail was going to be a thing."

Maybe a newer resolution/letter from the Borough Assembly, which partially addressed Khera's points, and also expressed the need for the project, would be the thing to do. If it were sent jointly -- or at the same time as -- a letter from PIA, that might have the most force.











So perhaps the Parks and Rec board could draft a letter and recommend to the Assembly to endorse it, while explaining why the initial action on the part of the Assembly wasn't enough to make the trail happen. That is, if you all are into the idea of the trail.

Best,

Casey Knight
606 Queen Street
907-650-7345

Item 9A.

10 attachments

-  **Letter in Favor of the trail.pdf**
32K
-  **Knight.Letter.about.paul.kheras.letter.pdf**
45K
-  **Khera.Letter.to.sue.harai.pdf**
240K
-  **Proposed.Trail.Route.pdf**
1052K
-  **5190_6b_chap20 copy.pdf**
962K
-  **Section 4(f) | Federal Transit Administration copy.pdf**
158K
-  **5190_6b_chap22 copy.pdf**
2501K
-  **4.18.2017.Planning Commission Report - PIA Trail.pdf**
1326K
-  **10.25.2016.Planning.commission.pdf**
2167K
-  **Borough.Draft Letter of Support for PIA Trail.pdf**
125K

***A Letter in Support of a Trail from Severson Subdivision to Haugen Drive
7 February 2020
Casey Knight, resident of 606 Queen Street***

To Whom It May Concern:

The purpose of this note is to comment in favor of a trail connecting Severson Subdivision to Haugen Drive. The path, to be built and funded by PIA, would begin at the intersection of Odin and Queen Street, cut a short way across the muskeg to Noseeum Street, continue to the top of Noseeum, and then cut across the wooded area that makes up the drainages in to Hammer Slough and Mill Slough, and finally connecting to Haugen Drive on the down hill side of the fire hall.

As I see it, the trail would help to solve two main problems for the residents of Petersburg.

First, there is the problem that walkers and bike riders from Severson Subdivision and Lumber Street are disconnected from local paths, other residential districts, both grocery stores, and the Post Office. I think of this as a **problem of access** for pedestrians.

While there are quite a few pedestrian paths on the North side of town (in the muskegs behind the baseball field, along Haugen drive near the airport, and behind the airport on the access roads), such paths are lacking on the South side of town (there is one paved path on the Libby Straight stretch between one-mile and two-mile). This new trail would connect pedestrians in the Severson Subdivision area to the network of pedestrian walkways on the North side of town.

It would also allow walkers and bike riders to travel easily between that area and the other residential districts. And the distance you would need to walk on the trail in order to visit Hammer and Wikan or the Post Office would be a fraction of that of the hike along North Nordic, across the Hammer Slough bridge, and up Haugen Drive.

Second, I believe that the trail would provide a much safer route for pedestrians traveling from Severson Subdivision or Lumber Street. The trail would solve a **problem of safety** for pedestrians.

The route along North Nordic and Haugen Drive to the Post Office and Hammer and Wikan does not feel safe when you walk or ride your bike. There are no bike lanes, and there is no room on the road for bike lanes. So if you want to ride your bike, you tend either to take to the sidewalk, or weave in and out between parked cars. Both of these alternatives are unsafe. In addition, during the winter, snow plows make berms that cover the sidewalks. This forces walkers to walk in the edges of the streets, which is especially unsafe in winter conditions. Any time of the year, families with young children whole live in the area would have access to a safe, traffic-free walking path. The trail would provide a safe alternative for pedestrians in and around Severson Subdivision and Lumber Street.

These are not the only reasons to support a trail from Severson Subdivision to Haugen Drive. Dog walkers would have another route. Tourists would have another trail to tramp. We would all have another path to walk on a nice day.

Sitka has a beautiful cross-town trail. Cities in the lower-48 have them. It's time for Petersburg to catch up.

Sincerely,

Casey Knight
caseyaknight@gmail.com
907-650-7345

***A Letter in Reaction to Paul Khera's February 14, 2020 Letter to the Petersburg Indian Association
Casey Knight
18 February 2020***

To Whom It May Concern:

The purpose of this note is to reply to some points made by Paul Khera, Aviation Planner for Alaska DOT&PF, Southcoast Region, in his recent letter to the PIA. Mr. Khera's letter was a response to a request by PIA to build a trail on currently unused airport land in the vicinity of the James A. Johnson Airport in Petersburg, Alaska. The purpose of his letter was to provide reasons why PIA cannot be granted access to the unused land for the purpose of building said trail.

As I understand it, Mr. Khera expressed two main points.

The following quotation from Mr. Khera's letter contains the first point:

"You [PIA] are correct regarding the fact that the current airport master plan does not indicate any development of the land where you propose to build a trail, but that **does not mean the property is excess to the needs of the airport** or that it should be put to other uses. Vacant land on airports serves a purpose in that it provides a **buffer between airport operations and incompatible uses**" [emphasis my own].

The thought here seems to be that the land in question must remain vacant in order to provide a buffer between airport operations and incompatible lands uses (such as residential housing). This, however, is clearly false. The land, which currently serves as a buffer between the airport and some main residential districts in Petersburg, would still serve its function as a buffer between the airport and those residences. Indeed, Chapter 20 ("Compatible Land Use and Airspace Protection") of the FAA Airport Compliance Manual (hereafter ACM) contains the following quote (page 20-1):

"Proximity of ... recreational areas has proven not only to be compatible, but to be mutually beneficial as well. Some communities have used the resources of an airport to contribute to the quality of life for the local community."

Indeed, it cannot legitimately be claimed that the trail itself is an incompatible use of the land. In Chapter 20 of ACM, the notion of compatibility is defined as follows (page 20-5):

"Compatibility of land use is attained when the use of the adjacent property neither **adversely affects flight operations** from the airport nor is itself adversely affected by such flight operations" [emphasis my own].

Clearly, a trail going through the forest and muskeg well outside of the runway boundary fence would not adversely affect flight operations.

The second point expressed by Mr. Khera begins as follows:

"[ACM] **cautions against allowing non-aeronautical uses like you [PIA] have proposed** because they result in protections under 49 U.S. Code 303, Section 4(f)" [emphasis my own].

Mr. Khera seems to be referring to a brief part of Chapter 22 ("Releases from Federal Obligation") of ACM. On page 22-4 of this chapter, there is a sentence that reads as follows:

“Airport sponsors considering requests to use airport land for recreational purposes **who are planning future airport development projects** should assess potential applicability of section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C., rectified at section 303)” [emphasis my own].

While this sentence does seem to be expressing some level of caution, it is extremely important to note the emphasized portion. Mr. Khera agrees in his letter that there is currently no future development project in the Petersburg airport facilities that would be located anywhere near the proposed trail. It would seem, then, that ACM does not in fact caution against allowing non-aeronautical uses *like the proposed trail*, as this trail does not conflict with any planned future airport development.

Mr. Khera’s second point continues as follows:

“Once such a use [e.g., a recreational trail] is established, Section 4(f) protects that use and **diminishes our ability** to implement future airport development that is **necessary for aeronautical activities**” [emphasis my own].

While Section 4(f) clearly protects established recreational use of land, there is also a rigorous step-by-step procedure (“the Section 4(f) process”) that would allow future development of the airport — especially development that is necessary for aeronautical activities. Section 4(f) would essentially require that future development attempt to proceed without eliminating the trail. It would not prohibit any and all future development in the area of the trail (cf. the outline of Section 4(f) at <https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/section-4f>). Indeed, if it were shown that elimination of the trail was *necessary* for aeronautical activities, then the Section 4(f) process would allow it. At worst, the Section 4(f) process would require more paperwork and planning in the future, if airport development conflicted with the trail location. Therefore, it seems that Section 4(f) would not in fact diminish the ability for the airport to be developed for aeronautical necessities at any point in the future.

Mr. Khera closes his letter as follows:

It is my sincere hope that this does not appear to be an **overly cautious** approach on our part. **Previous experiences** with airports across the United States have informed the FAA that we need to be vigilant in protecting our public airport lands...” [emphasis my own].

I respect Mr. Khera’s caution and vigilance. However, I would warn against haphazardly applying lessons learned from previous experiences with other airports. The situation in Petersburg is unique. The Petersburg airport is not a major hub, serving multiple cities or a greater metropolitan area. It serves a single small community, which barely even deserves the name “city”. There are only two Alaska Airlines flights in and out per day, and it is subject to some doubt whether we will even retain those two flights in the long-term, especially given the current fiscal climate.

Mr. Khera agrees that we cannot identify any future development that would conflict with the trail. The fact that we cannot identify such possible development should be reason enough to accept that the trail would not preclude any future necessary development of the airport.

Sincerely,

Casey Knight
caseyaknight@gmail.com
 907-650-7345



THE STATE
of **ALASKA**
GOVERNOR MIKE DUNLEAVY

Department of Transportation and
Public Facilities

DIVISION of PROGRAM DEVELOPMENT and STATEWIDE PLANNING
Juneau Field Office

P.O. Box 112500
Juneau, Alaska 99811-2500
Main: (907) 465-4070
Fax number: (907) 465-6984
dot.alaska.gov

February 14, 2020

Petersburg Indian Association
Attn: Susan E. Harai, PE/PLS,
Tribal Transportation Director
P.O. Box 1418
Petersburg, Alaska 99833

RE: Petersburg Indian Association Access Request, James A. Johnson Airport Trail

Dear Ms. Harai:

I am reaching out to you and the Petersburg Indian Association to introduce myself as the Aviation Planner for the Department of Transportation and Public Facilities (DOT&PF), Southcoast Region. As regional planner for airports and facilities, I support operations and management of public airports to meet current and future aeronautical needs in accordance with state and federal regulations and requirements. Sharyn Augustine has shared with me that the Petersburg Indian Association is interested in obtaining access to airport lands to construct a trail.

Petersburg James A. Johnson Airport is certificated under 49 CFR Part 139 of the Federal Aviation Regulations and is federally obligated through funding we receive from the FAA's Airport Improvement Program (AIP). As recipients of AIP grants, we are responsible for compliance with the grant assurances. One of these requires our preservation of all rights and powers necessary for ensuring the aeronautical utility of the airport. We cannot grant a land use which may limit expansion, revenue generation or future aeronautical use of the airport. You are correct regarding the fact that the current airport master plan does not indicate any development of the land where you propose to build a trail, but that does not mean the property is excess to the needs of the airport or that it should be put to other uses. Vacant land on airports serves a purpose in that it provides a buffer between airport operations and incompatible land uses.

The FAA Airport Compliance Manual, Order 5190.6B, guides our management of airport lands. It cautions against allowing non-aeronautical uses like you have proposed because they result in protections under 49 U.S. Code 303, Section 4(f). Once such a use is established, Section 4(f) protects that use and diminishes our ability to implement future airport development that is necessary for aeronautical activities. We may not have identified that development in our current plans, but we the airport is expected to be operating long into the future and will undoubtedly need things we cannot identify now.

"Keep Alaska Moving through service and infrastructure."

It is my sincere hope that this does not appear to be an overly cautious approach on our part. Previous experiences with airports across the United States have informed the FAA that we need to be vigilant in protecting our public airport lands and keep airports operating properly and efficiently for the traveling public.

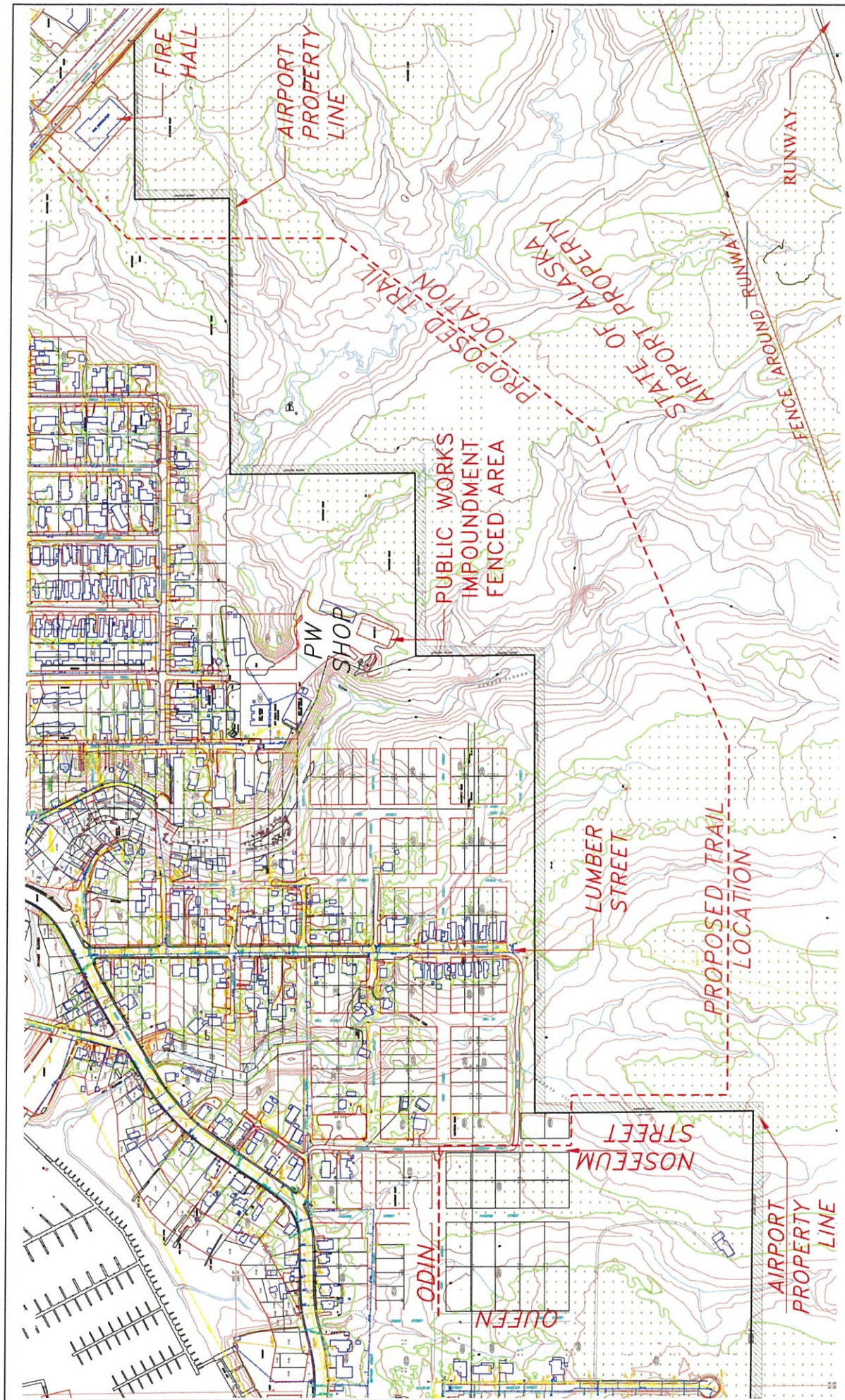
If you have any further questions on this matter, please feel free to email me at paul.khera@alaska.gov or call me at (907) 465-4445. Thank you!

Sincerely,



Paul Khera
Aviation Planner

- cc: Lance Mearig, Division Director
- Sharyn Augustine, Airport Leasing Specialist
- Barry Youngberg, Petersburg Airport Manager



PROPOSED TRAIL LOCATION
 FIRE STATION TO NOSEEUM STREET

SCALE: 1"=300'

Harai & Associates, Inc.
 28 January 2017

Chapter 20. Compatible Land Use and Airspace Protection

20.1. Background. Land use planning is an important tool in ensuring that land adjacent to, or in the immediate vicinity of, the airport is consistent with activities and purposes compatible with normal airport operations, including aircraft landing and takeoff. Ensuring compatible land use near federally obligated airports is an important responsibility and an issue of federal interest. In effect since 1964, Grant Assurance 21, *Compatible Land Use*, implementing Title 49 United States Code (U.S.C.) § 47107 (a) (10), requires, in part, that the sponsor:

“...take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which federal funds have been expended.”

Incompatible land use at or near airports may result in the creation of hazards to air navigation and reductions in airport utility resulting from obstructions to flight paths or noise-related incompatible land use resulting from residential construction too close to the airport.

Airports present a variety of unique challenges to those involved in community planning. Height restrictions are necessary in the vicinity of airports and airways for the protection of aircraft in flight. Residential housing and other land uses near airports must remain compatible with airports and the airport approach/departure corridors. Additional concerns include the airport’s proximity to landfills and wetlands that may result in hazards to air navigation created by flocks of birds attracted to the landfills or wetlands. Unusual lighting in the approach area to an airport can create a visual hazard for pilots. Also, land uses that obscure visibility by creating smoke or steam may be hazardous to flight. Each of these concerns must be addressed in community planning in order to maintain the safety of flight as well as the quality of life expected by community residents.

As communities continue to grow, areas that once were rural in nature can quickly become urbanized. A result of “urban sprawl” is the loss of open space and the resulting loss of airports and/or their utility. Many communities have relied upon their airports as an economic engine. Proximity of industrial parks and recreational areas has proven not only to be compatible, but to be mutually beneficial as well. Some communities have used the resources of an airport to contribute to the quality of life for the local community.

In addition to the basic economic value of the airport, the preservation of open space and the ability to accommodate emergency medical airlifts are specific examples of this contribution to the community. Increases in air travel are placing an increasing demand on the nation's airports. Environmental concerns and cost may prohibit the establishment of new airports. This means that to accommodate air traffic demand, maximum utility must be achieved from existing airports. For this to happen, the land use in the vicinity of airports must be reserved for compatible uses.



Incompatible land use is one of the most serious problems affecting aviation today. (Above is an aerial view of residential development near the Lancaster Airport in Pennsylvania.) Zoning ordinances should be reviewed to determine what uses are currently permitted around the airport and to find out if there have been any recent changes in zoning. It is important that local land use planners become involved in the airport's master planning process by providing input on the potential impacts that future airport development plans may have on their communities. Coordination between the airport and the zoning entities is extremely important to achieve a successful cohabitation between airport and community. (Photo: FAA)

Grant Assurance 21, *Compatible Land Use*, relates to the obligation of the airport sponsor to take appropriate actions to zone and control existing and planned land uses to make them compatible with aircraft operations at the airport. The FAA recognizes that not all airport sponsors have direct jurisdictional control over uses of property near the airport. However, for the purpose of evaluating airport sponsor compliance with the compatible land use assurance, the FAA does not consider a sponsor's lack of direct authority as a reason for the sponsor to decline to take any action at all to achieve land use compatibility outside the airport boundaries.

In all cases, the FAA expects a sponsor to take appropriate actions to the extent reasonably possible to minimize incompatible land. Quite often, airport sponsors have a voice in the affairs of the community where an incompatible development is located or proposed. The sponsor should make an effort to ensure proper zoning or other land use controls are in place.

20.2. Zoning and Land Use Planning.

a. Description. Zoning is an effective method of meeting the federal obligation to ensure compatible land use and to protect airport approaches. Generally, zoning is a matter within the authority of state and local governments. Where the sponsor does have authority to zone or control land use, FAA expects the sponsor to zone and use other measures to restrict the use of

09/30/2009

5190.6B

land in the vicinity of the airport to activities and purposes compatible with normal aircraft operations. Restricting residential development near the airport is essential in order to avoid noise-related problems.

Sponsors and local communities should consider adopting adequate guidelines and zoning laws that consider noise impacts in land use planning and development. Similarly, any airport sponsor that has the authority to adopt ordinances restricting incompatible land development and limiting the height of structures in airport approaches according to the standards prescribed in 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*, is generally expected to use that authority.

b. Guidance. There are a number of sources that can assist an airport sponsor in dealing with noise, obstructions, and other incompatible land uses. Some of these are:

- (1). *A Model Zoning Ordinance to Limit Height of Objects Around Airports*, Advisory Circular (AC) 150/5190-4A.
- (2). *Citizen Participation in Airport Planning*, AC 150/5050-4.
- (3). *Guidelines for Considering Noise in Land Use Planning and Control*, Federal Interagency Committee on Urban Noise, June 1980.
- (4). *Hazardous Wildlife Attractants on or Near Airports*, AC 150/5200-33B, August 28, 2007.
- (5). *Noise Control Planning*, FAA Order 1050.11A, January 13, 1986.
- (6). *Noise Control and Compatibility Planning for Airports*, AC 150/5020-1.
- (7). *Federal and State Coordination of Environmental Reviews for Airport Improvement Projects*. (RTF format) – Joint Review by Federal Aviation Administration and National Association of State Aviation Officials (NASAO), issued March 2002.
- (8). *Land Use Compatibility and Airports, a Guide for Effective Land Use Planning* (PDF format), issued by the FAA Office of Environment and Energy.
- (9). *Compatible Land Use Planning Initiative* (PDF format), 63 Fed. Reg. 27876, May 21, 1998.
- (10). *Draft Aviation Noise Abatement Policy 2000* (PDF format) 65 Fed. Reg. 43802, July 14, 2000.
- (11). *Airport Noise Compatibility Planning Toolkit – FAA’s Initiative for Airport Noise and Compatibility Planning*, issued by the FAA Office of Environment and Energy.

c. Master Planning and Zoning. The airport master planning process provides a means to promote land use compatibility around an airport. Incompatible land uses around an airport can affect the safe and efficient operation of aircraft. Within an airport’s noise impact areas,

residential and public facilities – such as schools, churches, public health facilities, and concert halls – are sensitive to high noise levels and can affect the development of the airport. Most commercial and industrial uses, especially those associated with the airport, are compatible with airports. An airport master plan is a published document approved by the governmental agency or authority that owns/operates the airport. The airport master plan should be incorporated into local comprehensive land use plans and used by local land use planners and airport planners to evaluate new development within the airport environs. Integration of airport master plans and comprehensive land use plans begins during the development of the master plan. Local municipalities surrounding the airport boundaries must be contacted to collect information on existing land uses in and around airports. Local comprehensive land use plans are also reviewed to determine the types of land uses planned for the future.

Additionally, sponsors should monitor local zoning ordinances to determine what uses are currently permitted around the airport and whether there have been any recent changes in zoning. It is important for local land use planners to become involved in the review and development of the airport’s master planning process. They can provide input on potential impacts that future airport development plans may have on communities surrounding the airport. Any conflicts or inconsistencies between airport development plans and the local comprehensive plans should be noted in the airport master plan. The information on future airport expansion and development contained in the airport’s master plan should be incorporated in the development of comprehensive land use plans or their subsequent updates or amendments to ensure land use compatibility with the airport. During the development of such plans, planners should coordinate and consult with the airport staff so that the airport’s future plans for expansion can be taken into consideration. Local land use planners should review the airport’s master plan to determine how future airport projects could affect existing and projected land uses around the airport. Other opportunities for coordination and communication between the airport and local planning agencies include the FAA noise compatibility planning process. (See chapter 13 of this Order, *Airport Noise and Access Restrictions*, for information on aircraft noise compatibility planning.)

Noise compatibility studies provide opportunities for input from airport users, local municipalities, communities, private citizens, and the airport sponsor on recommended operational measures and land use control measures that could minimize or prohibit the development or continuation of incompatible land uses. The airport master plan is also a tool to ensure that planning among federal, state, regional, and local agencies is coordinated. The incorporation and review of these plans provides for the orderly development of air transportation while protecting the public health, safety, and welfare. The legal structure of airport ownership will determine its power to regulate or influence land uses around the airport. Municipalities or counties with this regulatory authority need to be aware of existing and long-term airport development plans and the importance of using that authority to minimize development of incompatible land uses.

d. Reasonable Attempt. In cases where the airport sponsor does not have the authority to enact zoning ordinances, it should demonstrate a reasonable attempt to inform surrounding municipalities on the need for land use compatibility zoning. The sponsor can accomplish this through the dissemination of information, education, or ongoing communication with

09/30/2009

5190.6B

surrounding municipalities. Depending upon the sponsor's capabilities and authority, action could include exercising zoning authority as granted under state law or engaging in active representation and defense of the airport's interests before the pertinent zoning authorities. The sponsor may also take action with respect to implementing sound insulation, land acquisition, purchase of easements, and real estate disclosure programs or initiatives to mitigate areas to make them compatible with aircraft operations. Sponsors without zoning authority may also work to change zoning laws to protect airport interests.

e. Definition of Compatible Land Use. Compatibility of land use is attained when the use of adjacent property neither adversely affects flight operations from the airport nor is itself adversely affected by such flight operations. In most cases, the adverse effect of flight operations on adjacent land results from exposure of noise sensitive development, such as residential areas, to aircraft noise and vibration. Land use that adversely affects flight operations is that which creates or contributes to a flight hazard. For example, any land use that might allow tall structures, block the line of sight from the control tower to all parts of the airfield, inhibit pilot visibility (such as glaring lights, smoke, etc.), produce electronic aberrations in navigational guidance systems, or that would tend to attract birds would be considered an incompatible land use. For instance, under certain circumstances, an exposed landfill may attract birds. If open incineration is regularly permitted, it can also create a smoke hazard.

f. Definition of Concurrent Land Use. In some cases, concurrent land use can be an appropriate compatible land use. Concurrent land use means that the land can be used for more than one purpose at the same time. For example, portions of land needed for clear zone purposes could also be used for agriculture purposes at the same time, which would be consistent with Grant Assurance 21, *Compatible Land Use*.

g. Pre-existing Obstructions. (1) Historically, some airports were developed at locations where preexisting *structures* or natural terrain (for example, hilltops) would constitute an obstruction by currently applicable standards. If such obstructions were not required to be removed as a condition for a grant agreement, the execution of the agreement by the government constitutes a recognition that the removal was not reasonably within the power of the sponsor. (2) There are many former military airports that were acquired as public airports under the Surplus Property Act, where the existence of obstructions at the time of development was considered acceptable. At such airports where obstructions in the approach cannot feasibly be removed, relocated, or lowered, and where FAA has determined them to be a hazard, consideration may be given to the displacement or relocation of the threshold.

20.3. Residential Use of Land on or Near Airport Property.

a. General. The general rule on residential use of land on or near airport property is that it is incompatible with airport operations because of the impact of aircraft noise and, in some cases, for reasons of safety, depending on the location of the property. Nonetheless, the FAA has received proposals to locate residences immediately adjacent to airport property or even on the airport itself, as part of "airpark" developments. "Airpark" developments allow aircraft owners to reside and park their aircraft on the same property, with immediate access to an airfield. Proponents of airparks argue that airparks are an exception to the general rule because aircraft

owners will accept the impacts of living near the airport and will actually support the security and financial viability of the airport.

b. FAA position. The FAA considers residential use by aircraft owners to be no different from any residential use, and finds it incompatible with the operation of a public use airport. It is common for private airparks to impose restrictions on the use of the airfield, such as night curfews, because aircraft owners have the same interest as other homeowners in minimizing noise and sleep disturbances at home. The FAA has no problem with such restrictions at private unobligated airparks operated by the resident owners for their own benefit. At federally obligated public-use airports, however, the existence of the incompatible land use is not acceptable. First, aircraft owners are entitled to the same protection from airport impacts as any other residents of the community. Second, the likelihood that residents of an airpark will seek restrictions on the use of the airport for the benefit of their residential use is very high, whether or not they own aircraft. A federally obligated airport must provide reasonable access to all users. Restrictions on the use of the airport for the benefit of airpark residents is not consistent with the obligation to provide reasonable access to the public.

c. On-airport and off-airport residential use. The general policy against approval of on-airport and off-airport residential proposals is the same. There are, however, different considerations in the review and analysis of on-airport and off-airport land use. The FAA has received proposals for airparks or co-located homes and hangars both on the airport itself or off of the airport, with “through-the-fence” access.

20.4. Residential Airparks Adjacent to Federally Obligated Airports.

a. General. In several instances, the FAA has received requests from airport sponsors and developers interested in developing residential airparks adjacent to federally obligated airports. These types of development include “through-the-fence” access to the airport and generally include aircraft hangars or parking co-located with individual residences.

The FAA has no problem with private residential airparks since there is no federal obligation for reasonable access. Residential owners can limit access to the airport as they wish. However, FAA approval of such developments on federally obligated airports cannot be justified. First, residential property owners tend to seek to limit airport use consistent with their residential use, which is contrary to the obligation for reasonable public access to the airport. Second, developers can tend to view Airport Improvement Program (AIP) grants for the airfield as a subsidy of the development, increasing the value of the airpark development at no cost to the developer or residents. The FAA’s AIP program is not a funding mechanism for improving or subsidizing private and residential development.

Any residential use existing on the airport or any residential use granting “through-the-fence” access is an incompatible land use.

Any residential use on an airport or residential use granting “through-the-fence” access is an incompatible land use.

b. FAA Position. Permitting development of a residential airpark near a federally obligated airport, through zoning approval or otherwise, would be inconsistent with Grant Assurance 21, *Compatible Land Use*. The FAA expects sponsors to oppose zoning laws that would permit residential development near airports.

For this purpose, the FAA considers residential use to include: permanent or long-term living quarters; part-time or secondary residences; and developments known as residential hangars, hangar homes, campgrounds, fly-in communities or airpark developments – even when co-located with an aviation hangar or aeronautical facility.

Allowing residential development on federally obligated airports is incompatible with aircraft operations and conflicts with several grant assurance and surplus property requirements, as mentioned above. Residential development inside federally obligated airports is inconsistent with federal obligations regarding the use of airport property.

Accordingly, the FAA will not support requests to enter into any agreement that grants access to the airfield for the establishment of a residential airpark since that access would involve a violation of Grant Assurance 21, *Compatible Land Use*.

c. “Through-the-Fence.” Off-airport residential airparks are privately owned and maintained residential facilities. They are not considered aeronautical facilities eligible for reasonable access to a federally obligated airport. The airport sponsor is under no federal obligation to allow “through-the-fence” access for these privately



In several instances, the FAA has received requests from airport sponsors and developers interested in developing residential airparks adjacent to federally obligated airports. These types of development generally include residential hangar sites and a “through-the-fence” access to the airport. While these types of development have taken place at some private use airports, it does not provide the basis to justify FAA approval of such developments on federally obligated airports. Seen here is Spruce Creek in Florida. (Photo: CAP)

owned residential airparks. Allowing such access in most cases could be an encumbrance on the airport in conflict with Grant Assurance 5, *Preserving Rights and Powers*. In addition, residential hangars with “through-the-fence” access are considered an incompatible land use at federally obligated public use airports. (For additional information on “through-the-fence” agreements, see paragraph 12.7, “Agreements Granting ‘Through- the-Fence’ Access” in chapter 12 of this Order, *Review of Aeronautical Lease Agreements*.)

d. Releases. The FAA will not release airport property from its federal obligations so that it can be used for residential development. Also, the FAA will not release airport land for off-airport use with “through-the-fence” access to the airfield. Obligated airport land may not be released unless the FAA finds that it is no longer needed for airport purposes. Since the requested off-airport use would involve basic airport functions such as aircraft parking and taxiing, the FAA could not find that the property was no longer needed for an airport use. A request to release airport land for a residential airpark will be denied as inconsistent with both policies.

20.5. Residential Development on Federally Obligated Airports.

a. General. This guidance sets forth FAA policy regarding residential development on federally obligated airports, including developments known within the industry as residential hangars and airpark developments. FAA airports district offices (ADOs) and regional airports divisions are responsible for ensuring that residential developments are not approved when reviewing a proposed ALP or any other information related to the airports subject to FAA review. There is no justification for the introduction of residential development inside a federally obligated airport. It is the sponsor’s federal obligation not to make or permit any changes or alterations in the airport or any of its facilities that are not in conformity with the ALP, as approved by the FAA, and that might, in the opinion of the FAA, adversely affect the safety, utility, or efficiency of the airport.

b. Background. The FAA differentiates between a typical pilot resting facility or crew quarters and a hangar residence or hangar home. The FAA recognizes that certain aeronautical uses – such as commercial air taxi, charter, and medical evacuation services – may have a need for limited and short-term flight crew quarters for temporary use, including overnight and on-duty times. There may be a need for aircraft rescue and fire fighting (ARFF) quarters if there is a 24-hour coverage requirement. Moreover, an airport manager or a fixed-base operator (FBO)⁴⁵ duty manager may have living quarters assigned as part of his or her official duties. Living quarters in these cases would be airport-compatible if an airport management or FBO job requires an official presence at the airport at off-duty times, and if the specific circumstances at the airport reasonably justify that requirement.

However, other than the performance of official duties in running an airport or FBO, the FAA does not consider permanent or long-term living quarters to be an acceptable use of airport property at federally obligated airports. This includes developments known as airparks or fly-in

⁴⁵ A fixed-base operator (FBO) is a commercial entity providing aeronautical services such as fueling, maintenance, storage, ground and flight instruction, etc., to the public.

communities, and any other full-time, part-time, or secondary residences on airport property – even when co-located with an aviation hangar or aeronautical facility. While flight crew or caretaker quarters may include some amenities, such as beds, showers, televisions, and refrigerators, these facilities are designed to be used for overnights and resting periods, not as permanent or even temporary residences for flight crews, aircraft owners or operators, guests, customers, or the families or relatives of same.

The definition of flight crew is limited to those individuals necessary for the operation of an aircraft, such as pilot-in-command (PIC), second in command, flight engineer, flight attendants, loadmasters, search and rescue (SAR) flight personnel, medical technicians, and flight mechanics. It does not include the families, relatives, or guests of flight crewmembers not meeting the preceding definition.

An effort to obtain residential status for the development under zoning laws may indicate intent to build for residential use. Airport standards, rules, and regulations should prevent the introduction of residential development on federally obligated airports. The FAA expects the airport sponsor to have rules and regulations to control or prevent such uses, as well as to oppose residential zoning that would permit such uses since these uses may create hazards or safety risks between airport operations and nonaeronautical tenant activities. If doubts exist regarding the nature of a proposed facility, the airport sponsor may ask FAA to evaluate the proposed development. Also, the FAA may conduct a land use inspection to determine the true nature of the development; the FAA would then make a determination on whether the facility is compatible with the guidance provided herein.

c. Authority and Compliance Requirements. Allowing residential development, including airport hangars that incorporate living quarters for permanent or long-term use, on federally obligated airports is incompatible with airport operations. It conflicts with several grant assurance requirements.

Under Grant Assurance 5, *Preserving Rights and Powers*, an airport sponsor should not take any action that may deprive it of its rights and powers to direct and control airport development and comply with the grant assurances. The private interests of residents establishing private living can conflict with the interests of the airport sponsor to preserve its rights and powers to operate the airport in compliance with its federal obligations. It should not be assumed that the interests of the sponsor and that of a homeowner located on the airport will be the same or that because the homeowner owns an aircraft, he or she will automatically support the airport on all aviation activities. In addition, local laws relating to residences could restrict the airport operator’s ability to control use of airport land and to apply standard airport regulations.

Under Grant Assurance 19, *Operation and Maintenance*, airport sponsors will not cause or permit any activity or action that would interfere with the intended use of the airport for airport purposes. Permanent living facilities should not be permitted at public airports because the needs of airport operations may be incompatible with residential occupancy from a safety standpoint.

Under Grant Assurance 21, *Compatible Land Use*, airport sponsors, to the extent possible, must ensure compatible land use both on and off the airport. Residential development in the vicinity of airports may result in complaints from residents concerned about personal safety, aircraft noise, pollution, and other quality-of-life issues. Bringing residential development onto the airport, even in the form of residential hangars, increases the likelihood that quality-of-life issues may lead to conflicts with the airport sponsor and appeals for restrictions on aircraft operations. Moreover, an airport sponsor permitting on-airport residential living quarters will have greater difficulty convincing local zoning authorities to restrict residential development off-airport. Therefore, airport sponsors are encouraged to:

- (1). Explicitly prohibit the development of residential living quarters on the airport in all tenant leases and subleases.
- (2). Develop minimum standards that require the explicit advanced approval of all tenant subleases by the airport sponsor.
- (3). Include clauses in all tenant leases stating that unauthorized development of residential living quarters may be declared an event of default under the lease and that the airport sponsor may declare any noncomplying subleases null and void.
- (4.) Convert any existing living quarters into nonresidential use at the earliest opportunity, especially if the airport sponsor holds title to the living quarters.

d. Conclusion. Permitting certain on-airport development, including residential development, conflicts with several federal grant assurances and federal surplus property obligations. Such residential development may have some or all of the following undesirable consequences:

- (1). Aircraft noise complaints.
- (2). Proposed restrictions or limitations on aircraft and/or airport operations brought by the residential tenants.
- (3). The execution of easements, leases, and subleases that encumber airport property for nonaeronautical uses at the expense of aeronautical uses.
- (4). Increased likelihood of vehicle/pedestrian deviations (V/PDs) due to residents, guests, and unsupervised children unfamiliar with an operating airfield environment; unleashed pets roaming the airfield; and the interaction between private vehicles and aircraft that compromise safe airfield operations.
- (5). Increased public safety and legal liability risks, including fire hazards, if codes have been compromised by the co-location of residential living quarters within hangars and other aeronautical facilities.
- (6). Line-of-sight obstructions and operational limitations due to the greater height of two-story hangars.

09/30/2009

5190.6B

e. Summary. Residential development, either standing alone or collocated as part of a hangar or other aeronautical facility, is not an acceptable use of airport property under the federal grant assurances or surplus and nonsurplus property federal obligations. The ADOs and regional airports divisions have the responsibility for ensuring that residential development is not approved as part of a review of a proposed ALP and that airport property is not released for residential development.

20.6. through 20.10. reserved.

Sample Easement and Right-of-Way Grant

The easement and right of way hereby granted includes the continuing right in the Grantee to prevent the erection or growth upon Grantors' property of any building, structure, tree, or other object, extending into the air space above the aforesaid imaginary plane,

(OR USE THE FOLLOWING)

extending into the air space above the said Mean Sea level of (i.e., 150) feet,¹

(OR USE THE FOLLOWING)

extending into the air space above the surface of Grantors' property;¹

and to remove from said air space, or at the sole option of the Grantee, as an alternative, to mark and light as obstructions to air navigation, any such building, structure, tree or other objects now upon, or which in the future may be upon Grantors' property, together with the right of ingress to, egress from, and passage over Grantors' property for the above purposes.

TO HAVE AND TO HOLD said easement and right of way, and all rights appertaining thereto unto the Grantee, its successors, and assigns, until said (full name of airport) shall be abandoned and shall cease to be used for public airport purposes.

AND for the consideration hereinabove set forth, the Grantors, for themselves, their heirs, administrators, executors, successors, and assigns, do hereby agree that for and during the life of said easement and right of way, they will not hereafter erect, permit the erection or growth of, or permit or suffer to remain upon Grantors' property any building, structure, tree, or other object extending into the aforesaid prohibited air space, and that they shall not hereafter use or permit or suffer the use of Grantors' property in such a manner as to create electrical interference with radio communication between any installation upon said airport and aircraft, or as to make it difficult for flyers to distinguish between airport lights and others, or as to impair visibility in the vicinity of the airport or as otherwise to endanger the landing, taking off, or maneuvering of aircraft, it being understood and agreed that the aforesaid covenants and agreements shall run with the land.

In consideration of the premises and to assure Grantee of the continued benefits accorded it under this Easement, (name of mortgagee), owner and holder of a mortgage dated _____ and recorded _____ covering the premises above described, does hereby covenant and agree that said mortgage shall be subject to and subordinate to this Easement and the recording of this Easement shall have preference and precedence and shall be superior and prior in lien to said mortgage irrespective of the date of the making or recording of said mortgage instrument.²

² Local recordation and subordination practices must also be met. If subordination is necessary, in which case the mortgagee must join in the agreement, the above language is suggested.

FAIR DISCLOSURE STATEMENT

A disclosure statement, adhering to the form of the statement below, shall be provided to and signed by each potential purchaser of property within the Airport Influence Area as shown on the approved Airport Land Use Drawing. The signed statement will then be affixed by the Seller to the agreement of the sale.

The tract of land situated at

_____ in _____ (County and State), consisting of approximately _____ acres which is being conveyed from _____ to _____ lies within _____ miles of _____ (airport name) may be subjected to varying noise levels, as the same is shown and depicted on the official Zoning Maps.

CERTIFICATION

The undersigned purchaser(s) of said tract of land certify(ies) that (he) (they) (has) (have) read the above disclosure statement and acknowledge(s) the pre-existence of the airport named above and the noise exposure due to the operation of said airport.

SUGGESTED DISCLOSURE TO REAL ESTATE BUYERS

Customarily, someone will request a letter from the municipality about outstanding charges and assessments against a property. Something similar to this language, adapted for your airport, can be incorporated into a letter sent to buyers and title companies in preparation for closing.

"Please be advised that the subject property is located within the height restriction zone of the (blank) airport, or is located within a similar distance from the airport. It is conceivable that standard flight patterns would result in aircraft passing over (or nearly so) the property at altitudes of less than (blank) feet. Current airport use patterns suggest that the average number of takeoffs/touchdowns exceeds (blank) annually. A property buyer should be aware that use patterns vary greatly, with the possibility of increased traffic on (blank). The airport presently serves primarily recreational aircraft, and there are no current initiatives to extend any runway beyond the current (blank) length. Airport plans allow for runway extension in the future, which might impact the number and size of both pleasure and non-pleasure aircraft. Generally, it is not practical to redirect or severely limit airport usage and/or planned-for expansion, and residential development proximate to the airport ought to assume, at some indefinite date, an impact from air traffic."

09/30/2009

5190.6B

Sample FAA Position Letter on Residential Airparks - Page 1



U.S. Department of Transportation
Federal Aviation Administration

Office of Associate Administrator for Airports

800 Independence Ave., SW
Washington, DC 20591

AUG 29 2009

Mr. Hal Shevers
Chairman
Clermont County-Sporty's Airport
Batavia, OH 45103

Dear Mr. Shevers:

Thank you for your letter of July 18. In your letter, you suggested the Federal Aviation Administration promote developing residential airparks as a means to improve airport security and reduce the closure rate of general aviation airports. Residential airparks developed next to an airport usually rely on "through-the-fence" agreements to gain access to the airfield.

First, I would like to make clear that the FAA does not oppose residential airparks at private use airports. Private use airports are operated for the benefit of the private owners, and the owners are free to make any use of airport land they like. A public airport receiving Federal financial support is different, however, because it is operated for the benefit of the general public. Also, it is obligated to meet certain requirements under FAA grant agreements and Federal law. Allowing residential development on or next to the airport conflicts with several of those requirements.

An airpark is a residential use and is therefore an incompatible use of land on or immediately adjacent to a public airport. The fact there is aircraft parking collocated with the house does not change the fact that this is a residential use. Since 1982, the FAA has emphasized the importance of avoiding the encroachment of residential development on public airports, and the Agency has spent more than \$300 million in Airport Improvement Program (AIP) funds to address land use incompatibility issues. A substantial part of that amount was used to buy land and houses and to relocate the residents. Encouraging residential airparks on or near a federally obligated airport, as you suggest, would be inconsistent with this effort and commitment of resources.

Allowing an incompatible land use such as residential development on or next to a federally obligated airport is inconsistent with 49 USC §47104(a) (10) and associated FAA Grant Assurance 21, *Compatible Land Use*. This is because a federally obligated airport must ensure, to the best of its ability, compatible land use both off and on an airport. We would ask how an airport could be successful in preventing incompatible residential development before local zoning authorities if the airport operator promotes residential airparks on or next to the airport.

Additionally, residential airparks, if not located on airport property itself, require through-the-fence access. While not prohibited, the FAA discourages through-the-fence operations because

Sample FAA Position Letter on Residential Airparks - Page 2

they make it more difficult for an airport operator to maintain control of airport operations and allocate airport costs to all users.

A through-the-fence access to the airfield from private property also may be inconsistent with security guidance issued by the Transportation Security Administration (TSA). TSA created guidelines for general aviation airports: Information Publication (IP) A-001, *Security Guidelines for General Aviation Airports*. The TSA guidelines, drafted in cooperation with several user organizations including the Aircraft Owners and Pilots Associations (AOPA), recommend better control of the airport perimeter with fencing and tighter access controls. Accordingly, we do not agree with your view that a residential airpark and the associated through-the-fence access points can be said to improve airport security. In fact, multiple through-the-fence access points to the airfield could hinder rather than help an airport operator maintain perimeter security.

Finally, we find your statement that general aviation airports have been closing at an alarming rate to be misleading, because it is simply untrue with respect to *federally* obligated airports. In fact, the FAA has consistently denied airport closure requests. Of approximately 3,300 airports in the United States with Federal obligations, the number of closures approved by the FAA in the last 20 years has been minimal. The closures that have occurred generally relate to replacement by a new airport or the expiration of Federal obligations. AOPA has recognized our efforts. In its latest correspondence to the FAA on the *Revised Flight Plan 2006-2010*, AOPA stated, "the FAA is doing an excellent job of protecting airports across the country by holding communities accountable for keeping the airport open and available to all users."

For the above reasons, we are not able to support your proposal to promote the development of residential airparks at federally obligated airports.

I trust that this information is helpful.

Sincerely,

**Original signed by:
Woodie Woodward**

Woodie Woodward
Associate Administrator
for Airports

09/30/2009

5190.6B

THIS PAGE INTENTIONALLY LEFT BLANK



Section 4(f)

- [Overview of Section 4\(f\)](#)
- [Section 4\(f\) Compliance Process](#)
- [Federal Statutes and Guidance](#)

Overview of Section 4(f)

The Section 4(f) process as described in [49 U.S.C 303](#) states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. Section 4(f) has been part of Federal law in some form since 1966. In 1983, Section 4(f) of the DOT Act, (49 U.S.C, 1653f) was re-codified as 49 USC 303. Protection of parklands and historic sites, however, is still commonly referred to as the *Section 4(f) process*. The impacts of projects on historic and cultural resources are also regulated under the [Section 106 process](#).

Section 4(f) applies to all historic sites, but only to publicly owned parks, recreational areas, and wildlife and waterfowl refuges. Any project that affects Section 4(f) land must include a Section (4f) assessment. A transportation program or project requiring the use of such land will be approved only if there is no prudent and feasible alternative to using that land and if the program or project includes all possible planning to minimize harm to the land or resources.

49 U.S.C. 303 does not establish any procedures for preparing Section 4(f) documents, for circulating them, or for coordinating them with other agencies. The Federal Highway Administration (FHWA) has developed administrative procedures for the preparation, circulation and coordination of Section 4(f) documents. These are described in [FHWA's Section 4\(f\) Policy Paper](#). FTA recommends that the July 12, 2012 Section 4(f) Policy Paper be used as FTA guidance on Section 4(f) matters. The policies and procedures described in the paper are also recommended to be follow

by FTA Regional Offices and grant applicants to the extent they apply to projects proposed for FTA funding, per the [November 9, 2012 Memorandum](#) from FTA Headquarters office of Planning and Environment to all FTA Regional Administrators.

Section 4(f) Compliance Process

For projects that may have an effect on Section 4(f) lands the compliance process typically has three steps:

1. **Determining Significance.** For a property to be deemed *significant*, it must play an important role in meeting the objectives of a community in terms of the availability and functions of recreation, park or wildlife and waterfowl refuge areas. Significance is determined through consultation with the federal, state, or local officials having jurisdiction over the property. Once a property's significance has been determined, Section 4(f) prohibits both the actual taking of land from the protected property and *constructive use* of the property – where a project's *proximity* to the Section 4(f) resource substantially impairs the normal use of the land.
2. **Developing Alternatives.** Parklands are to be protected unless unusual factors or unique problems are present, or the cost, environmental impacts, or community disruption resulting from proposed alternatives are particularly large. In evaluating an alternative, one must consider whether the alternative uses Section 4(f) property, whether it is prudent and feasible, and to what extent it harms the resource. If several alternatives include the use of land from a Section 4(f) resource, the alternative which is prudent and feasible and that has the least overall impact on the resource, including mitigation measures, must be selected.
3. **Section 4(f) Evaluation.** Whenever Section 4(f) property is used for a project, documentation must be prepared that demonstrates that there are unique problems or unusual factors involved in the use of non-Section 4(f) alternatives, or that the costs and social, economic, and environmental impacts, or community disruption resulting from the alternatives are particularly large. The evaluation must contain the following information, developed by the applicant in cooperation with FTA:
 - ○ A description of the proposed action.
 - ○ A description of the resource.
 - ○ The impacts of each alternative on the resource.
 - ○ Alternatives to avoid using the resource.

- Measures to minimize harm.
- Coordination with the agency having jurisdiction over the Section 4(f) property.

Federal Statutes and Guidance

- [Part 774—Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites \(Section 4\(f\)\)](#) - Section 4(f) Regulation, 23 CFR Part 774
- [November 9, 2012 Memorandum](#) - FTA Memo recommending use of the FHWA Section 4(f) Policy Paper
- [FHWA Section 4\(f\) Legislation & Environmental Guidebook](#) - Establishes a national policy for the protection of public parks, historic sites, and public waterfowl and wildlife refuges.
- [Federal Highway Administration \(FHWA\) Section 4\(f\) Policy Paper, 1989](#) - Guidance on Section (4f) compliance process applicable to mass transportation projects.

Updated: Wednesday, March 16, 2016

Contact Us

Office of Planning & Environment

Federal Transit Administration
1200 New Jersey Avenue, SE
Washington, DC 20590
United States

Phone: 202-366-4033

Business Hours:
8:30 a.m.-5 p.m. ET, M-F

Share

[Submit Feedback >](#)

Chapter 22. Releases from Federal Obligations

22.1. Introduction. This chapter discusses the laws, regulations, policies, and procedures pertaining to sponsor requests for a release from federal obligations and land use requirements. The FAA Administrator's authority to grant a release depends on the type of obligating document, such as a property conveyance or grant agreement.



The FAA Administrator's authority to grant a release depends on the type of obligating document, such as a property conveyance or grant agreement. It also depends on the type of grant agreement, such as airport planning, noise mitigation, or airport improvement. Furthermore, the timing and circumstance of the particular document affects the Administrator's ability to grant a release. In all cases, the benefit to civil aviation is the FAA's prime concern. (Photo: CAP)

Any property, when described as part of an airport in an agreement with the United States or defined by an airport layout plan (ALP) or listed in the Exhibit "A" property map, is considered to be "dedicated" or obligated

property for airport purposes by the terms of the agreement. If any of the property so dedicated is not needed for present or future airport purposes, an amendment to, or a release from, the agreement is required.

In all cases, the benefit to civil aviation is the FAA's prime concern and is represented by various considerations. These include the future growth in operations; capacity of the airport; the interests of aeronautical users and service providers; and the local, regional, and national interests of the airport. It is the responsibility of the FAA airports district offices (ADOs) and regional airports divisions to review the release request and to execute the release document, if appropriate.

22.2. Definition. A "release" is defined as the formal, written authorization discharging and relinquishing the FAA's right to enforce an airport's contractual obligations. In some cases, the release is limited to releasing the sponsor from a particular assurance or federal obligation. In other cases, a release may permit disposal of certain airport property.

09/30/2009

5190.6B

22.3. Duration and Authority. When the duration of the physical useful life of a specific grant improvement ends, the sponsor is automatically released from its federal obligations for that grant without any formal action from the FAA. The physical useful life of such a facility extends to the time it is serviceable and useable with ordinary day-to-day maintenance. However, airport land acquired with federal assistance under the Airport Improvement Program (AIP) and/or conveyed as surplus or nonsurplus property is federally obligated in perpetuity (forever).

The Administrator has delegated to ADOs and regional offices the authority to release, modify, or amend assurances of individual sponsor agreements under specific circumstances as prescribed in this chapter. ADOs and regional airports divisions do not have the authority to modify the list of assurances in a grant agreement. In addition, ADOs do not have the authority to effect a release permitting the abandonment, sale, or disposal of a complete airport. (See Order 1100.5, *FAA Organization - Field*, issued February 6, 1989.)

22.4. FAA Consideration of Releases.

a. General. Within the specific authority conferred upon the FAA Administrator by law, the Administrator will, when requested, consider a release, modification, reform, or amendment of any airport agreement to the extent that such action has the potential to protect, advance, or benefit the public interest in civil aviation. Such action may involve only relief from specific limitations or covenants of an agreement or it may involve a complete and total release that authorizes subsequent disposal of federally obligated airport property. Major considerations in granting approval of a release request include:

- (1). The reasonableness and practicality of the sponsor's request.
- (2). The effect of the request on needed aeronautical facilities.
- (3). The net benefit to civil aviation.
- (4). The compatibility of the proposal with the needs of civil aviation.

Any release having the effect of permitting the abandonment, sale, or disposal of a complete airport must be referred to the Director of Airport Compliance and Field Operations (ACO-1) for approval by the Associate Administrator for the Office of Airports (ARP-1). (See Order 1100.5, *FAA Organization – Field*, issued February 6, 1989.)

b. Types of Federal Obligations. Generally, a sponsor can be federally obligated by the following actions:

- (1). Acceptance of a federal grant for an aeronautical improvement, including land for aeronautical use. Property listed on the Exhibit “A” of a grant agreement is obligated, regardless of how it was acquired or its purpose.
- (2). Acceptance of a conveyance of federal land.

09/30/2009

5190.6B

(3). Federal grants for a military airport program (MAP), for noise, and for planning. Planning grants contain a limited list of assurances and do not impose all of the obligations of a development grant.

(4). Acquisition of property with airport revenue, regardless of whether the property is on the Exhibit "A" or ALP.

(5). Designation of property for aeronautical purposes on an ALP. Once designated for aeronautical use, the property may not be used for nonaeronautical purposes without FAA approval.

c. Types of Release Requests. Various conditions and circumstances can affect the manner and degree of sponsor federal obligations and the procedures for release from these obligations. A sponsor can request different kinds and degrees of release, including the following general categories:

(1). Change in the use, operation, or designation of on-airport property.

(2). Release and removal of airport dedicated real or personal property or facilities for disposal and/or removal from airport dedicated use.

22.5. Request for Concurrent Use of Aeronautical Property for Other Uses.

If aeronautical land is to remain in use for its primary aeronautical purpose but also be used for a compatible revenue-producing nonaeronautical purpose, no formal release request is required. This is considered a concurrent use of aeronautical property and requires FAA approval. Aeronautical property may be used for a compatible nonaviation purpose while at the same time serving the primary purpose for which it was acquired. For example,



The FAA will consider releases from federal obligations, changes in use, and changes in designation according to the types of release requests in connection with the various federal obligations. In some cases, FAA's approval of a change in use is not a release of a specific federal obligation. Rather, it may represent FAA's concurrence with a sponsor's proposed change in use to eliminate any potential impact on a general federal obligation to provide aeronautical access and to operate and maintain infrastructure. For example, the FAA should not release property on the approach end of a runway if this results in a structure or construction that would impact the airport. As shown here, the highway on the lower left corner of the photograph has resulted in an extensive displaced threshold, diminishing the utility of the airport. (Photo: CAP)

there may be concurrent use of runway clear zone land and low growing crops to generate revenue.

Airport sponsors considering requests to use airport land for recreational purposes who are planning future airport development projects should assess potential applicability of section 4(f) of the Department of Transportation Act of 1966 (49 United States Code (U.S.C.) § 303).^{49 50}

Airport sponsors considering requests to use airport land for recreational purposes who are planning future airport development projects should assess potential applicability of section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C., recodified at section § 303).

a. Surplus Property Land and Concurrent Use. In some cases, surplus property land is designated as aeronautical use by its transfer documents. If so, a sponsor must request a release of its federal obligation to use such land for aeronautical purposes if it wishes to use it for nonaeronautical purposes exclusively. However, if the sponsor will continue to use the land for its primary aeronautical function, then a compatible nonaeronautical use could be considered a concurrent use. Such a concurrent use would not require a release from the surplus property requirement.

The FAA should review such concurrent use to ensure it is compatible with the primary aeronautical use of the surplus property land. FAA should also confirm that nonaeronautical use does not prevent the use of the land for needed aeronautical support purposes. Surplus property designated for aeronautical use should not be approved for concurrent nonaeronautical use if such use degrades – or potentially degrades – the aeronautical utility of the parcels in question.

b. Grant Land and Concurrent Use. Land purchased pursuant to an FAA grant is presumed to be in pursuit of an aeronautical purpose. However, some grant land may be suitable for concurrent use. Requests to use grant land for concurrent use should be approved by FAA. This consent can be in the form of an amendment to an ALP. Grant land may be used for a compatible nonaviation purpose while at the same time serving the primary purpose for which it was acquired.

⁴⁹ Department of Transportation (DOT) Section 4(f) property refers to publicly owned land of a public park, recreation area, wildlife or waterfowl refuge, or historic site of national, state, or local significance. It also applies to those portions of federally designated Wild and Scenic Rivers that are otherwise eligible as historic sites or that are publicly owned and function as – or are designated in a management plan as – a significant park, recreation area, or wildlife and waterfowl refuge. (See 49 U.S.C. § 303.)

⁵⁰ See 23 CFR § 774.11(g) and FHWA and FTA Final Rule; Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites, 73 F.R. 13368-01, March 12, 2008 (Interpreting DOT Section 4(f) not to apply to temporary use of airport property.)

As with surplus property, grant land designated for aeronautical use should not be approved for concurrent nonaeronautical use if such use degrades – or potentially degrades – the aeronautical utility of the parcels in question.

22.6. Request for Interim Use of Aeronautical Property for Other Uses. The ADOs and regional airports divisions may consent to the interim use (not more than five (5) years) for nonaviation purposes of dedicated aeronautical land. This is the case whether or not the land was acquired with grant funds, is surplus property, or is otherwise dedicated for aeronautical use. A request for a use that would exceed three (3) years should be subject to concurrent use guidelines. FAA approval shall not be granted if the FAA determines that an aeronautical demand is likely to exist within the period of the proposed interim use.

Aeronautical demand might be demonstrated by the existence of a qualified aeronautical service provider expressing interest in such property for aeronautical use, or by projected growth in airport operations. Interim use should not be incompatible with current or foreseen aeronautical use of the property in question or other airport property. If the land in question is grant land, FAA consent or approval must be based on a determination that the property as a whole has not ceased to be used or needed for airport purposes within the meaning of the applicable statute.

Interim use represents a temporary arrangement for the use of airport land for nonaeronautical purposes. Therefore, it must be anticipated that the interim use will end and the land will be returned to aeronautical use. If a proposed nonaeronautical use will involve granting a long-term lease or constructing capital improvements, it will be difficult – if not impossible – to recover the land on short notice if it is needed for aeronautical purposes. Such a use is not interim and should not be treated as such. Therefore, interim use should not be approved if the proposed use will prevent the land from being recovered on short notice for airport purposes. Interim use proposals should be carefully evaluated to ensure that what is being proposed as a temporary arrangement is not really a long-term or permanent change in land use.

The ADOs and regional airports divisions may consent to the interim use of dedicated aeronautical property for nonaviation purposes. Regardless of how the property was acquired, these FAA offices have the authority to decide whether the airport may use such property for nonaeronautical purposes or not.

22.7. Release of Federal Maintenance Obligation. A partial release may be granted to an airport sponsor to remove the obligation to maintain specific areas of the airport pursuant to Grant Assurance 19an, *Operation and Maintenance*. Such circumstance would occur when airport facilities are no longer needed for civil aviation requirements. It is unlikely that a total release would be granted under the circumstances. Note that a release from the maintenance obligation is not a release from all the terms of Grant Assurance 19 since many of the obligations in that assurance apply to the airport as a whole.

a. Other Terms. A release of the federal maintenance obligation does not constitute a release of the land from other applicable terms and conditions or covenants with the applicable compliance agreements. The most common example of such a release is when airport sponsors request the FAA to release a particular parcel of land or facility from the federal obligation dedicating it to aeronautical use. This, in turn, may permit revenue producing nonaeronautical use of the parcel. The same result can be obtained without a formal maintenance obligation release, simply by approving a change to the ALP showing the parcel in question as nonaeronautical.

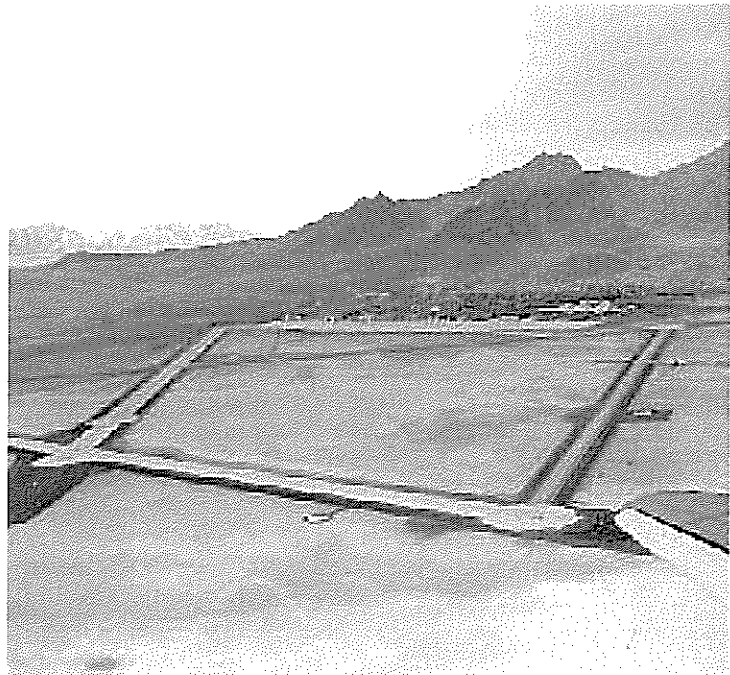
b. Unsafe. When it becomes unsafe for aeronautical purposes, the airport sponsor may have to discontinue an aviation use (i.e., a dilapidated taxiway). FAA's Flight Standards office should be involved in all matters related to decisions dealing with, or relying upon, a safety assessment. If the airport sponsor no longer requires the use of the runway, it must seek a release from Grant Assurance 19, *Operation and Maintenance*.

22.8. Industrial Use Changes.

Certain surplus property restrictions prohibiting the use of the property as an industrial plant, factory, or similar facility have been repealed by Public Law (P.L.) No. 81-311. The FAA will issue the releases or corrections to eliminate restrictions that may have been repealed or modified by laws, such as these industrial use restrictions.

22.9. Release of National Emergency Use Provision (NEUP).

a. General. Practically all War Assets Administration (WAA) Regulation 16 and P.L. No. 80-289 instruments of disposal of real and related personal property also contain the National Emergency Use Provision (NEUP). Under this provision, the United States has the right to make exclusive or nonexclusive use of the airport or any portion thereof during a war or national emergency. This provision is similar in all such instruments.



A request for release of the NEUP should be limited to parcels that are no longer needed for aviation purposes. The NEUP represents the U.S. Government's interest and ability to reactivate an airport as a military facility in case of war or national emergency. This provision has been used several times. One example is the former Naval Air Station (NAS) Miami, which in 1952 was reactivated as a Marine Corps Air Station during the Korean War. The Navy Department took over the facility from its civilian sponsor from 1952 through 1958, after which it was returned to civilian control. In other cases, old World War II installations decommissioned after the War were never reactivated. Since many had excessive parcels of land, such as the one depicted here, the FAA has granted several releases for disposal over the years and, if permitted by DoD, released the NEUP as well. (Photo: USAF)

(See a sample NEUP legal description and release request at the end of this chapter.)

b. Procedures. The FAA may grant a release from this provision, which is often referred to as the recapture clause. When requesting a release of the NEUP clause, the airport sponsor must provide the FAA with adequate information, including property drawings and property description, in duplicate. However, the concurrence of the Chairman of the Department of Defense (DoD) Airports Subgroup Office [HQ USAF/XOO-CA, 1480 Air Force Pentagon, Room 4D1010, Washington DC 20330-1480] is also required. FAA must make the request to DoD.

The FAA regional airports division will forward the documentation required to the FAA headquarters Airport Compliance Division (ACO-100). If approved, ACO-100 will then request DoD's concurrence. Upon receipt of DoD concurrence, ACO-100 will forward the determination to the FAA regional airports division for release of the NEUP.

The FAA regional airports division must provide a copy of the release instrument to the appropriate Army Corps of Engineers District Engineer's office. The FAA will not approve a request for release of the NEUP involving the whole airport. In addition, DoD generally does not concur with a request for release of the NEUP if the release involves actual runways, taxiways, or aprons. A request for release of the NEUP should be limited to parcels that are no longer needed for aviation purposes.

The NEUP represents the U.S. Government's interest in and ability to reactivate an airport as a military facility in case of war or national emergency. This provision has been used several times. One example is the former Naval Air Station (NAS) Miami, which in 1952 was reactivated as a Marine Corps Air Station during the Korean War. The Navy Department took over the facility from its civilian sponsor from 1952 and 1958, after which it was returned to civilian control.

In other cases, old World War II installations decommissioned after the war were never reactivated. Since many had excessive parcels of land, the FAA granted several releases for disposal over the years and, when permitted by DoD, released the NEUP as well.

22.10. Release from Federal Obligation to Furnish Space or Land without Charge. FAA may release a sponsor from Grant Assurance 28, *Land for Federal Facilities*. Before granting this release, the ADO or regional airports division should evaluate all pertinent facts and circumstances and obtain concurrence from other offices within the FAA such as Air Traffic and Airways Facilities, the National Oceanic and Atmospheric Administration (NOAA), or other interested and qualified federal entities. The office may accomplish the release either by discharging the sponsor from the assurance or through an amendment to the grant agreement.

22.11. Release of Reverter Clause. In order to promote appropriate private investment in airport facilities, the sponsors of surplus property may seek to remove a provision giving the United States the option to revert title to itself in the event of default of the sponsor to the conditions of its surplus property federal obligations. This reverter clause is an important remedy intended to be reserved to the United States Government; it will not normally be released

09/30/2009

5190.6B

and the ADOs cannot grant such a release. Any such proposal to release the sponsor from the reverter clause shall be referred to ACO-1 for consideration.

22.12. Exclusive Rights Federal Obligations cannot be Released without Release and Disposal of the Parcel or Closure of Airport. Any airport that has received federal assistance is subject to the exclusive rights provision discussed in chapter 8 of this Order, *Exclusive Rights*. This federal obligation exists for as long as the airport is used as an airport. Therefore, there is no provision for a release from this federal obligation without disposal of the parcel involved or disposal of the entire airport.

22.13. Federal Obligations Imposed with the Airport Layout Plan and Exhibit "A." A sponsor has a federal obligation to maintain an up-to-date ALP and is required to present an accurate Exhibit "A" upon the execution of a federal grant. The sponsor is required to continue developing the airport according to the approved land uses associated with those documents and in accordance with proposed changes submitted to the ADO or regional airports division for consideration, documentation, and approval.

22.14. Procedures for Operational Releases or Requests for Change in Use. For releases other than land, the sponsor must begin with a formal request signed by an authorized official. Although a specific format is not required, the request should include the following:

- a. Affected agreement(s)/ federal agreements.
- b. Modification requested.
- c. Need for the modification.
- d. Facts and circumstances that justify the request.
- e. State and local law pertinent to the document.
- f. Description of facilities involved.
- g. Source of funds for the facility's original acquisition.
- h. Present condition of facilities.
- i. Present use of facilities.

22.15. Release of Federal Obligations in Regard to Personal Property, Structures, and Facilities. Personal property, structures, and facilities may have been acquired through a federal surplus property conveyance, a federal grant, or through purchase with airport revenue. Personal property, structures, or facilities acquired with federal assistance require a release or federal procedure. Personal property, structures, or facilities acquired through nonfederal sources and not using airport revenue do not require a release or federal procedure. Nonetheless, these items of personal property, structures, or facilities should be considered assets of the airport account.

a. Surplus Property Releases of Personal Property, Structures, and Facilities. Surplus airport property falling into the categories of personal property, structures, and facilities may be released from all inventory accountability (whether or not the airport at which they are located is included in chapter 13, *Civil Airports Required by Department of Defense for National*

09/30/2009

5190.6B

Emergency Use, of FAA Order 5190.2R, *List of Public Airports Affected by Agreements with the Federal Government*) when it has been determined that such property acquired with federal funds:

- (1). Is beyond its useful life;
- (2). Has deteriorated beyond economical repair or rehabilitation;
- (3). Is no longer needed;
- (4). Has been replaced;
- (5). Is to be traded to obtain similar or other property needed for the airport;
- (6). Has been destroyed or lost by fire or other uncontrollable cause and the ensured value, if any, has been credited to the airport fund; or
- (7). Has been, or should be, removed or relocated to permit needed airport improvement or expansion, including salvage or other use, elsewhere on an airport.

b. Abandonment, Demolition, or Conversion of Grant Funded Improvements. The FAA may grant a release that permits the sponsor to abandon, demolish, or convert property (other than land) before the designated useful life expires. The ADO or regional airports division may grant the release when any of the following apply:

- The facility is no longer needed for the purpose for which it was developed.
- Normal maintenance will no longer sustain the facility's serviceability.
- The facility requires major reconstruction, rehabilitation, or repair.

c. Disposal of Grant Funded Personal Property. Grant funded personal property should be maintained on the sponsor's inventory for the useful life of the specific equipment. The federal obligation regarding personal property expires with the useful life of the specific piece of property. Should the sponsor desire to dispose of personal property prior to the expiration of its useful life, it should consult with the ADO or regional airports division prior to seeking release from its obligations.

d. Reinvestment of Federal Share. After the FAA has determined that a release of grant funded improvements is appropriate and that the release serves the interest of the public in civil aviation, the FAA may require the sponsor, as a condition of the release, to reimburse the federal government or reinvest in an approved AIP eligible project. The amount to be reimbursed or reinvested is an amount representing the unamortized portion of the useful life of the federal grant remaining at the time the facility will be removed from aeronautical use. Special circumstances involving the involuntary destruction of the improvement or equipment would be an exception. Depreciation of personal property may follow a different formula related to its

useful life or actual value. The FAA will require a specific project or projects and a timeline for completion for reinvestment in a new AIP eligible project.

All land described in a project application and shown on an Exhibit "A" constitutes the airport property federally obligated for compliance under the terms and covenants of a grant agreement. A sponsor is federally obligated to obtain FAA consent to delete any land described and shown on the Exhibit "A."

22.16. All Disposals of Airport Real Property. All land described in a project application and shown on an Exhibit "A" constitutes the airport's federally obligated property. A sponsor is federally obligated to obtain FAA consent to delete any land described and shown on the Exhibit "A."

FAA consent shall be granted only if it is determined that the property is not needed for present or foreseeable public airport purposes. When federally obligated land is deleted, the Exhibit "A" and the approved ALP should be revised as appropriate. Where the action involves the deletion of land not acquired with federal financial assistance, there is no required reimbursement of grant revenues. However all proceeds are treated as airport revenue. Also, the airport account must receive fair market value (FMV) compensation for all deletions of airport real property from the airport (i.e., from Exhibit "A") even if the sponsor does not sell the property or sells the property below fair market value.



After airport property is released, there are continuing restrictions on the released property. The ADO or regional airports office must include in any deed, lease, or other conveyance of a property interest to others a restriction that (a) prohibits the erection of structures or growth of natural objects that would constitute an obstruction to air navigation, and (b) prohibits any activity on the land that would interfere with, or be a hazard to, the flight of aircraft over the land or to and from the airport, or that interferes with air navigation and communication facilities serving the airport. The photo above, taken from one of Cincinnati Lunken Airport's runways, illustrates the clear runway safety areas (RSAs) resulting from not permitting the erection of obstacles near runways. (Photo: FAA)

a. Continuing Right of Flight over all Airport Land Disposals. A total release permitting sale or disposal of federally obligated land must specify that the sponsor is obligated to include in any deed, lease, or other conveyance of a property interest to another a reservation assuring the public rights to fly aircraft over the land released and to cause inherent aircraft noise over the land released. The following language must be used:

This is hereby reserved to the (full name of the grantor or lessor), its successors and assigns, for the use and benefit of the public, a right of flight for the passage of aircraft in the airspace above the surface of the premises herein (state whether conveyed or leased). This public right of flight shall include the right to cause in said airspace any noise inherent in the operation of any aircraft used for navigation or flight through the said airspace or landing at, taking off from, or operation on the (official airport name).

b. Continuing Restrictions on Released Property. The ADO or regional airports division must include in any deed, lease, or other conveyance of a property interest to others a restriction that:

(1). Prohibits the erection of structures or growth of natural objects that would constitute an obstruction to air navigation.

(2). Prohibits any activity on the land that would interfere with or be a hazard to the flight of aircraft over the land or to and from the airport, or that interferes with air navigation and communication facilities serving the airport. These restrictions are set forth in the instrument of release and identify the applicable height limits above which no structure or growth is permitted. The airport sponsor will compute these limits according to the currently effective FAA criteria as applied to the airport. The ADO, regional airports division, and airport sponsor will not incorporate advisory circulars, design manuals, Federal Aviation Regulations (found in Title 14 Code of Federal Regulations (CFR)), or other such documents by reference in the instruments or releases issued by the FAA in lieu of actual computed limits.

22.17. Release of Federal Obligations in Regard to Real Property Acquired as Federal Surplus Property.

Airport sponsors receive surplus real property in many various sizes and shapes. Often the property is not ideally sized or arranged to serve the evolving needs of the airport. Adjustments can be made that benefit the airport. The airport sponsor must convince the FAA that its plans for the use, and possible disposal, of surplus property benefit the airport.

a. General Policy. A total release permitting the sale and disposal of real property acquired for airport purposes under the Surplus Property Act shall not be granted unless it can be clearly shown that the disposal of such property will benefit civil aviation. If any such property is no longer needed to support an airport purpose or activity directly (including the generation of revenue for the airport), the property may be released for sale or disposal upon a demonstration that such disposal will produce an equal or greater benefit (to the airport or another public airport) than the continued retention of the land.

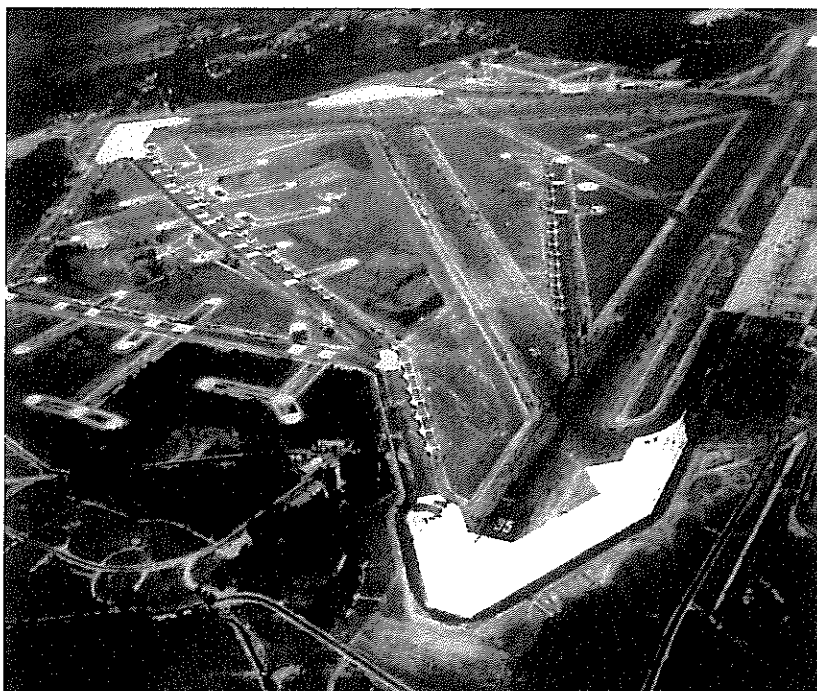
09/30/2009

5190.6B

In no case shall a release be granted unless the FAA determines that the land involved can be disposed of without adversely affecting the development, improvement, operation, or maintenance of the airport where the land is located. Any approved disposal must not be in excess of the present and foreseeable needs of the airport. Such a release has the effect of authorizing the conversion of a real property asset into another form of asset (cash or physical improvements) that better serves the purpose for which the real property was initially conveyed. This objective is not met unless an amount equal to the current fair market value (FMV) of the property is realized as a consequence of the release and such amount is committed to airport purposes.

b. Purpose of Release. The airport owner requesting a release of surplus airport land must identify and support the reason for which the release is requested. One justification of a release could be a showing that the expected net proceeds from the sale of the property at its current market value will be required to finance items of airport development and improvement where that need has been confirmed with FAA concurrence.

The FAA may consider requests for release from sponsors demonstrating that more value may be obtained from a disposal of specific parcels than the retention of those parcels for revenue production under leasing. Such a proposal would need to overcome the preference for holding surplus property land and leasing it for aeronautically compatible purposes that also generate airport revenue. Special care should be applied to ensure that no property that could be used for aeronautical purposes,



In no case shall a release be granted unless the FAA determines that the land involved can be disposed of without adversely affecting the development, improvement, operation, or maintenance of the airport where the land is located. Any approved disposal must be in excess of the present and foreseeable future needs of the airport. Such a release has the effect of authorizing the conversion of a real property asset into another form of asset (cash or physical improvements) that better serves the purpose for which the real property was initially conveyed. Special care should be applied to ensure that no property that could be used for aeronautical purposes, including aeronautical protection, is released. This 1944 photograph of Grenier Field in New Hampshire, which is Manchester Airport today, clearly shows how important it is to apply the release process with caution. Unused land belonging to the base might be released and, over time, incompatible land uses could take hold. Today, Manchester airport is significantly encroached upon. (Photo: USAF)

09/30/2009

5190.6B

including aeronautical protection, is released.

c. Determining Fair Market Value. A sale and disposal of airport property for less than its fair market value is inconsistent with the intent of the statute and shall not be authorized. The value to be placed on land for which a release has been requested shall be based on the present appraised value (for its highest and best use) of the land itself and any federal improvements initially conveyed with the property.

In many cases, the original buildings and improvements may have outlived their useful life and a determination may have been made by FAA that no further federal obligation to preserve or maintain them exists. If they have been replaced under such circumstances, or if additional improvements have been added without federal financing, the value of such improvements does not need to be included in the appraisal for purposes of determining the fair market value of the surplus property. However, the value realized from the disposal of any improvement owned by the airport sponsor must be treated as airport revenue.

d. Appraisals. A release authorizing the sale and disposal of airport land shall not be granted unless the fair market value has been supported by at least one independent appraisal report acceptable to the FAA. Appraisals shall be made by an independent and qualified real estate appraiser. The requirement for an appraisal may be waived if the FAA determines that:

(1). The approximate fair market or salvage value of the property released is less than \$25,000;

or

(2). The property released is a utility system to be sold to a utility company and will accommodate the continued airport use and operational requirements;

or

(3). It would be in the public interest to require public advertising and sale to the highest responsible bidder in lieu of appraisals.

e. Application of Proceeds from the Sale of Surplus Real Property. Title 14 CFR Part 155.7(d) requires that any release of airport land for sale or disposal shall be subject to a written commitment of the airport sponsor to receive a fair market value for the property. FAA shall not issue a release without this commitment. Part 155 can be found in Appendix K of this Order.

(1). The net proceeds realized from the sale of surplus property – or the equivalent amount if the property is not sold – must be placed in an identifiable interest bearing account to be used for the purposes listed in (2) below.

(2). The proceeds of sale must be used for one or more of the following purposes as agreed to by FAA and reflected in the supporting documentation for the deed of release:

(a). Eligible items of airport development set forth in the current airport grant program and reflected in the airport's capital improvement program (CIP).

(b). Any aeronautical items of airport development not eligible under the grant program.

(c). Retirement of airport bonds that are secured by pledges of airport revenue, including repayment of loans from other federal agencies.

(d). Development of common use facilities, utilities, and other improvements on dedicated revenue production property that clearly enhances the revenue production capabilities of the property.

(3). All aeronautical improvements funded by the proceeds of sale will be accomplished in accordance with current applicable FAA design criteria or such state standards as have been approved by the FAA.

(4). Any interest earned by the account holding the proceeds of sale may be used for the operating and maintenance of the aeronautical portion of the airport or to enhance the revenue producing capability of the aeronautical activities at the airport.

22.18. Release of Federal Obligations in Regard to Real Property Acquired with Federal Grant Assistance.

The FAA grants funds for the purchase of real property for aeronautical use. Over time, however, such acquisitions may result in parcels that are no longer needed for aeronautical use. A sponsor may then (a) be released by FAA from the responsibility to maintain a grant-acquired parcel for its originally intended aeronautical use (making it available for nonaeronautical use to generate airport revenue), (b) be released by FAA to use the parcel for a concurrent or interim nonaeronautical use to generate airport revenue, or (c) be released by FAA to dispose of the parcel at fair market value.

Also, grant-acquired real property can be exchanged for other property not held by the sponsor but that serves an airport purpose more effectively than the originally acquired parcel. However, a grant land swap cannot result in a net loss in the value of the federal interest in the grant land.


Federal Aviation Regulations

PART 155

**Release of Airport Property
from Surplus Property Disposal Restrictions**

Published December 1974

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION



Title 14 CFR Part 155.7(d) requires that any release of airport land for sale or disposal shall be subject to a written commitment of the airport owner to receive a fair market value for the property.

Federal obligations of the grant land should be formally released and transferred to the new parcel.

22.19. Effect of not Receiving or Receiving a Grant after December 30, 1987.

a. Not Receiving a Grant after December 30, 1987.

(1). Applicability. This paragraph is applicable to any request for release for sale or disposal of any airport land acquired with funds from the Federal Aid to Airports Program (FAAP), the Airport Development Aid Program (ADAP), or the Airport Improvement Program (AIP) and where the sponsor has not received additional grants after December 30, 1987. A sponsor's request must assure that the federal government shall be reimbursed or the federal share of the net proceeds will be reinvested (a) in the airport, (b) in a replacement airport, or (c) in another operating public airport.

(2). Reimbursement. The requirement for reimbursement shall apply only where there is no alternative to invest in a replacement or operating public airport owned or to be owned by the sponsor. However, the sponsor may elect to reinvest the federal share of the net proceeds in any other grant-obligated public airport by contract between the respective airport owners with FAA concurrence. FAA concurrence in such a contract is contingent upon such funds being used for grant-eligible airport development. Except where the grant agreement specifically provides otherwise (by special condition), the amount to be reimbursed shall be the amount of the federal share of the grant times the net proceeds from sale of the property at its current fair market value.

(3). Reinvestment. Reinvestment of the total net proceeds (both federal and sponsor share) is required if the sponsor continues to own or control – or will own or control – a public airport or a replacement public airport. Reinvestment shall be accomplished within five (5) years (or a timeframe satisfactory to the FAA Administrator) for specified items of airport improvement in the order of priority established for releases of surplus airport property in paragraph 22.17.e above.

Unlike surplus property, the purposes for which land was acquired under FAAP/ADAP/AIP did not include nonaeronautical income production. If reinvestment cannot be accomplished within five (5) years or if the net proceeds derived exceed the cost of grant-eligible airport development, reimbursement of the remaining share will be required.

b. Receiving a Grant after December 30, 1987.

(1). Land for Airport Purposes (Other than Noise Compatibility Purposes). A sponsor entering into a grant after December 30, 1987, under the Airport and Airway Improvement Act of 1982 (AAIA), as amended by the Airport and Airway Safety and Capacity Expansion Act of 1987 (1987 Airport Act), is to dispose of land at fair market value when the land is no longer needed for airport purposes. This also applies to land purchased under FAAP/ADAP/AIP after December 30, 1987. The federal share of the sale proceeds of the land is to be deposited into the Trust Fund. The sponsor will retain or reserve an interest in the land to ensure it will be used only for purposes compatible with the airport.

(2). Land for Noise Compatibility Purposes.

A sponsor entering into a grant after December 30, 1987, under the AAIA, as amended by the 1987 Airport Act, will dispose of noise land at fair market value when the land is no longer needed for noise compatibility purposes. This also applies to land purchased under FAAP/ADAP/AIP. An interest or right shall be reserved in the land to ensure it will be used only for purposes that are compatible with the noise levels generated by aircraft. The portion of the disposal proceeds that represent the federal government's share is to be reinvested in another approved noise compatibility project, reinvested in an approved airport development project or deposited into the Trust Fund. Disposal of noise land



For a request to release an entire airport that is to be replaced by another new or existing airport, the general policy is to treat the proposal as a trade-in of the land and facilities developed with federal aid at the old airport toward the acquisition and development of better facilities at the new airport. (Photo: FAA)

may be by sale, long-term lease, or exchange. (See Program Guidance Letter (PGL) 08-2, Management of Acquired Noise Land: Inventory – Reuse – Disposal, dated February 8, 2008, updated March 26, 2009 (available on the FAA web site).

22.20. Release of Entire Airport.

a. Approval Authority. The FAA Associate Administrator for Airports (ARP-1) is the FAA approving official for a sponsor’s request to be released from its federal obligations for the purpose of abandoning or disposing of an entire airport before disposal can occur. That authority is not delegated. A copy of the sponsor's request, including related exhibits and documents, and a copy of the FAA Airports regional statement supporting and justifying the proposed action shall be provided to ARP-1.

b. Replacement Airport. In the instance of a disposal of an entire airport that is to be replaced by a new or replacement airport, the general policy is to treat the proposal as a trade-in of the land and facilities developed with federal aid at the old airport for the acquisition and development of better facilities at a new or replacement airport.

09/30/2009

5190.6B

Release under these circumstances is contingent upon transferring federal grant obligations to the new or replacement airport. The release would become effective upon the transfer of the federal grant obligations to the new airport, when the new airport becomes operational. Development costs for the new airport in excess of the value from the disposal of the old airport would be eligible for AIP assistance. In these circumstances, the availability of a new and better airport is the basis for determining that the old one is no longer needed and that its useful life has expired. The original grant agreement is then terminated with the transfer of the grant obligations. (See Appendix T of this Order, *Sample FAA Letter on Replacement Airport*, regarding replacement airport.)

22.21. Procedures for the Application, Consideration, and Resolution of Release Requests.

The ADO or regional airports division will base its decision to release, modify, reform, or amend an airport agreement on the procedures and guidelines outlined in this chapter and on the specific factors pertinent to the type of agreement and the release requested.

22.22 General Documentation Procedures. The sponsor's proposed release, modification, reformation, or amendment is a material alteration of its contractual relationship with the FAA. If approved, the results may have a substantial impact on the service that the sponsor provides to the aeronautical public. Accordingly, the ADOs and regional airports divisions must fully document all such actions to include the following:

- a. A complete description of the airport sponsor's federal obligations, including grant history, surplus property received, reference to appropriate planning documents (Exhibit "A" or ALP) with notations on additional land holdings and land use.
- b. A complete description of all terms, conditions, and federal obligations that may need to be modified in order to achieve the result requested by the sponsor.
- c. The sponsor's justification for release, modification, reformation, or amendment.
- d. The ADO or regional office's determination for public notice and comment or documentation of the notice and a summary of comments received.
- e. The ADO or regional office's preliminary determination on the request.
- f. The endorsement of the FAA official authorized to grant the request.

22.23. Airport Sponsor Request for Release. The sponsor must submit its request for release, modification, reformation, or amendment in writing signed by a duly authorized official of the sponsor. Normally, the sponsor submits an original request and supporting material to the ADO or regional airports division. If the FAA or other federal agencies require it, the sponsor may need to submit additional copies of the request and supporting material to headquarters offices or to the offices of other federal agencies.

22.24. Content of Written Requests for Release. Although no special format is required, the sponsor must make its request specific and indicate, as applicable, the following:

09/30/2009

5190.6B

- a. All obligating agreement(s) with the United States.
- b. The type of release or modification requested.
- c. Reasons for requesting the release, modification, reformation or amendment.
- d. The expected use or disposition of the property or facilities.
- e. The facts and circumstances that justify the request.
- f. The requirements of state or local law, which the ADO or regional office will include in the language of the approval document if it consents to, or grants, the request.
- g. The involved property or facilities.
- h. A description of how the sponsor acquired or obtained the property.
- i. The present condition and present use of any property or facilities involved.

22.25. Content of Request for Written Release for Disposal. In addition to the above, the sponsor must include the following in its request for release involving disposal of capital items:

- a. The fair market value of the property.
- b. Proceeds expected from the disposal of the property and the expected use of the revenues derived.
- c. A comparison of the relative advantage or benefit to the airport from the sale of the property as opposed to retention for rental income.
- d. Provision for reimbursing the airport account for the fair market value of the property if the property is not going to be sold upon release, for example, if the municipality intends to use it for a new city office building or sports complex.
- e. A description of any intangible benefits the airport will realize from the release. The sponsor may submit a plan substantiating a claim of intangible benefits to the airport accruing from the release, the amount attributed to the intangible benefits, and the merit of applying the intangible benefits as an offset against the fair market value of the property to be released.

NOTE: Only benefits to the airport may be cited as justification for the release, whether tangible or intangible. The nonaviation interest of the sponsor or the local community – such as making land available for economic development – does not constitute an airport benefit that can be considered in justifying a release and disposal.

The nonaviation interest of the sponsor or the local community does not constitute an airport benefit that can be considered in justifying a release and disposal.

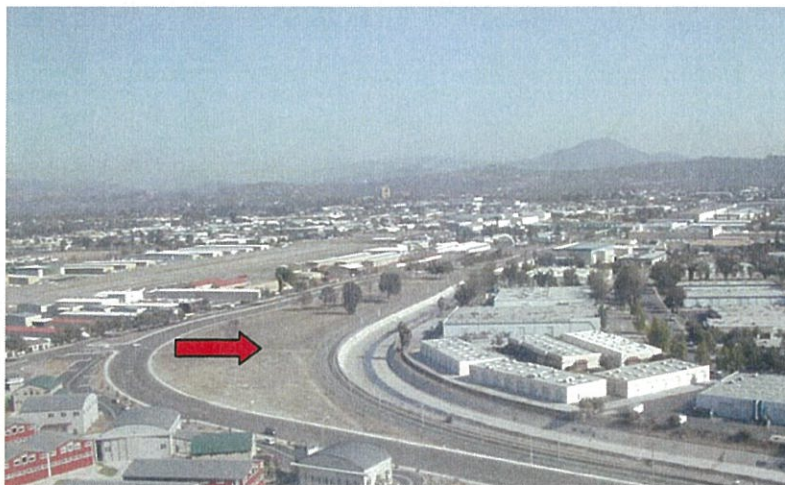


22.26. Exhibits to the Written Request for Release.

a. Drawings. The sponsor must attach to each copy of the request scaled drawings showing all airport property and airport facilities that are currently federally obligated by agreements with the United States. The sponsor should attach other exhibits supporting or justifying the request, such as maps, photographs, plans, and appraisal reports, as appropriate.

The reasonableness and practicality of the sponsor's request for release of airport property is related to the necessary aeronautical facilities and the priority of the need. In addition, the evaluation should consider the net benefit to be derived by civil aviation and the compatibility of the proposal with the needs of civil aviation, including the balance of benefits to all users as well as to the public at large. For example, as shown in the photograph above, a request for release of the property where aircraft are parked or where a hangar is located would be denied because the property is serving an aeronautical function. On the other hand, in a case such as the one depicted below, where airport property is separated by a road, the FAA may concur in releasing the property in question for revenue-producing nonaeronautical use provided it generates fair market value for the airport, is not needed for any aeronautical function, and its use is compatible with airport operations. (Photos: FAA)

Although desirable, the FAA does not require scaled ALP drawings to support a request for release. If the FAA grants the release, the drawing serves to explain or depict the effect on the airport graphically. The drawings do not serve as the document by which the release is granted, and unless a release has been executed in accordance with the



guidance contained in this chapter, the FAA will not approve any drawing inconsistent with the sponsor's current federal obligations.

b. Height and Data Computations. If the release contemplates change of use or disposal, the sponsor must provide height limit computations to limit the height of fixed objects to ensure navigation and compatible land use. It is essential to prevent an incompatible obstruction to air navigation from being located near the airport on property the airport once owned.

c. Application of Sale Proceeds. If the release action requested would permit a sale or disposal of airport property, the sponsor should provide documentation about the intended use of proceeds and evidence that the proceeds from disposal represent fair market value.

22.27. FAA Evaluation of Sponsor Requests. When the ADOs or regional airports divisions receive a request supported by the appropriate documentation and exhibits, they need to evaluate the total impact of the sponsor's proposal on the airport and the sponsor's federal obligations. This evaluation includes consideration of pertinent factors such as:

a. All of the ways in which the sponsor is federally obligated, both in its operations and its property. This includes specific federal agreements and use obligations.

b. The sponsor's past and present compliance record under all its airport agreements and its actions to make available a safe and usable airport for aeronautical use by the public. If there has been noncompliance, evidence that the sponsor has taken or agreed to take appropriate corrective action.

c. The reasonableness and practicality of the sponsor's request in light of maintaining necessary aeronautical facilities and the priority of the airport in the National Plan of Integrated Airport Systems (NPIAS).

d. The net benefit to be derived by civil aviation and the compatibility of the proposal with the needs of civil aviation, including the balance of benefits to aeronautical users relative to the public at large.

e. Consistency with the guidelines for specific types of releases, as discussed in this chapter.

22.28. FAA Determination on Sponsor Requests. The FAA will not release more property than the sponsor has requested. The statutes, regulations, and policy applicable to the specific types of agreements involved must guide the decision to grant or deny the request based on the evaluation factors. In addition, the FAA must determine if FAA Order 5050.4B *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*, requires an environmental review procedure. Further, it must be determined if one of the following conditions exists:

a. The public purpose for which an agreement or a term, condition, or covenant of an agreement was intended to serve is no longer applicable. The FAA should not construe the omission of an

09/30/2009

5190.6B

airport from the NPIAS as a determination that such an airport has ceased to be needed for present or future airport purposes.

b. The release, modification, reformation, or amendment of an applicable agreement will not prevent accomplishment of the public purposes for which the airport or its facilities were federally obligated, and such action is necessary to protect or advance the interest of the United States in civil aviation.

c. The release, modification, reformation, or amendment will federally obligate the sponsor under new terms, conditions, covenants, reservations, or restrictions determined necessary in the public interest and to advance the interests of the United States in civil aviation (such as compatible land use for land that is disposed of).

d. The release, modification, reformation, or amendment will conform the rights and federal obligations of the sponsor to the statutes of the United States and the intent of the Congress, consistent with applicable law.

22.29. FAA Completion of Action on Sponsor Requests. The ADO or regional airports division will advise the sponsor that its request is granted or denied. It will also indicate if special conditions, qualifications, or restrictions apply to the approval. The approving FAA office may issue a letter of intent to approve the request in advance of the actual release, at the request of the sponsor.⁵¹ (See also section 22.32 of this chapter, *FAA Consent by Letter of Intent to Release – Basis for Use.*)

a. FAA Approval Action. If FAA approves the request or an acceptable modification of the request, the ADO or regional airports division will prepare the necessary instruments or documents. The ADO or regional airports division will initiate parallel action to amend all related FAA documents (i.e., NPIAS, ALP, Exhibit “A,” and FAA Form 5010, *Airport Master Record*) as required to achieve consistency with the release. The sponsor must thereafter provide the ADO or regional airports division with any acknowledgment or copies of executed instruments or documents as required for FAA record purposes.

b. Content of Release Document. The formal release will cite the agreements affected and identify specific areas or facilities involved. The ADO or regional airports division will notify the sponsor of the binding effect of the revised federal obligations.

22.30. FAA Denial of Release or Modification. When the ADO or regional airports division determines that the request is contrary to the public interest and therefore cannot grant the request, it will advise the airport sponsor in writing of the denial.

⁵¹ All such letters of intent should cite any specific understandings reached by the ADO and airport sponsor.

22.31. Procedures for Public Notice for a Change in Use of Aeronautical Property.

a. Summary. This section sets forth FAA guidance for public notice of the agency’s intent to release aeronautical property or facilities from federal obligations under the grant assurances and surplus property agreements.

Section 125 of *The Wendell H. Ford Aviation Investment and Reform Act for the 21st Century* (AIR-21) requires the FAA to provide an opportunity for public notice and comment prior to the "waiver" or "modification" of a sponsor's federal obligation to use certain airport land for nonaeronautical purposes.

b. Responsibilities. The ADOs or regional airports divisions are responsible for complying with the requirements of the statute and policy guidance governing the notice and release of aeronautical property.

c. Authority. Section 125 of AIR-21 has been codified as amendments to 49 U.S.C. §§ 47107(h), 47125, 47151, and 47153.

See a sample *Notification Memo for Federal Register Notice Governing the Notification and Release of Aeronautical Property* and a *Sample Federal Register Notice Governing the Notification and Release of Aeronautical Property* at the end of this chapter.

d. Scope and Applicability. As a matter of policy, the FAA will provide public notice of a proposed release of a sponsor from its federal obligations regarding any land, facilities, and improvements used or depicted on an ALP for aeronautical use where the release would affect the aeronautical use of the property, including certain releases for which notice is not expressly required by section 125 of AIR-21. Public notice requirements apply to release of the following types of property:

- (1). Land acquired for an aeronautical purpose (except noise compatibility) with federal assistance in accordance with 49 U.S.C. § 47107(c)(2)(B).
- (2). Land (surplus property) provided for aeronautical purpose in accordance with 49 U.S.C. § 47151.
- (3). Land conveyances of the United States Government for aeronautical purposes in accordance with 49 U.S.C. § 47125.
- (4). Land used as an aircraft movement area with federally financed airport improvements.

e. Purpose. Airport property becomes federally obligated for airport purposes when an airport sponsor receives federal financial assistance. The FAA land release procedures evaluate the sponsor’s request for release of land to the extent that such action will protect, advance, or benefit the public interest in civil aviation or, specifically, the public’s investment in the national airport system. Section 125 of AIR-21 requires the FAA to solicit and consider public comment as a part of the agency’s decision making on a sponsor’s request for release.

09/30/2009

5190.6B

f. Procedures. At least 30 days prior to the agency's determination of an airport sponsor's request to release aeronautical property or facilities, notice must be published in the *Federal Register* to afford the public an opportunity to comment. Public notice is also an opportunity for the FAA to obtain additional information as a part of its evaluation of the airport sponsor's request. It allows the FAA to take public comment into account in the agency's decision making. Public notice is not required for:

- (1). Approval of the interim use of airport property on a short-term period, generally not exceeding five (5) years;
- (2). Grant of utility or other types of easements that will have no adverse effect on the aeronautical use of the airport;
- (3). Release of aeronautical property as a part of a major environmental action in which public notice and comment is an integral part of the environment review; or
- (4). Release of noise compatibility land.

22.32. FAA Consent by Letter of Intent to Release – Basis for Use.

a. Use of Letter of Intent. Release and disposal of facilities developed through federal assistance is often necessary to finance replacement facilities. The sponsor may, therefore, request a letter of intent to release even if it is merely to permit the sponsor to determine the market demand for portions of the available airport property proposed for release and disposal.

b. Letter of Intent Contingencies. The ADO or regional airports division may issue such a letter of intent to release if the letter contains appropriate conditions and makes clear that actual release is specifically contingent upon adequate replacement facilities being developed and becoming operable and available for use.

c. Binding Commitment. The letter represents a binding commitment (subject to future appropriations) and an advance decision to release the property once specific conditions have been met. It should be used only when all of the required conditions pertinent to the type of release sought have been met or are specifically made a condition of the pledge contained in the letter of intent. In addition, such a letter should cite any specific understandings reached regarding anticipated problems in achieving the substitution of airport properties (i.e., who pays for relocation of various facilities and equipment and the cost of extinguishing existing leases). The letter should specify a reasonable time limit on the commitment to release. The sample *Letter of Intent to Release Airport Property* at the end of this chapter will assist in drafting such a letter.

22.33. The Environmental Implications of Releases.

a. When a sponsor accepts a federal airport development grant or a conveyance of federal surplus property for airport purposes, the sponsor incurs specific federal obligations with respect to the uses of the property. FAA action is required to release a sponsor from federal obligations in the

09/30/2009

5190.6B

event the sponsor desires to sell the airport land. This action is normally categorically excluded, but may require an environmental assessment in accordance with the provisions of chapter 3, "Environmental Action Choices," of FAA Order 5050.4B *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*.

In this case, the assessment shall address the known and immediately foreseeable environmental consequences of the release action. As with other federal actions regarding land, appropriate coordination with federal, state, or local agencies shall be completed for applicable areas of environmental consideration (i.e., historic and archeological site considerations, section 4(f) lands, wetlands, coastal zones, and endangered species).⁵² In such cases, coordination with the State Historic Preservation Officer is required.

b. In making the final determination, the responsible federal official shall consider the effects of covenants that will encumber the title and the extent of federal ability to enforce these covenants subsequent to the release action. The standard conditions of release relative to the right of flight, including the right to make noise from such activity and the prohibition against erection of obstructions or other actions that would interfere with the flight of aircraft over the land released, may be considered as mitigating factors and may be included in environmental assessments when required. When the intended use of released land is consistent with uses described and covered in a prior environmental assessment, the prior data and analysis may be used as input to the present assessment. When the conditions set forth in the applicable sections of FAA Order 5050.4B *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*, apply, a written reevaluation may be used to support the property release.

c. In some cases, another federal agency may be the lead agency responsible for preparing an environmental assessment and environmental impact statement, if required. In these circumstances, the FAA may be a cooperating agency. To support the release action, the FAA may then adopt the environmental document prepared by the other agency in accordance with the provisions of Council of Environmental Quality (CEQ) 1506.3.

d. Long term leases that are not related to aeronautical activities or airport support services have the effect of a release for all practical purposes, and shall be treated the same as a release. Such leases include convenience concessions serving the public such as hotel, ground transportation, food and personal services, and leases that require the FAA's consent for the conversion of aeronautical airport property to revenue-producing nonaeronautical property. Long-term leases are normally those exceeding 25 years.

22.34. through 22.37. reserved.

⁵² See FAA Order 5050.4A, *Airport Environmental Handbook*, for additional information.

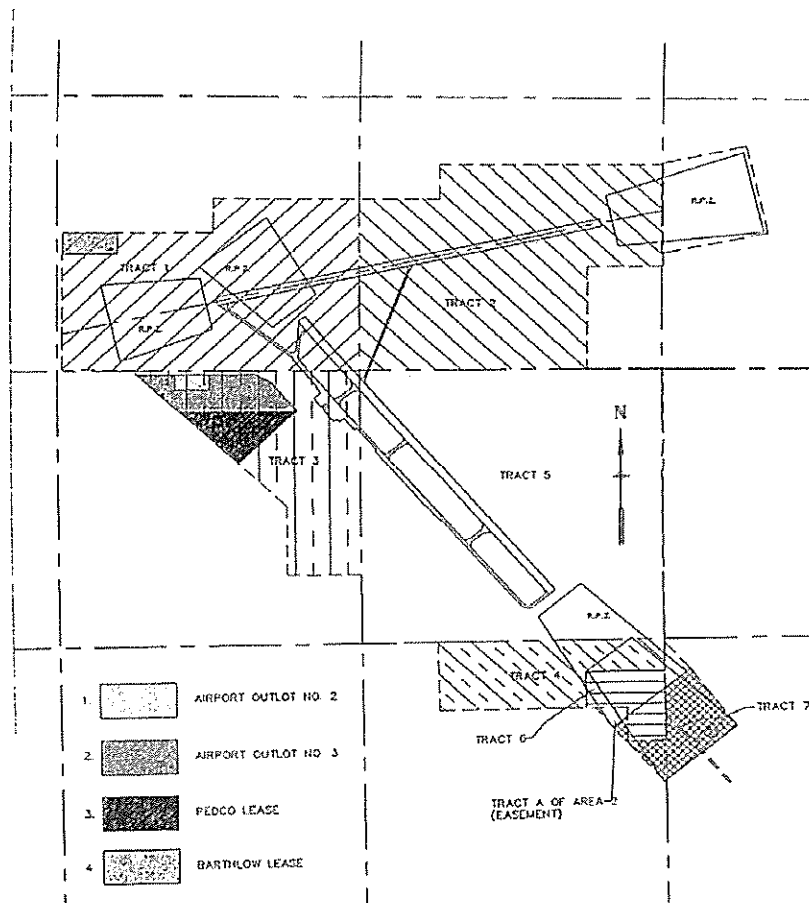
Sample NEUP Legal Description

Legal Description

1. That portion of Tract 3 of the Pierre Municipal Airport, consisting of the parcels designated as Airport Outlot 2 and Airport Outlot 3, located in the North half (1/2), Section thirty five (35), Township one hundred eleven (111) North, Range seventy nine (79) West, Hughes County, South Dakota.

2. That portion of Tract 3 of the Pierre Municipal Airport, consisting of the parcels designated as the Pedco Lease, described as starting at the southwest corner of "B" Street right of way, the point of beginning; thence south easterly along the south westerly property line of lot 6, Airport outlot 3, extended, a distance of 1441.45 feet; thence north easterly a distance of 1416.11 to the south east corner of "B" street right of way, thence west a distance of 2015.64 feet to the point of beginning.

3. That portion of Tract 1 of the Pierre Municipal Airport, consisting of the parcel designated as the Barthlow lease, located in the north 400 feet of the east 1050 feet of the west 1083 feet of the southwest quarter (1/4) of section twenty six (26), Township one hundred eleven (111) North, Range seventy nine (79) West.



The FAA will not approve a request for release of the National Emergency Use Provision (NEUP) involving the whole airport. In addition, the Department of Defense (DoD) generally does not concur with a request for release of the NEUP that involves actual runways, taxiways, or aprons. A request for release of the NEUP should be limited to parcels that are no longer needed for aviation purposes. Above is a sample visual and legal description of the specific parcels of land to which the release from the NEUP would apply. (Diagram: FAA).

09/30/2009

5190.6B

Sample NEUP Release Request



U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Associate
Administrator for Airports

800 Independence Ave., SW.
Washington, DC 20591

JUN 23 2006

Mr. Timothy W. Bennett
Chairman, DOD Airports Subgroup
IIQ USAF/XOO-CA
1480 Air Force Pentagon, Room 4D1010
Washington, DC 20330-1480

Dear Mr. Bennett:

The Federal Aviation Administration (FAA) has received a request from the Fort Wayne-Allen County Airport Authority (FWACAA) for the release of the National Emergency Use Provision (NEUP) on land at the Fort Wayne International Airport in Fort Wayne, Indiana.

The property containing the Fort Wayne International Airport, formerly known as Baer Army Airfield, was transferred to the city of Fort Wayne (the airport sponsor that later became the FWACAA) under the provisions of Section 13, Public Law 80-289 of the Surplus Property Act of 1944. The transfer document includes the NEUP provision.

As a matter of Policy, the FAA does not request a release from the NEUP for all airport property conveyed. However, we do concur with the release of the NEUP on certain designated parcels of airport property that are not currently required for aeronautical purposes. The subject land for this NEUP release request, approximately 2.44 acres, is not currently required for aeronautical purposes and is needed for the relocation of Indianapolis Road. The FAA concurs with the use of the parcel for non-aeronautical use. The attached property map and legal description depicts the subject parcel.

Consequently, in accordance with Section 7-7(d), Chapter 7, FAA Order 5190.6A *Airport Compliance Requirements*, we request the concurrence of the Department of Defense in the release of the NEUP provision on the tract of property described above and as shown in the attached documents.

Thank you in advance for your consideration. If you have any questions or need further assistance, please contact Mr. Miguel Vasconcelos at (202) 267-8730.

Sincerely,

Charles Erhard, Manager
Airport Compliance Division, AAS-400

Enclosures

09/30/2009

5190.6B

Sample DoD Response to FAA NEUP Release Request



DOD
POLICY BOARD
ON FEDERAL AVIATION

THE SECRETARY OF DEFENSE
WASHINGTON DC 20030-1480

HQ USAF/A3O-AA
1480 Air Force Pentagon, Rm 4D1010
Washington DC 20330-1480

14 Jul 06


Mr. Charles C. Erhard
Manager, Airport Compliance Division, AAS-400
Federal Aviation Administration
800 Independence Avenue SW
Washington DC 20591

Mr. Erhard

This is in response to your letter of June 23, 2006, requesting the release of approximately 2.44 acres of property at the Fort Wayne International Airport, Indiana from the National Emergency Use Provision (NEUP).

The Airports Subgroup, on behalf of the Department of Defense, concurs with the FAA to release of the NEUP on the designated parcels of airport property that are not currently required for aeronautical purposes (as shown in the attached property map and legal description). A copy of the release instrument must be provided to the appropriate District Corps of Engineers' office.

Sincerely


TIMOTHY W. BENNETT
Chairman
DOD Airports Subgroup

- Attachments:
1. Property Map
2. Legal Description

09/30/2009

5190.6B



US Department of Transportation
Federal Aviation Administration

Memorandum

Airports District Office
11677 South Wayne Road
Suite 107
Romulus, MI 48174

Subject ACTION: Federal Register Notice, Public Notice For Waiver of Aeronautical Land-Use Assurance Wood County Regional Airport, Bowling Green, Ohio **Date** July 7, 2004

From Irene Porter, Manager
Detroit Airports District Office, DET ADO-600 **Reply to**
Attn of Jagiello
734-229-2956

To Regulations Division, Office of the Chief Counsel, AGC-200
PHRU: Manager, Safety/Standards Branch, AGL 620
Regional Counsel, AGL-7

Attached are the original and two (2) copies of the Federal Register notice for Public Notice For Waiver of Aeronautical Land-Use Assurance at Wood County Regional Airport, Bowling Green, Ohio.

This notice is submitted to be docketed by the Regulations Division Staff for publication in the Federal Register.

Please insert the date, which is 30 days after the date of publication in the Federal Register, under "DATES: Comments must be received on or before _____."

Irene Porter

Attachment (3)

cc: AGL-620 w/attachments (for information)
AAS-400 w/attachments (for information) ✓

Notification Memo for Federal Register Notice Governing the Notification and Release of Aeronautical Property

Federal Aviation Administration Public Notice For Waiver Of Aeronautical Land-Use Assurance

Hallock Municipal Airport, Hallock, MN

AGENCY: Federal Aviation Administration, DOT

ACTION: Notice of intent of waiver with respect to land.

SUMMARY: The Federal Aviation Administration (FAA) is considering a proposal to change a portion of the airport from aeronautical use to nonaeronautical use and to authorize the sale and/or conversion of the airport property. The proposal consists of two parcels of land containing a total of 4.18 acres located on the north side of the airport along County Road 13.

These parcels were originally acquired under Grant No. FAAP-01 in 1964. The parcels were acquired for a runway that has since been abandoned and replaced by a new primary runway in a different location. The land comprising these parcels is, therefore, no longer needed for aeronautical purposes and the airport owner wishes to sell a 4.0 acre parcel for an agricultural implement dealership and convert 0.18 acres of another parcel for use as a city wastewater lift station site. The income from the sale/conversion of these parcels will be reinvested in the airport for extending the useful life of the runway pavement.

Approval does not constitute a commitment by the FAA to financially assist in the disposal of the subject airport property nor a determination of eligibility for grant-in-aid funding from the FAA. The disposition of proceeds from the disposal of the airport property will be in accordance with FAA's Policy and Procedures Concerning the Use of Airport Revenue, published in the Federal Register on February 16, 1999. In accordance with section 47107(h) of title 49, United States Code, this notice is required to be published in the *Federal Register* 30 days before modifying the land-use assurance that requires the property to be used for an aeronautical purpose.

DATE: Comments must be received on or before [Insert date which is 30-days after date of publication in the *Federal Register*.]

ADDRESSES: Send comments on this document to Mr. Gordon L. Nelson, Program Manager, Federal Aviation Administration, Minneapolis Airports District Office, 6020 28th Avenue South, Room 102, Minneapolis, MN 55450-2706.

FOR FURTHER INFORMATION CONTACT: Mr. Henry Noel, City Administrator, 163 South 3rd Street, Hallock, MN 56728, telephone (218)843-2737; or Mr. Gordon L. Nelson, Program Manager, Federal Aviation Administration, Minneapolis Airports District Office, 6020 28th Avenue South, Room 102, Minneapolis, MN 55450-2706, telephone (612)713-4358/FAX (612)713-4364. Documents reflecting this FAA action may be reviewed at the above locations.

SUPPLEMENTARY INFORMATION: Following are legal descriptions of the property located in Kittson County, MN: That part of Section 24, T161N, R49W described as follows: Commencing at an iron monument at the NW corner of said Section 24; thence South 89 degrees 40 minutes 33 seconds East, assumed bearing, along the north line of said Section 24 a distance of 2523.77 feet; thence South 27 degrees 29 minutes 58 seconds East, a distance of 33.72 feet to an iron pipe monument; being the point of beginning of the tract to be described; thence North 89 degrees 40 minutes 34 seconds East, parallel with north line of said Section 24 a distance of 400 feet to an iron pipe monument; thence South 22 degrees 18 minutes 25 seconds East, parallel with and 40 feet perpendicular to the westerly right-of-way line of Burlington Northern, Inc. railroad, a distance of 437.34 feet to an iron pipe monument; thence South 67 degrees 41 minutes 37 seconds West 317.57 feet to an iron pipe monument; thence North 27 degrees 29 minutes 58 seconds West 589.49 feet to the point of beginning, containing 4.00 acres, more or less.

That part of the NE1/4 of the NW1/4 of Section 24, T161N, R49W bounded as follows: Beginning on the north line of said Section 24 at a point which lies 557.00 feet west of the northeast corner of the NW1/4 being the point of beginning of the tract to be described; thence South 0 degrees 19 minutes 27 seconds West, assumed bearing, along a line perpendicular to said section line a distance of 172.82 feet; thence North 27 degrees 22 minutes 40 seconds West, a distance of 195.19 feet to the north line of said Section 24, thence South 89 degrees 40 minutes 33 seconds East, a distance of 90.74 feet along the north line of said section back to the point of beginning, containing 0.18 acres, more or less.

Issued in Minneapolis, MN on December 11, 2006

Robert A. Huber
Manager, Minneapolis Airports District Office
FAA, Great Lakes Region

Sample Federal Register Notice Governing the Notification and Release of Aeronautical Property

Sample Letter of Intent to Release Airport Property - Page 1



U.S. Department
of Transportation
**Federal Aviation
Administration**

Detroit Airports District Office
11677 South Wayne Road
Suite 107
Romulus, MI 48174

April 17, 2006

Mr. Kent L. Maurer, Manager
Jackson County- Reynolds Field
3606 Wildwood Avenue
Jackson, Michigan 49202

Dear Mr. Maurer:

Jackson County Airport-Reynolds Field, Jackson, Michigan
Letter of Intent to Release Airport Property (Approximately 68 Acres)
Parcels 15A and 62

This "Letter of Intent to Release Airport Property" is being issued in response to Mr. Chip Kraus' letter, dated May 11, 2005, and supporting documentation requesting the Federal Aviation Administration (FAA) to release the County of Jackson, Michigan (hereinafter referred to as "sponsor") of its obligations to maintain as airport property 2 parcels of land (Parcels 15A and 62). This property is located in the northeast quadrant of the airport as currently depicted in the Airport Layout Plan (ALP) and Exhibit A. This land is to be sold and/or leased for proposed use as commercial development.

The FAA is authorized to grant a release of airport property from disposal restrictions if it is determined that (1) the property to which the release relates no longer serves the purpose for which it was made subject to the terms, conditions, reservations, or restrictions concerned, and (2) the release will not prevent accomplishing the purpose for which the property was made subject to the terms, conditions, reservations, or restrictions, and is necessary to protect or advance the interests of the United States in civil aviation.

The FAA finds that Parcels 15A and 62 are no longer required for current or future public airport purposes, nor would the release thereof prevent the accomplishment of the public airport purpose for which the airport facilities were obligated.

Accordingly, this Letter of Intent represents a decision by the FAA to release Parcels 15A and 62 upon submission and/or consideration of the following conditions:

- a. The County should keep the FAA informed of its timetable for redevelopment of the two parcels. The County shall submit for review detailed information relating to the marketing and proposed use of the property.

09/30/2009

5190.6B

2

- b. If a sale is contemplated, present to FAA a draft sales or lease agreement or agreements the County intends to execute with a prospective buyer/lessee for the property in question and disclose the sale price or rental value to be determined based upon fair-market valuation. You should submit documented evidence (such as a rezoning application and approval) indicating that Parcels 15A and 62 are rezoned in a manner that is compatible with airport operations (for example "non-residential" i.e. C-2) and consistent with Condition a. above.
- c. Federal Aviation Regulation (FAR) Part 77 (recodified as 14 Code of Federal Regulations (CFR) Part 77) surfaces must be adhered to relating to any building, structure, poles, trees, or other object on the property relating to Jackson County Airport-Reynolds Field. The County will retain a right of entry onto the property conveyed to cut, remove, or lower any object, natural or otherwise, of a height in excess of 14 CFR Part 77 surfaces relating to the airport. This public right shall include the right to mark or light as obstructions to air navigation, any and all objects that may at any time project or extend above said surfaces.
- d. A notice consistent with the requirements of 14 CFR Part 77 (FAA Form 7460-1) must be filed prior to constructing any facility, structure, or other item on the property.
- e. The property shall not be used to create electrical interference with communication between the installation upon the airport and aircraft, make it difficult for fliers to distinguish between airport lights and others, impair visibility in the vicinity of the airport, or endanger the landing, taking off, or maneuvering of aircraft.
- f. A right of flight for the passage of aircraft in the airspace above the surface of the property shall be maintained (easement) specifying that any noise inherent in the operation of any aircraft used for navigation shall be allowed.
- g. The property shall not be used to create a potential for attracting birds and other wildlife that may pose a hazard to aircraft in accordance with current FAA guidance.
- h. The Hurd-Marvin Drain has been identified on the southern portion of the subject site on both parcels. Additionally, approximately 5.48 acres of the subject property has been categorized as wetlands. These areas are specifically precluded from any development on, or disturbance of, or impacts to the Hurd-Marvin Drain, or the designated wetlands, unless they comply with the requirements of Executive Order 11990, the Fish and Wildlife Coordination Act, and the National Environmental Policy Act.
- i. The MALS approach light plane complex and line-of-sight must not be penetrated. In order to protect these surfaces, no objects shall penetrate 14 CFR

Sample Letter of Intent to Release Airport Property - Page 2

Part 77 50:1 approach slope for Runway End 24 on Parcels 15A and 62, as depicted on the attached Figure 2-0. This drawing shall be part of the release documents between you and the prospective buyer(s).

- j. The Middle Marker for Runway End 24 is located approximately 3,275' from Runway End 24, on the extended runway centerline. FAA ingress/egress to this site shall be maintained.
- k. The lease between the County of Jackson, Michigan, and the United States of America dated May 14, 1986 shall be maintained. The lease allows FAA personnel access to Runway 24 MALSR and Middle Marker sites to maintain these NAVAIDs. The ground easements described in the lease relating to Parcels 15A and 62 are shown on the attached Figure 1-0 and shall be maintained. A narrative description of the leased areas for the MALSR and Middle Marker is described in Attachment "A". These documents shall be part of the release documents between you and the prospective buyer(s).
- l. The County will, by agreement with FAA, commit all proceeds from the sale or lease of the property to the development, maintenance and operations of the County airport system, in conformance with the FAA's revenue use policy. The revenue use policy may be accessed at the following web address:

http://www.faa.gov/airports_airtraffic/airports/resources/publications/federal_register_notices/media/obligation_final99.pdf.

Therefore, upon submission of and adherence to the above-mentioned conditions, FAA will approve the release of the property from the applicable terms, conditions, reservations, and restrictions recorded in the grant assurances.

If you need further assistance or have any questions, please contact me at (734) 229-2900.

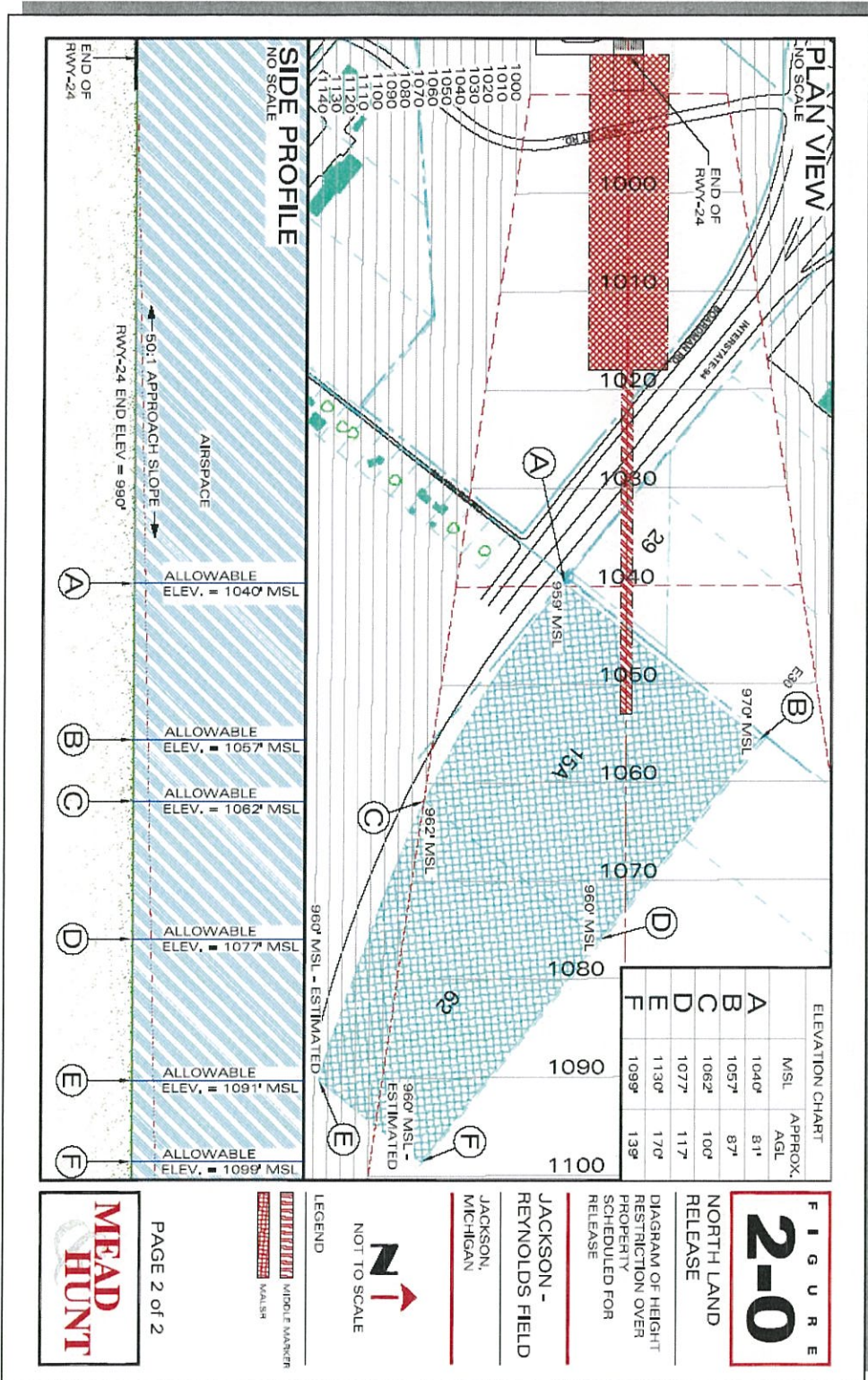
Sincerely,



Irene R. Porter
Manager, Detroit Airports District Office

Attachments

cc: AGL-620, AAS-400, F. Kraus, MMTSB



Sample Letter of Intent to Release Airport Property - Page 4

09/30/2009

5190.6B

Attachment "A" to
Lease No. DTFAL4-86-L-R955

Site Descriptions

MALSR, Runway 24:

An area 400 feet wide symmetrical about the runway centerline and beginning at the end of the runway extending 1,600 feet northeast followed by an area 60 feet wide, symmetrical about the runway centerline extending an additional 1,600 feet northeast. The Unit includes light stations at 200 feet intervals, access roads, underground cables, power and control stations, transformers, access off of Airport Road, conduit under I-94 and Airport Road. Area described includes R.O.W. along I-94. The underground cables are within the area described and extend beyond.

Middle Marker, Runway 24:

An area 60 feet wide and symmetrical about the runway centerline and extending 150 feet NE of the MALSR/RAIL area. The unit includes a pole mounted marker, transformer, access road, and underground cables.

Sample Letter of Intent to Release Airport Property - Page 5

Table 22.1: Guide to Releases

Land Acquisition Circumstance	Title 49 U.S.C. Requirement to Notify Public Release of Aero Land Use Obligation	Fed Register Notice Required	Surplus Property Deed of Release Required	Grant Assurance Letter of Release Required	Required to use proceeds for AIP Elig Dev Only (Highest Priority) or Opr & Maint.	Required to use proceeds for Noise mitigation
Surplus property transferred for aeronautical purposes	47151(d), 47153(c)	Yes	Yes	Yes, if airport has current federal grant assurances	Opr & Maint of airport	No
Surplus property transferred for nonaeronautical revenue production <u>and</u> shown on the ALP & Exhibit "A"	N/A	No	Yes	Yes, if airport has current federal grant assurances	Opr & Maint of airport	No
Surplus property transferred for nonaeronautical revenue production and <u>not</u> shown on the ALP & Exhibit "A"	N/A	No	Yes	No	Opr & Maint of airport	No
Land acquired with AIP assistance	47107(h)	Yes	No	Yes	AIP Elig Only	No
Land acquired with FAAP or ADAP assistance <u>and</u> land assurances have expired	N/A	No	No	Yes, if airport has current federal grant assurances	Opr & Maint of airport	No
Unobligated land acquired without federal assistance <u>and</u> on the ALP and Exhibit "A" as airport land <u>and</u> without federally financed airport improvements.	N/A	No	No	Yes, if airport has current federal grant assurances	Opr & Maint of airport	No
Land acquired without federal assistance and <u>not</u> on the ALP or Exhibit "A" as airport land	N/A	No	No	No	No	No
Land acquired without federal assistance and airport facilities exist on the land that was developed or improved less than 20 years ago with federal assistance	N/A	Yes	No	Yes, if airport has current federal grant assurances	(1) Replace federally financed development (2) AIP Elig Dev	No
Land acquired without federal assistance and airport facilities exist on the land that was developed or improved more than 20 years ago with federal assistance	N/A	Yes	No	Yes, if airport has current federal grant assurances	Opr & Maint of airport	No
Land acquired with noise funds	N/A	No	No	No	See ----->	Yes
Federal government land conveyed to sponsor under U.S.C. § 47125 by a federal agency and the sponsor asks the FAA to waive the requirement that the land be used for airport purposes.	47125(a)	Yes	No	Yes, if airport has current federal grant assurances	A purpose approved by the Secretary.	No
AIP acquired development land (U.S.C. § 47107(c)(2)(B)), surplus property (U.S.C. § 47151), conveyed government land (U.S.C. § 47125), or land with federally financed improvements. Land use changed (not released) to nonaeronautical.	N/A	Yes	No	No	N/A	N/A

09/30/2009

5190.6B

Sample Actual Deed of Release – Page 1

DEED OF RELEASE

WHEREAS, the United States of America, acting by and through the General Services Administrator, under and pursuant to the powers and authority contained in the Federal Property and Administrative Services Act of 1949 (63 Stat. 377), and the Surplus Property Act of 1944 (58 Stat. 765), as amended, by instrument entitled "Quitclaim Deed" dated January 29, 1959, did remise, release, and forever quitclaim to the City of Sebastian of the State of Florida, its successors and assigns, all rights, title and interest of the United States of America in and to certain property known as Sebastian Municipal Airport subject to certain conditions, reservations, exceptions and restrictions; and,

WHEREAS, the City of Sebastian has requested the United States of America to release the hereinafter described property from all of the conditions, reservations, exceptions and restrictions of said instrument; and,

WHEREAS, the Administrator of the Federal Aviation Agency, under and pursuant to the powers and authority contained in Public Law 311 (62 Stat. 700) is authorized to grant a release from any of the terms, conditions, reservations and restrictions contained in, and to convey, quitclaim or release any right or interest reserved to the United States of America by any instrument of disposal under which surplus airport property was conveyed to a non-Federal public agency pursuant to Section 13 of the Surplus Property Act of 1944 (58 Stat. 765); and,

WHEREAS, the said Administrator has determined that the land described hereinafter is no longer needed for the purpose for which it was made subject to the terms, conditions, reservations and restrictions of the said surplus airport property instrument of transfer and that said land can be released without adversely affecting the aeronautical use of the said airport; and,

NOW, THEREFORE, for the considerations above expressed, the United States of America, except as hereinafter provided, does hereby quitclaim, convey and release unto the City of Sebastian, Florida, its successors and assigns, all rights, title and interest reserved or granted to the United States of America by the said Quitclaim Deed dated January 29, 1959, insofar as same pertains to the following described land, to wit:

A strip of land 53 feet wide, over, through and across Lots 52, 53, 51, the Allen Tract, Lots 44, 43, 42, 41 and 40 in Section 28; Lots 17, 16, 15 and 14 in Section 29; Lots 82, 83, 76, 75, 74, 53, 54 and 55 in Section 22, of the Fleming Grant in Township 31 South, Range 38 East, Township 30 South, Range 38 East which lies within 53 feet Easterly of the Baseline of Survey and/or centerline of construction according to the Right of Way Map of Section 88602-2601, State Road S-505, Roseland Road, as filed in Map Book 1, Pages 83 and 84 in the office of the Clerk of the Circuit Court, Indian River County, Florida, a part of said Baseline and/or Centerline being more particularly described as follows:

BEGINNING at a point on the Southwesterly line of and 100.22 feet S 44°32'44" E of the Northwest corner of Lot 62, Section 28 of the Fleming Grant in Township 31 South, Range 38 East, run N 11°39'14" W a distance of 800.62 feet to the beginning of a curve to the right; thence Northerly on said curve having a central angle of 07°10'15" and a radius of 5729.65 feet a distance of 717.08 feet to the end of said curve; thence N 04°48'59" W a distance of 5528.83 feet to the beginning of a curve to the right; thence Northeasterly on said curve having a central angle of 50°03'30" and a radius of 1562.88 feet, a distance of 1367.50 feet to the end of said curve; thence N 45°19'31" E a distance of 1704.86 feet to a point on the Northeast line of and 2636.77 feet N 44°37'29" W of the Easterly corner of Section 22 of the Fleming Grant in Township 30 South, Range 38 East;

excepting therefrom the existing 33 foot Right of Way for Roseland Road and containing 3.22 acres, more or less, Indian River County, Florida.

The release of the above described land is subject to the following terms and conditions:

1. That, in any instrument conveying title to the land, or granting any easement therein, Indian River County, Florida, will reserve for itself,

-2-

its successors and assigns, for the use and benefit of the public, a right of flight for the passage of aircraft in the airspace above the surface of the land conveyed, together with the right to cause in said airspace such noise, as may be inherent in the operation of aircraft now known or hereafter used for navigation of or flight in the air, using said airspace for landing at, taking off from, or operating on the Sebastian Municipal Airport.

- 2. That any instrument conveying title or granting an easement in the land shall contain a provision restricting and establishing the height of structures or objects of natural growth on the said land in accordance with the currently effective Federal Aviation Agency Technical Standard Order N18 as applied to Sebastian Municipal Airport.
- 3. That any instrument conveying title or granting an easement in the land shall contain a provision which will prohibit any use of the land that would interfere with the operation of aircraft or adversely affect the operation or maintenance of the Sebastian Municipal Airport.

IN WITNESS WHEREOF, the United States of America has caused these presents to be executed in its name and on its behalf by the Chief, Airports Division, Southern Region, Federal Aviation Agency, all as of the 10 day of January, 1963.

UNITED STATES OF AMERICA
The Administrator of the Federal Aviation Agency

BY [Signature]
acting Chief, Airports Division, Southern Region

STATE OF GEORGIA }
 } ss
COUNTY OF FULTON }

On this 10 day of January, 1963, before me, [Signature], a Notary Public in and for the County of Fulton, State of Georgia, personally appeared [Signature], known to me to be the Chief, Airports Division, Southern Region, Federal Aviation Agency, and known to me to be the person whose name is subscribed to the within instrument and acknowledged that he executed the same on behalf of the Administrator of the Federal Aviation Agency and the United States of America.

WITNESS my hand and official seal.

[Signature]
Notary Public in and for said County & State

(SEAL)

My commission expires 7-11-66.

09/30/2009

5190.6B

THIS PAGE INTENTIONALLY LEFT BLANK

Planning Commission Report
April 18, 2017

TO: Borough Assembly
FROM: Planning Commission
Subject: Construction of a Pedestrian Trail

Recommendation: Recommends the Borough Assembly support construction and maintenance of a pedestrian trail from Haugen Drive to Severson’s Subdivision as proposed by PIA and further recommends that parking areas be constructed at either end of the trail.

The Petersburg Planning & Zoning Commission makes this recommendation based on the following:

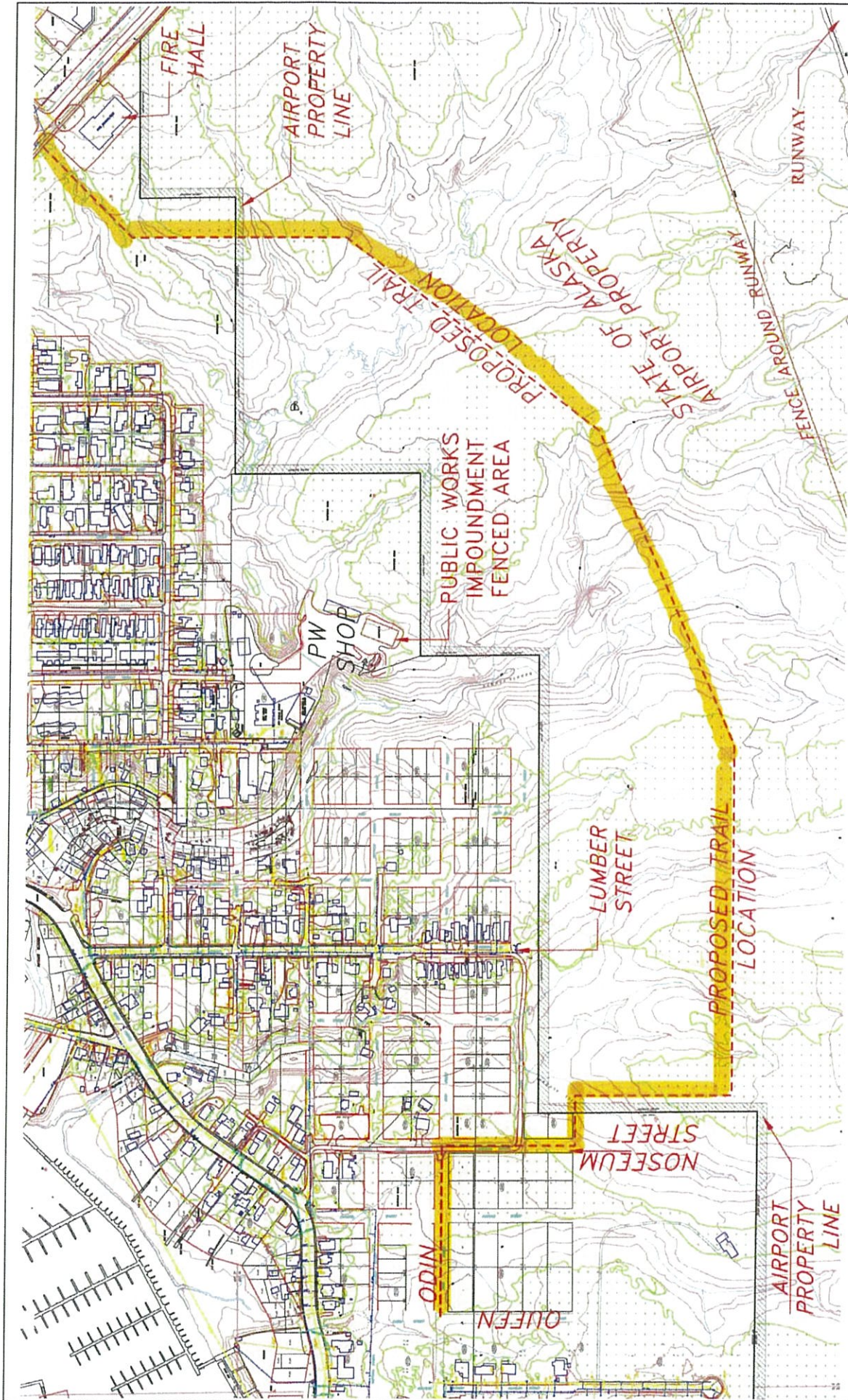
1. A proposed trail route between Haugen Drive and Severson’s Subdivision was proposed by the Petersburg Indian Association in August, 2016.
2. Hearing notices were mailed to property owners within 600 feet of the route on August 30, 2016.
3. On September 27, 2016, a duly noticed public hearing was held by the Petersburg Borough Planning Commission. At the September 27, 2016 hearing, the PIA withdrew their proposed trail because the proposed route was not suitable.
4. PIA submitted a new proposed route. Hearing notices were mailed to property owners within 600 feet of the original trail route on March 6, 2017.
5. On April 18, 2017, a duly noticed public hearing was held by the Petersburg Borough Planning Commission.
6. At the public hearing, the Planning Commission considered and reviewed applicant materials, public comments and testimony, including:
 - a. Written comments from Donna Marsh, Ronn and Tina Buschmann, Sam Bunge, Sharon Smith, Alice and Thomas Crumps, and Molly Taiber.
 - b. Oral testimony from Rick Braun Joe Bertagnoli, and Sandy Dixson.
 - c. Petition signed by Tango St. residents.
7. The revised trail route begins on Haugen Drive (adjacent to the Fire Hall) and terminates at the corner of Odin Street and Queen Street in Severson’s Subdivision. The majority of the proposed trail is located on airport property. (See attached map)
8. The proposed trail and parking areas would be constructed and maintained by the Petersburg Indian Association.
9. The proposed route would be located within:
 - a. borough-owned right-of-ways – trails are an allowable use of right-of ways;
 - b. airport property – PIA is working to obtain the necessary easements from DOT;
 - c. private property – property owner is willing to grant PIA an easement for the trail as well as providing sufficient area for a small parking area.

Planning Commission Report

April 18, 2017

10. Fire Department expressed concerns about location of trailhead adjacent to the Fire Hall particularly that it may encourage residents to park in the Fire Hall lot can be addressed by constructing a small parking area near the Haugen St. trailhead.
11. Neighbor concerns about lack of parking on the Severn's side of the trail can be addressed by constructing a small parking area on private property at the end of Noseum St. The property owner expressed support.
12. Neighbor concerns about increased pedestrian traffic were discussed. The majority of the commission felt the trail route was located on existing borough right-of-ways, which could someday be developed for roads and sidewalks. The trail would not result in more traffic than a road/sidewalk.
13. Neighbor concerns about trail being used for illegal drug trade were discussed. The majority of the commission felt illegal activities occurs on existing trails, roads, and sidewalks. These are law enforcement concerns and are not caused by the existing infrastructure.
14. Concerns about trail design and construction materials are to be addressed during the design phase by PIA engineer, Susan Harai. Ms. Harai indicated PIA would provide public notice and a public meeting would be held about the proposed design.

Based on the preceding, the Petersburg Planning & Zoning Commission makes the following Recommendation: Recommends the Borough Assembly support construction and maintenance of a pedestrian trail from Haugen Drive to Severson's Subdivision as proposed by PIA and further recommends that parking areas be constructed at either end of the trail.



PROPOSED TRAIL LOCATION
 FIRE STATION TO NOSEEUM STREET

SCALE: 1"=300'

Harai & Associates, Inc.
 28 January 2017

Rec'd
3/24/17


9 March 2017

Dear Planning and Zoning Commission,

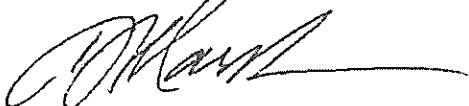
As a frequent user of the trails in and around Petersburg, I would like to share my thoughts on the proposed trail from Queen/Rambler Streets to Haugen Drive. While I am pleased at yet another option to enjoy this beautiful area we call home, I would urge the Commission to consider carefully the ramifications of the choice of trail built.

Accessibility to these trails makes them popular with walkers, runners, skiers and bicyclists, but the *type* of trail will either expand or limit their use. A crushed rock trail is much more functional than a board walk construction for several reasons listed here:

1. **Cost.** While I myself do not have numbers to verify this, it would be easy to conclude that a crushed rock surface by far is less expensive to both construct and maintain than a board walk trail in man hours, materials, and maintenance – even if a non-Borough entity bears the cost. It's costing the taxpayer regardless of who builds it.
2. **More cost.** The lower Raven's Roost Trail (crushed rock) was built using machines rather than people hauling the material in wheelbarrows. Its wider span helped to facilitate this as well as speed construction along, thus saving in labor costs. I have helped build a Petersburg trail using wheelbarrows, and it takes many many loads!
3. **Safety.** If you have not, please take the time to walk the nature trail between the elementary school and 8th Street. It doesn't have to be in snowy conditions, rainy weather or sub-freezing temperatures for the sections of that trail that are board-constructed to be extremely slippery.
4. **Versatility.** A crushed rock pathway can be easily and safely traversed by all users. Even those who wish to travel it on cross country skis have that option much more easily than on a board walk. It is also much easier to step off a rock path than an elevated board pathway.
5. **Surrounding terrain.** When winter conditions warrant, the muskeg around town is a great place for activities not on a trail. A board trail is an entire barrier in and of itself as it is not easily crossed without either damage to a machine or the trail, or cumbersome for a skier to work his way across the elevated board walk-way.

Thank you for the opportunity to submit my opinion and thank you for your consideration of the points presented here.

Sincerely,
Donna Marsh



Rec'd
3/24/17


Ronn and Tina Buschmann
P. O. Box 1367
Petersburg, Alaska 99833
(907) 723-1642

Planning and Zoning Commission March 10, 2017
Box 329
Petersburg, Alaska

Dear Commissioners,

I am writing to support the proposed trail/walkway from the Severson and RB subdivisions to the area of the Post Office. I believe this is a great opportunity to expand the walking trail system in town and promote good health and wellness for our citizens. I feel this strongly enough that I have offered to create a trail easement across my private land if that's what it takes to work out the routing.

Tina and I regularly drive to and walk on the trails from the school to Hungry Point, Sandy Beach to City Creek, Ravensroost, and Blind River Rapids. The potential for a trail from our neighborhood is very exciting. Rambler Street as well as the rest of these subdivisions have no sidewalks and parking is allowed on both sides of the streets so walking can become a matter of weaving around parked cars and traffic.

There is considerable neighborhood demand for places to walk for exercise as well as dog walking. My driveway is a long clear stretch with very little traffic and many in our neighborhood walk their dogs here. There is also an old trail from town to Scow Bay that crosses our property. Several people walk this trail; one fellow used to walk it every morning on his way to work at the Forest Service Building in Scow Bay. It has considerable use as a cross country skiing trail during the winter although we installed bollards to keep the four wheelers and snow machines from driving through our yard.

The reasoning I have heard behind about all the objections to this trail is the original trail's proximity to the end of Lumber Street. By rerouting the trail through my property, that objection should be eliminated. The balance of the trail is either on Odin and Noseum Street dedicated Right of Way which is "a strip of land occupied or intended to be occupied by a street, walkway, road ..., or for any other public purpose." (Petersburg Municipal Code.) or State of Alaska airport land.

We sincerely hope you will approve this project and that PIA can hurry and get it built.

Respectfully,

Ronn and Tina Buschmann

Liz Cabrera

From: Sharon <sharonpatzke@msn.com>
Sent: Monday, March 27, 2017 10:28 PM
To: Liz Cabrera
Subject: Regarding the Queen Street and Odin trail

Community & Economic Development and Planning and Zoning,

This is my second letter of objection to the proposed trail along side my private property on Queen street. I do not want this trail along side my property for several reasons..

- Safety issues including: inability to patrol or monitor, lack of lighting (or too much light), increase foot traffic of unknown people.
- Seasonal workers. Possible vagrancy. An increase of drug exchanges in wooded area, possible party sites in secluded woods on private properties along said trail.
- Negative effect of resale of properties.
- Garbage, dog walkers, loose dogs and dog poop.
- Increase exposure to common routines of daily living.
- Traffic at all hours of the day and night creating increased noise and disturbances.
- Invasion of privacy due to increase of foot traffic.

I'm not opposed to trails in Petersburg as I am an avid walker myself and love the trails. However, I find this section of the trail inconsiderate to us home owners on Queen and Odin Streets. An alternative to this section of your trail could start on an existing roadway already established . A roadway is easily monitored by police car and well lit. As a homeowner and property tax payer I would very much appreciate your consideration to these concerns. Thank you

Sharon Smith
907-518-0217

11 March 2017

Planning and Zoning Commission
Petersburg Borough

Hi,

I am very pleased by the plan to build a new trail between Severson / RB Subdivision and the Fire Hall. This trail will be a fine addition to the network of trails that walkers already enjoy in Petersburg.

I note that the length of the trail, as shown on the map provided by the Borough, is about 4,200 feet – a nice distance through some very scenic and quiet terrain.

If I am in town when construction is underway, I will volunteer to help with the work. If there is a need to locate some of the state airport boundary along the trail route, I can do that.

I walk a lot. I intend to use this new trail every week.

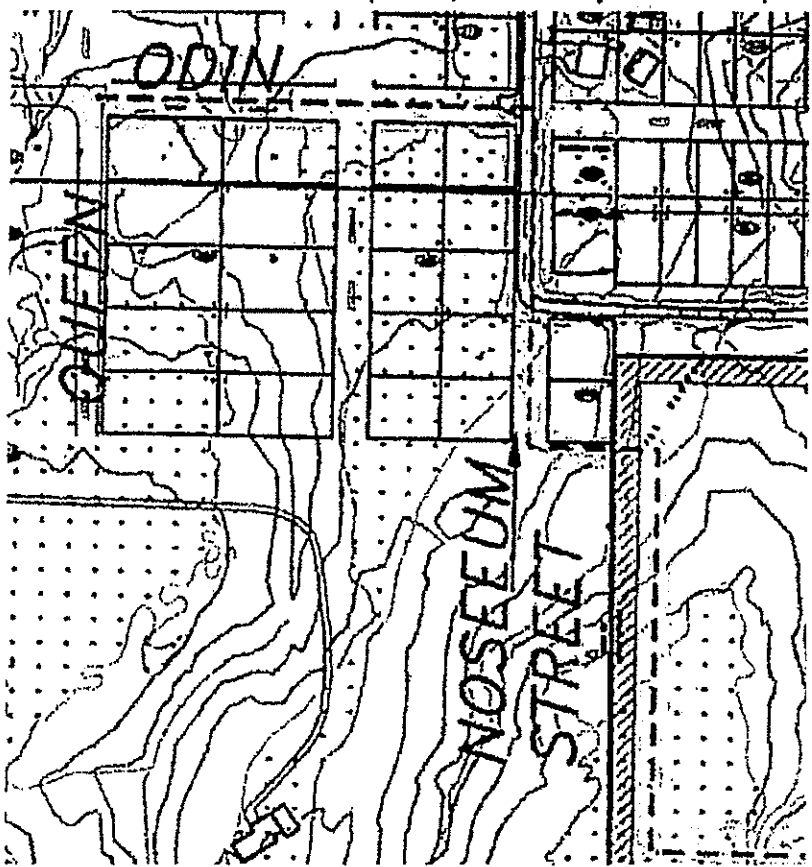
Let's do this!

Sam Bunge
P.O. Box 288

18 April 2017

Once again we are voicing our concerns about the proposal by PIA to construct a pedestrian trail between Haugen Drive and Odin Street. At a meeting in October 2016, we also expressed concern over the trail passing from our street, Noseeum, to Lumber Street. While we appreciate the fact that PIA took our initial concerns into consideration and have moved a portion of the trail, the newly proposed route brings up other concerns.

Namely, we are concerned with the portion of the trail from Severson subdivision (Odin Street) to Noseeum Street and along Noseeum Street into the muskeg up to the airport property line. This portion of the trail would border several private, residentially-zoned lots. (see picture below)



We are concerned that having a pedestrian trail border our properties, especially Lot 286B (1 & 2) will encroach upon the privacy of a (future) residential home as well as infringe upon our ability to access our lots once the trail is in place. How would we be able to put in a driveway to a home if there is an existing trail bordering our property? Likewise, we also wonder what would happen to the trail once the Borough decides to develop Odin Street through to Noseeum Street and extend Noseeum Street. If so, the trailhead would be right at the corner of our property and the trail would start or end, running right along the south-facing aspect of our lot.

Additionally, we worry that increased foot traffic will impact our current residence. We already have to deal with litter strewn alongside the street and at the end of Noseeum. Not only do we pick up paper waste, beer cans and bottles, but we've also had to pick up dog poop which has just been left near our driveway or on our property nearby. So we are concerned that an increase in foot traffic may bring more unwanted garbage into our area. How does the PIA plan to monitor and maintain this trail?

We also worry that there will be an increase in car traffic. We imagine that folks who don't live in the Severson subdivision may drive to the end of Noseeum, park their cars and walk along the trail. Where will the cars park? Where will they turn around?

We would like to find out how the trail would be constructed. Would it be a gravel path or a raised boardwalk or a combination of the two? Some of the sections through the muskeg seem pretty steep when you look at the topography so how will those portion of the trail remain safe throughout the winter? Would the trail be accessible throughout the Fall, Winter and into early Spring?

As you can see we have concerns about this portion of the trail as well as several important questions. We would urge the Planning and Zoning Committee to consider removing this portion of the trail (through residential areas) before approving it for construction.

Thank you for allowing us to have this opportunity to voice our concerns.

Alice and Thomas Cumps

We the undersigned support the Petersburg Indian Association's Plan to build a trail from the Odin St./Queen St. intersection, along Odin Street and Noseeum Street and through the Airport Reserve to the Post Office.

Name	Date	Address
<u>B.D. Brown</u>	4-15-17	705 PEARL F ST.
<u>STZ</u>	4-15-17	705 Pearl F. St.
<u>[Signature]</u>	4-15-17	606 Tango St.
<u>[Signature]</u>	4.15.17	606 Tango
<u>Kathy Chize</u>	4.15.17	20 Birch Street
<u>Brenda Norheim</u>	4-15-17	718 Sandy Beach
<u>Robin D. Jones</u>	4-15-17	603 TANGO ST.
<u>Justin Haley</u>	4-15-17	605 Tango St.
<u>Athana Haley</u>	4/15/17	605 Tango St
<u>Rita</u>	4-15-17	702 Hangen Dr
<u>Joe S</u>	4-15-17	603 Tango St

L) PROPOSED PEDESTRIAN TRAILS

Future trails projects proposed by PIA include three additions to the Petersburg Borough system. See **Map 5 – Proposed Pedestrian Trails**, page 25.

➤ **USPO to Severson's Subdivision**

\$500,000

The first addition will be a trail running from the Severson Subdivision on the south part of town to the existing walking/bike trail by the new fire station. This would link the south part of town to the airport area without going through down town Petersburg. The propose trail constructed by PIA will be about 6' wide and constructed of crushed rock and have several foot bridges constructed along the way. The trail would start at the end of Odin Street, skirt by Lumber Street with intersecting trail, continue across various muskeg and forested areas of the airport lands to terminate at the existing trail system along Haugen Drive. Approximate length is about one mile. This new trail would open up numerous opportunities for the area residences of Severson Subdivision.

➤ **Hungry Point Loop Trail Extension**

\$300,000

The second trail addition will be added to the existing Hungry Point Loop Trail. The extension will start midway on the trail and head northeast to intersect 14th Street. With the new addition to the existing trail the route could be utilized as a cross country run (5 kilometer or 3.1 miles).

➤ **City Creek Loop Trail**

\$300,000

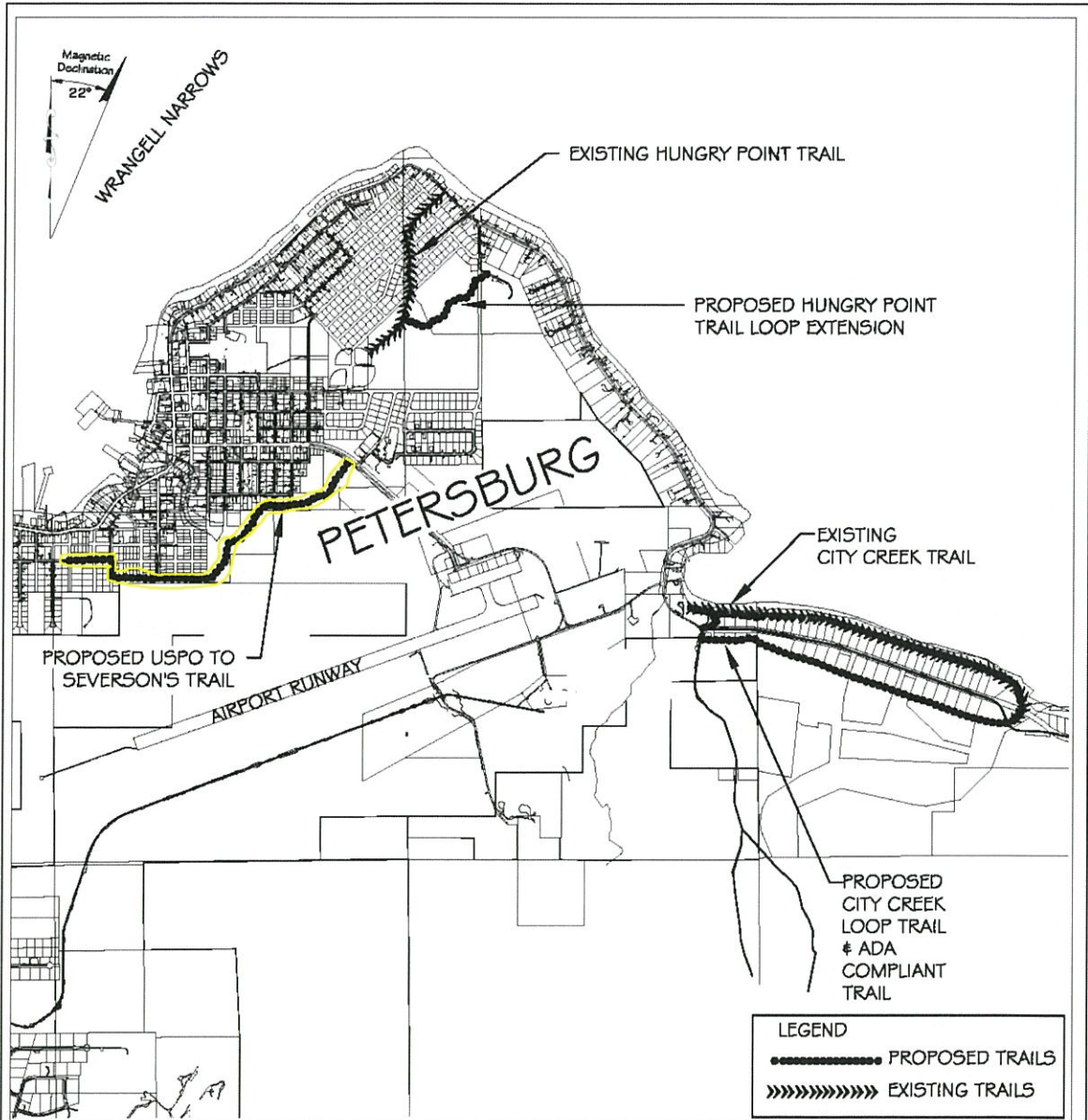
Plans for City Creek Trail are to make the entire trail ADA compliant. The existing trail starts are Sandy Beach Park and is approximately 1 mile and terminates at City Creek.

Rerouting of a trail connection from the Cabin Creek/Dump Hill intersection to the old chimney site is a proposed route.

An extension of the trail would access the area known as the old ski hill area. This new trail would begin at the start of the trailhead of Sandy Beach Park & City Creek Trail. From the start it would meander up the hill toward the bailer facility until it gained the top of the hill and then turn east and run along the back of the Sandy Beach Subdivision lots. This would continue until it reached City Creek and then it would lower in elevation through muskeg and timber until it reconnects with the Sandy Beach Park & City Creek Trail. Length of this trail would be about a mile. This trail would be constructed of crushed rock and be about 4' to 6' wide. Its main attraction would be vistas of Frederick Sound and the coastal mountain range. It would also provide back country skiing in the winter time.



Map 5 – Proposed Pedestrian Trails

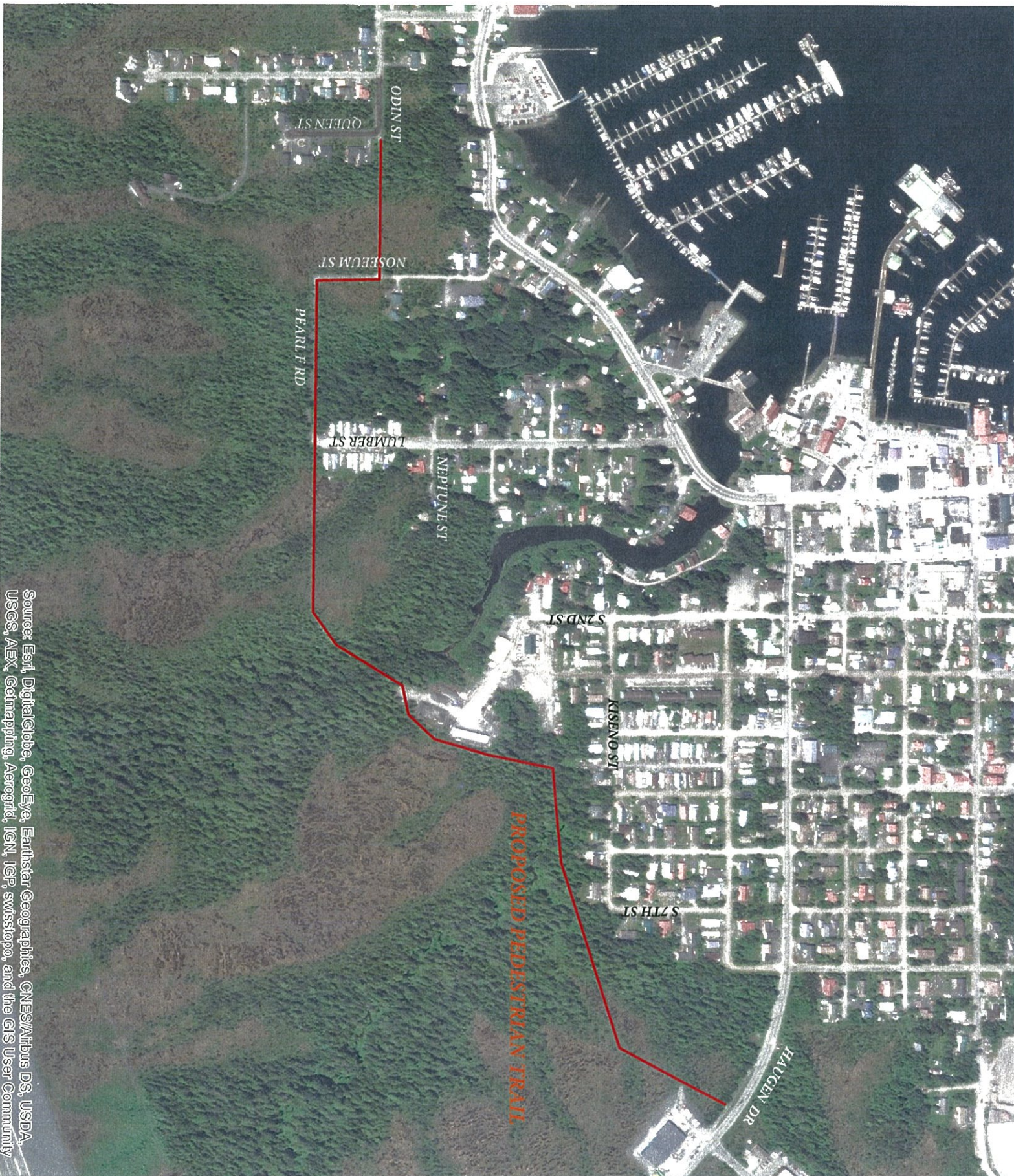


Map 5
Petesburg Indian Association
PROPOSED PEDESTRIAN TRAILS
Petersburg, Alaska
2015

0 1000 2000 3000 feet
Scale

SEH 3/2015

Table 4 - Transportation Priority List			
	Project	Cost	Year
1	Tribal Transportation Program Planning	\$55,000	2016
2	Develop a Tribal Transportation Safety Plan	\$12,500	FLH Safety Grant 2015
3	Design – Howkan and 12 th Street Sidewalk	\$40,000	2016
4	Annual Maintenance: Petersburg Borough & US Forest Service Transportation Facilities	\$90,000	2016
5	Develop a Tribal Transportation Safety Plan, phase 2	\$12,500	FLH Safety Grant 2016
6	Construction – Hungry Point Trail Loop	\$300,000	2016, 2017
7	Construction – City Creek Trail section 1, ADA compliant	\$300,000	2016, 2017
8	Design – Cabin Creek Reservoir Road Upgrade	\$10,000	AFLAP dependent
9	Construction – Cabin Creek Reservoir Road Upgrade	\$95,000	AFLAP dependent
10	Design – Cabin Creek Reservoir Road Scenic Upgrade	\$40,000	AFLAP dependent
11	Construction – Cabin Creek Reservoir Road Scenic Upgrade	\$346,000	AFLAP dependent
12	Tribal Transportation Program Planning	\$55,000	2017
13	Construction – Howkan and 12 th Street Sidewalk	\$410,000	2017, 2018
14	Design – Balder Street Sidewalk	\$20,000	2017
15	Annual Maintenance: Petersburg Borough & US Forest Service Transportation Facilities	\$90,000	2017
16	Design – USPO/Severson’s Subdivision Trail	\$40,000	2017, 2018
17	Tribal Transportation Program Planning	\$55,000	2018
18	Annual Maintenance: Petersburg Borough & US Forest Service Transportation Facilities	\$90,000	2018
19	Design – Petersburg Sidewalk Reconstruction – High School ADA compliant sidewalks	\$30,000	2018, 2019
20	Construction – Balder Street Sidewalk	\$200,000	2018, 2019
21	Tribal Transportation Program Planning	\$55,000	2019
22	Construction – High School ADA compliant sidewalks	\$200,000	2019
23	Construction – USPO/Severson’s Subdivision Trail	\$450,000	2019, 2020
24	Annual Maintenance: Petersburg Borough & US Forest Service Transportation Facilities	\$90,000	2019
25	Design – North Harbor Sidewalks ADA compliant	\$45,000	2019, 2020
26	Tribal Transportation Program Planning	\$55,000	2020
27	Annual Maintenance: Petersburg Borough & US Forest Service Transportation Facilities	\$90,000	2020
Total Funding Prioritized		\$3,276,000	



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

From: [Karl Hagerman](#)
To: [Liz Cabrera](#)
Subject: RE: Proposed USPO - Severson's Trail Route
Date: Wednesday, September 14, 2016 8:53:51 AM

Liz,

I have been supportive of PIA's efforts to establish new trails in our community and feel they are doing a good job of this while employing their tribal members. This proposed trail has pros and cons from my perspective and I'd like to provide my input to aid the discussion.

On the positive side, the trail will surely provide a convenient pathway and connection between the Post Office area and other populated areas. I believe many citizens would use the trail as a healthy alternative to driving when accessing the Post Office, PIA and the Hammer and Wikan grocery store area. Besides the access to a commercial area, the trail will provide walkers, runners and bicyclists another opportunity to recreate away from traffic and in our local habitat.

On the negative side, with high use can come the creation of the unintended consequence in which some individuals may use the trail for less than honorable purposes. The path is situated near several residential areas and the back yard of the Borough public works department and could easily be used by criminals to trespass, steal and vandalize property. This can be a large concern depending on how the path is used and by whom.

I have little concern of using right of way for this purpose as if the Borough ever decides to build roads in a right of way that would be in use for the trail, the trail will be obliterated in favor of the road and should not add much effort to a road building project.

If the project moves forward, I would suggest that separation, privacy or security fencing be installed in areas where residents or businesses are uncomfortable with the proximity of the path to their property. This is contradictory to the install of a public use pathway, but I've been hearing some concern from residents that are not pleased about the prospect of a path behind their homes and this may alleviate their fear of trespassers or a loss of privacy. I myself have concerns that I'll have many more people trying to access the path through the public works yard and this causes some concern about safety and security at my facility.

I support PIA, but some thought needs to go into this project so that it meets PIA's intended purpose without causing hardships to others along the proposed trail route.

Thank you,

Karl Hagerman
Public Works Director
Petersburg Borough
PO Box 329
Petersburg, Alaska 99833
Phone 907-772-4430

Karen Malcom

From: Casey Knight <caseyaknight@gmail.com>
Sent: Friday, September 16, 2016 8:47 AM
To: Karen Malcom
Subject: Pedestrian Trail from Severson's to Haugen

RECEIVED
9/16/16
KM 9:00AM

To Whom It May Concern,

I support the idea that there ought to be a trail to allow for pedestrians to travel across town. In avoiding traffic, it would be safer for pedestrians who want to walk from one end of town to the other. It would also be more pleasant to avoid traffic. A cross-town trail already exists in Sitka, and it sees heavy use by both residents and tourists.

I support the current proposed route, with one minor revision: it might be useful to include a short connection from the proposed route to the corner of S 7th Street and Kisenno Street.

The reason you might want to include this connection is to allow for use of the trail by a maximum number of Petersburg residents. If more people benefit from it, the easier it will be to justify spending the resources necessary to create it.

A possible reason not to include such a connection might be that there is no public right of way. But if such a right of way could be procured, I think it would be good to connect the trail to the corner of S 7th and Kisenno.

Sincerely,

Casey Knight

Karen Malcom

From: Sharon <sharonpatzke@msn.com>
Sent: Monday, September 19, 2016 8:41 PM
To: Karen Malcom
Subject: Trail on Odin



Planning and Zoning Commission,

I am writing to you in response to the proposed trail on the right of way on Odin and runs along my property on Queen Street. As someone who uses the trails in our area and enjoys them, I do have a problem with this particular trail. I am not comfortable with a trail running along side my property that connects along the way up to the Post Office. It will open up to me and the neighborhood a lot more foot traffic that will not be from the neighborhood.

I have woods and so do others which could draw people to come into our wooded areas, dogs running along the trail and using the area for a restroom, litter, seasonal workers, strangers. A dark path that may invite people to hang out. All of this right beside my house. As a widow I feel safe where I am. Add a trail and I will not feel so safe. We also have many children who live and play in the neighborhood. Safety is an issue.

We have brand new sidewalks to use. There is really no reason for the trail.

I am always thankful for the new ideas and trails. They are so good for us. But I do ask you to reconsider this particular trail.

Thank you,
Sharon Smith
601 Queen Street

RECEIVED
9/27/16
1:42PM

September 27, 2016
Planning and Zoning Commission

To whom this may concern;
Questions.....

- How close to my back yard is the trail?
- What is the need for a trail?
- Who will be using the trail?
- Is it a trail for people that don't want to be seen?
- Who will be patrolling the trail to ensure the safety of personal property that the path skirts?

My opinion.....

This will be an area that has no "watchful eye" providing the opportunity to access properties without being seen by neighbors or passers by. The path provides opportunity. Opportunity is all a person needs when deciding if they should or should not pick up that bicycle or power tool and head on down the path.....unseen.

A trail would also open up areas for unauthorized camping. The city doesn't have the funds to patrol the vast space made accessible by the trail.

Does this allow for access to the City's shop on 2nd Street? There's a law suit waiting to happen.

And what about the drugs? The trail will connect a problem area, Lumber Street, in Petersburg to a path of anonymity.

Snow machines.....they will use it.

I strongly object to the construction of the US Post Office to Severson's Subdivision Trail.

Thank you for your consideration.



Denise Loucks
604 Kiseno
518-0837

Community & Economic Development
PO Box 329
Petersburg AK 99833

RECEIVED
10/4/2016
2:13 PM

RE: Proposed route of a pedestrian trail connecting Post Office to Severson's

Dear Members of Planning & Zoning,

Thank you for asking for public input, after all this is several home owners back yard. I am opposed to the proposed route on several reason. They are as follows:

1. Route has several areas that are consider back yards.
2. Route covers several heavily wooded areas that the wolves/bears travel on (easy access for our town deer). Who in their right mind would consider taking this trail?
3. Who would maintain such a long trail (where is the bathroom and where is the garbage pick up?).
4. What about the streams? Trail would have to cross several streams that are any where from a trickle to a flowing brook. Land management!
5. If a grant has to used, why not think of these area:
 - Greens camp is in dire need of management/clean up
 - Build trail on other side of guard rail on North Nordic
 - Build trail looping airport runway

Quality vs. quantity will hopefully be considered when topic of this trail is discussed.

Sincerely,


Janet Kvernyik
105 South 7th Street



DRAFT

May 2, 2017

Petersburg Indian Association
Attn: Susan Harai, Engineer
PO Box
Petersburg, AK 99833

Dear PIA,

The Petersburg Borough Assembly supports PIA's plans of construction and maintenance of a pedestrian trail from Haugen Drive to Severson's Subdivision with parking areas at either end of the trail.

Thank you for your interest in the betterment of our community.

Sincerely,

Mark Jensen
Mayor

Borough Administration
PO Box 329, Petersburg, AK 99833 – Phone (907) 772-4425 Fax (907)772-3759
www.petersburgak.gov

Debra Thompson

From: Sarah Fine <sarah@finewalshlaw.com>
Sent: Monday, May 9, 2022 10:57 AM
To: Debra Thompson
Subject: Fwd: FW: Petersburg Trail
Attachments: Borough_Agreement_Letter_Data sheets_Maps.pdf

Additional relevant information and attachment from Sue Harai

----- Forwarded message -----

From: Susan Harai <susanharai@piatribal.org>
Date: Sun, May 8, 2022 at 8:52 AM
Subject: Re: FW: Petersburg Trail
To: Chad Wright <tribaladmin@piatribal.org>
Cc: Stephanie Payne <spayne@petersburgak.gov>, sarah@finewalshlaw.com <sarah@finewalshlaw.com>, Chris Cotta <ccotta@petersburgak.gov>, Stephen Giesbrecht <sgiesbrecht@petersburgak.gov>, Alan Murph <alan.murph@hotmail.com>

Hello All,

The PIA 2014 Long Range Transportation Plan added the USPO Severson Trail and it was all on Borough Property originally. See the attachment, and the document Steve signed to add the Borough's trails to PIAs transportation inventory. The drawing of the USPO Severson trail on Borough property is on the last page. My recollection was the trail on the Borough property has the property corner right on the edge of the Public Works city shop/ storage area. The city shop property is adjacent to the State of Alaska airport property. Karl had concerns about the trail going over and through his city shop/storage area. Chris, what are your thoughts?

The adjacent landowners who live on Noseeum, 8th and Kisen St were not for the trail because they expressed concerns of the trail being in their backyard.

The original location was very expensive as it goes through the Hammer's Slough ravine with extreme side slopes and was not ADA compliant as stairways would most likely be used. The end is also in a ravine with extreme side slopes and I have not looked at the "conservation easement" where the Borough dedicated wetlands (they did that when the Fire Station was built) but that could also be a hiccup because you cannot construct over the conservation easement.

The route over the airport property was more desirable for less construction challenges, not abutting homeowners and way less expensive, but the State of Alaska had sent PIA a letter saying that they were not going to approve an easement for that route.

I hope this helps.
Susan

Susan E. Harai PE/PLS
Tribal Transportation Director
Petersburg Indian Association
P.O. Box 1418
Petersburg, AK 99833

PIA 907.772.3636
cell: 907.650.7301



March 10, 2014

Gregory C. Smith P.E.
BIA, Branch of Transportation
3601 C Street, Suite 1100
Anchorage, AK

Dear Mr. Smith,

The Petersburg Indian Association (PIA) has identified the attached list of existing and proposed trails as Tribal Transportation Routes. These existing trails are open to the public as will the proposed trails be once they are designed and constructed. These trails are crucial to the Tribal Community in that they provide access to subsistence, cultural, and recreational activities. Additionally, the routes are within the State of Alaska's Safe Route to School radius providing safe biking and walking to school.

The Borough of Petersburg recognizes that the Tribe's Tribal Transportation Program (TTP), through the BIA, is the largest program in the Office of Federal Lands Highway. Established in 23 U.S.C. 202 to address the transportation needs of Tribal governments throughout the United States, the program receives \$450,000,000 annually to provide safe and adequate transportation and public road access to and within Indian reservations, Indian lands, and Alaska Native Village communities. The TTP program constructs and maintains roads, bridges, trails and transportation facilities that lead to Native village lands, surrounding communities, and the lands on which Tribal members reside and use for subsistence.

The PIA recognizes that the routes identified in the attached list provide a benefit to the community, are open to the public, and require a memorandum of agreement to be established prior to any construction, maintenance or upgrades. The Petersburg Borough will continue its existing ownership and will share the maintenance responsibilities with PIA and does not relinquish jurisdiction nor grant jurisdiction to the Tribe or BIA for any listed routes, bridges, trails, transportation facilities or associated right-of-ways.

The letter authorizes PIA to incorporate the Petersburg Borough trails and transportation facilities on the attached list into the BIA TTP inventory database, according to the process outlined in 25 CFR 170. In conclusion the listed trails will directly benefit those who depend on such facilities for their transportation needs.

Sincerely,

A handwritten signature in blue ink, appearing to read "Stephen Giesbrecht", is written over a horizontal line.

Stephen Giesbrecht
Borough Manager

Borough Administration
PO Box 329, Petersburg, AK 99833 – Phone (907) 772-4519 Fax (907)772-3759
www.ci.petersburg.ak.us

Petersburg Indian Association - 2014 Updated Inventory Catalog
2014 Borough Route Additions
Resolution No. 2014-03
Date: 3-05-2014

Route #	Section	Route Name	Length (mi)	Ownership	Construction Need	POB Latitude	POE Latitude	POB Longitude	POE Longitude
2500	10	City Creek Trail	1.2	5	2	56.805366°N	56.800707°N	132.920556°W	132.896542°W
2501	10	Hungry Point Trail	0.6	5	2	56.822596°N	56.815505°N	132.938573°W	132.944235°W
2502	10	Nature Boardwalk	0.4	5	2	56.815353°N	56.816027°N	132.951971°W	132.944010°W
2503	10	William Musson Memorial Pathway	0.2	5	2	56.814416°N	56.812288°N	132.944505°W	132.943574°W
2504	10	Hungry Point Trail Tie-in	0.3	5	2	56.817144°N	56.819256°N	132.940945°W	132.935800°W
2505	10	City Creek Trail Loop	0.9	5	2	56.803791°N	56.800742°N	132.919521°W	132.896793°W
2506	10	USPO Severson's Trail	1.0	5	2	56.807469°N	56.811334°N	132.966528°W	132.945225°W



Frederick Sound

Point of Beginning

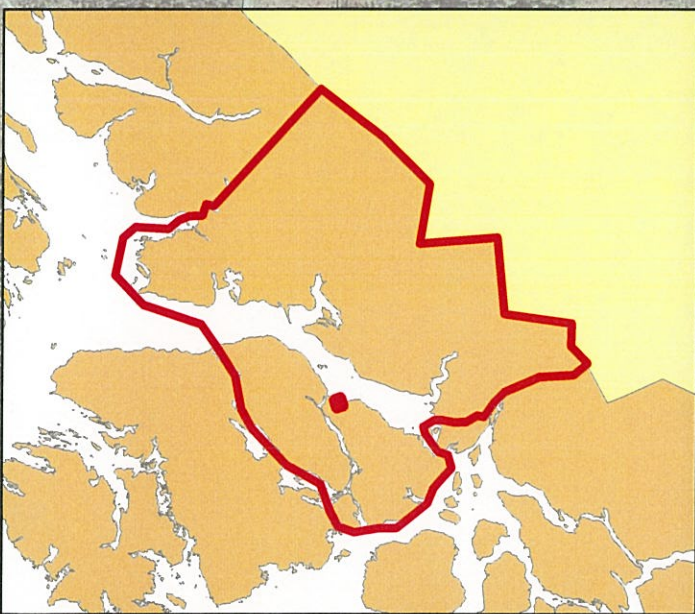
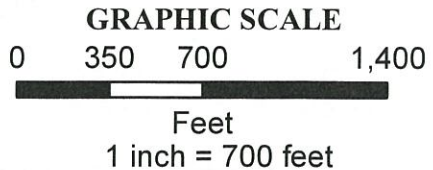
Point of Ending

**ROUTE: 2500
SECTION: 10
NAME: CITY CREEK TRAIL**

**LOCATION:
STATE OF ALASKA
COUNTY 280
PETERSBURG INDIAN ASSOCIATION
CONGRESSIONAL DISTRICT 01**

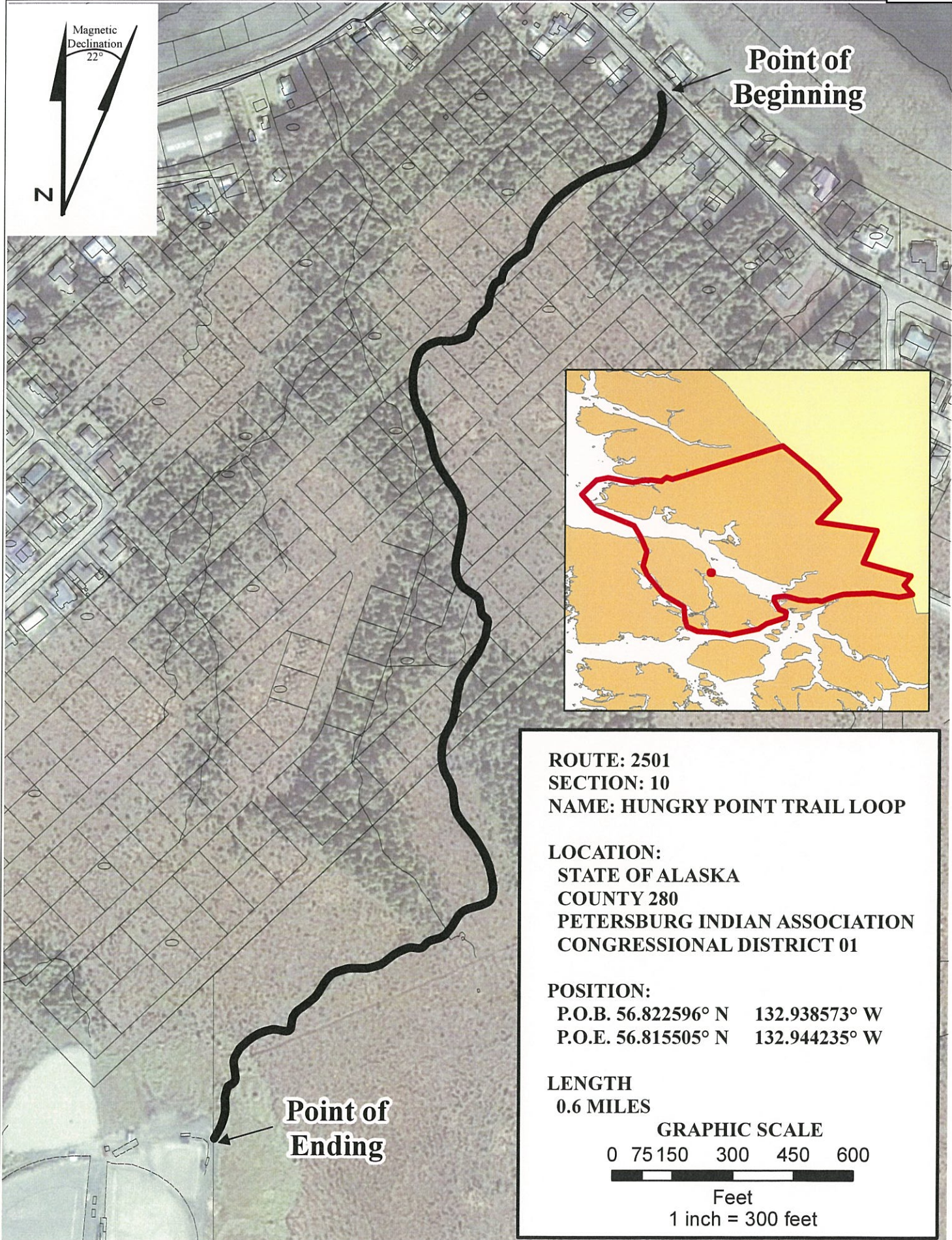
**POSITION:
P.O.B. 56.805366° N 132.920556° W
P.O.E. 56.800707° N 132.896542° W**

**LENGTH
1.2 MILES**





Point of Beginning



ROUTE: 2501
SECTION: 10
NAME: HUNGRY POINT TRAIL LOOP

LOCATION:
STATE OF ALASKA
COUNTY 280
PETERSBURG INDIAN ASSOCIATION
CONGRESSIONAL DISTRICT 01

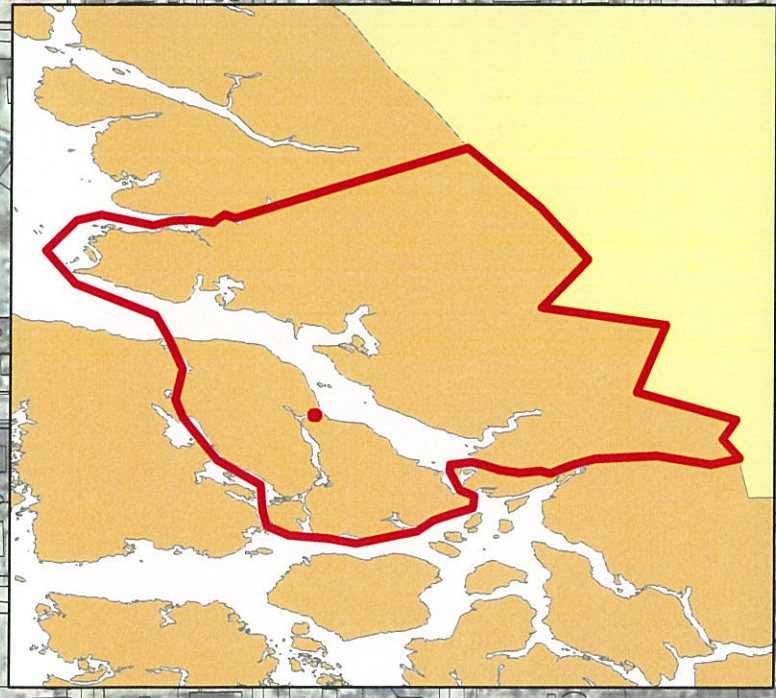
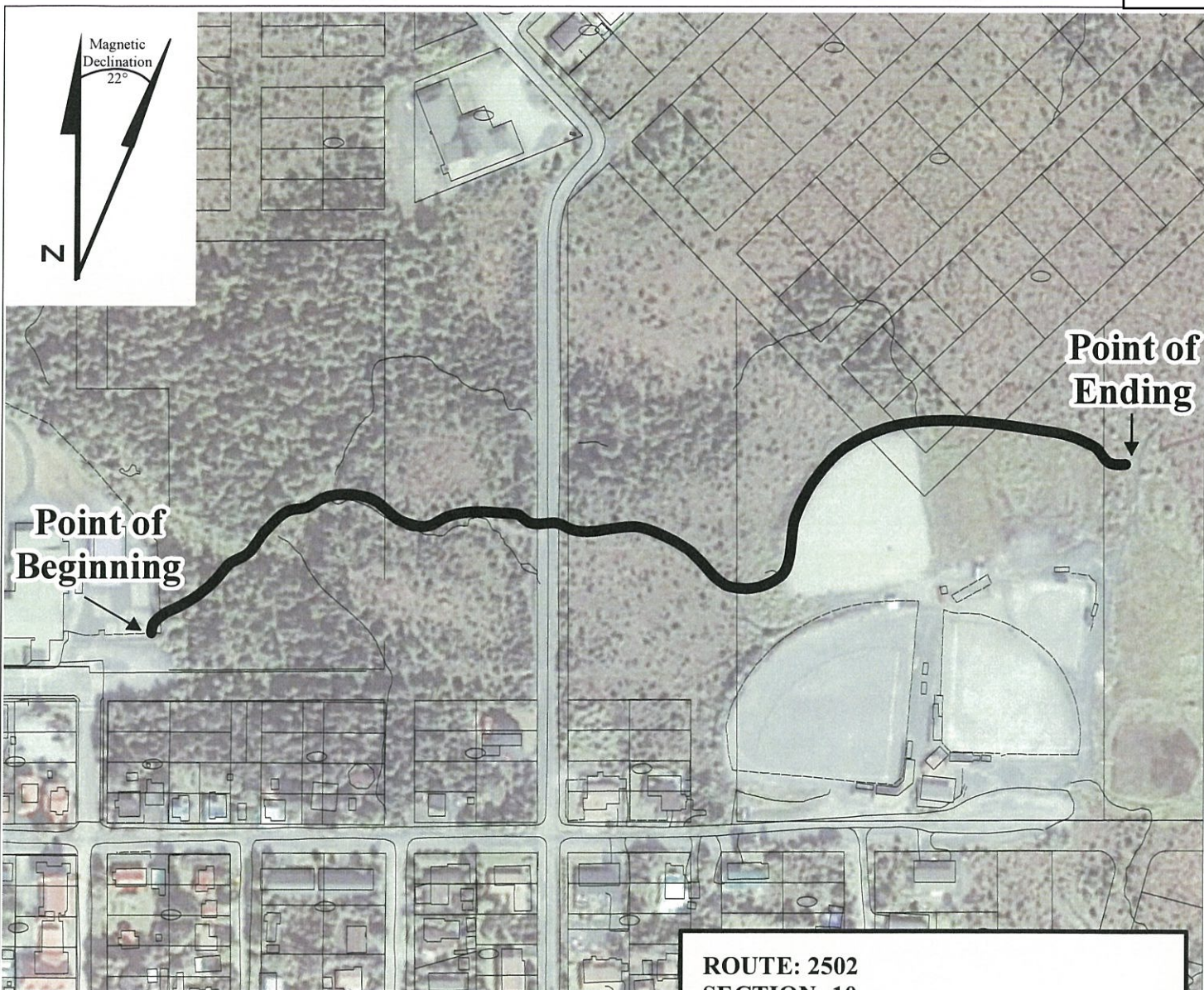
POSITION:
P.O.B. 56.822596° N 132.938573° W
P.O.E. 56.815505° N 132.944235° W

LENGTH
0.6 MILES



Feet
1 inch = 300 feet

Point of Ending



ROUTE: 2502
SECTION: 10
NAME: NATURE BOARDWALK

LOCATION:
 STATE OF ALASKA
 COUNTY 280
 PETERSBURG INDIAN ASSOCIATION
 CONGRESSIONAL DISTRICT 01

POSITION:
 P.O.B. 56.815353° N 132.951971° W
 P.O.E. 56.816027° N 132.944010° W

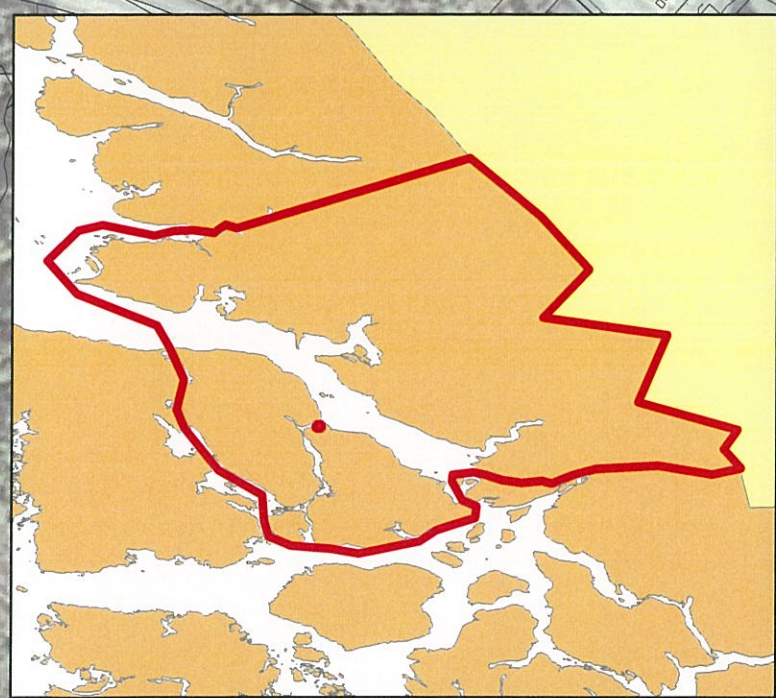
LENGTH
 0.4 MILES

GRAPHIC SCALE
 0 125 250 500
 Feet
 1 inch = 250 feet



Point of Beginning

Point of Ending

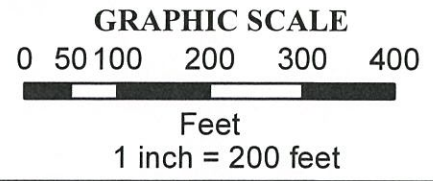


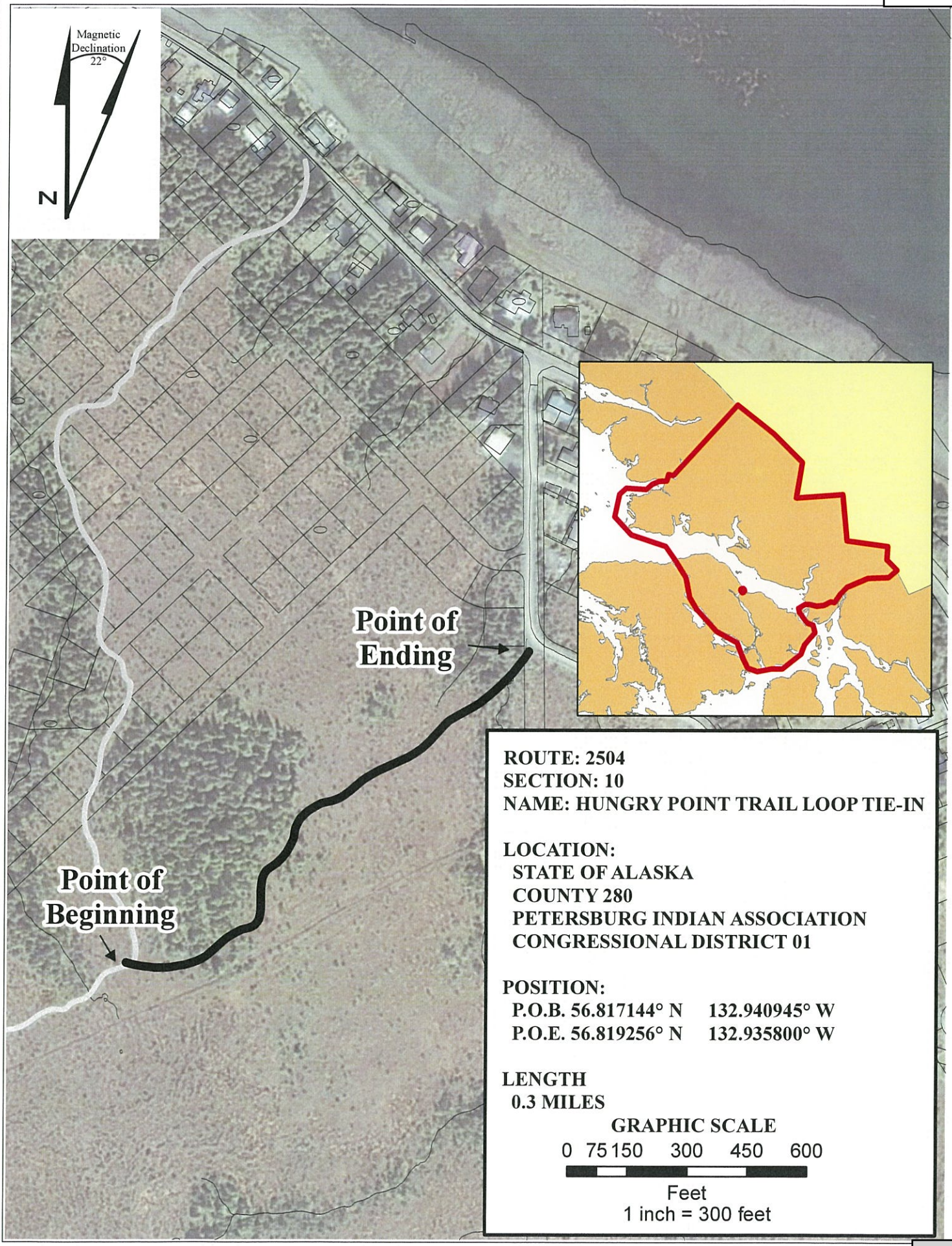
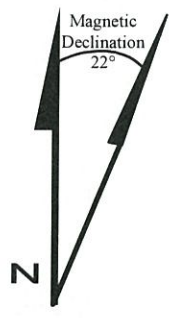
ROUTE: 2503
SECTION: 10
NAME: WILLIAM MUSSON
MEMORIAL PATHWAY

LOCATION:
STATE OF ALASKA
COUNTY 280
PETERSBURG INDIAN ASSOCIATION
CONGRESSIONAL DISTRICT 01

POSITION:
P.O.B. 56.814416° N 132.944505° W
P.O.E. 56.812288° N 132.943574° W

LENGTH
0.2 MILES





Point of Ending

Point of Beginning

ROUTE: 2504
SECTION: 10
NAME: HUNGRY POINT TRAIL LOOP TIE-IN

LOCATION:
 STATE OF ALASKA
 COUNTY 280
 PETERSBURG INDIAN ASSOCIATION
 CONGRESSIONAL DISTRICT 01

POSITION:
 P.O.B. 56.817144° N 132.940945° W
 P.O.E. 56.819256° N 132.935800° W

LENGTH
0.3 MILES

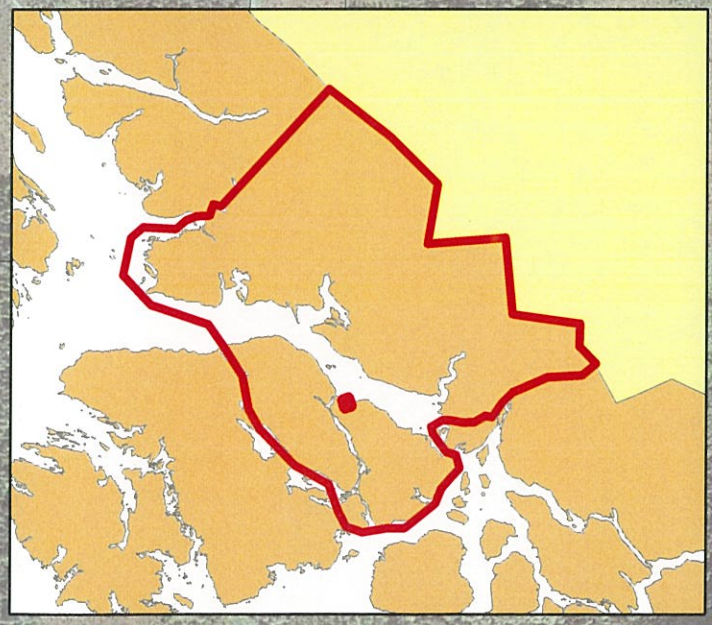
GRAPHIC SCALE
 0 75 150 300 450 600
 Feet
 1 inch = 300 feet



Frederick Sound

Point of Beginning

Point of Ending

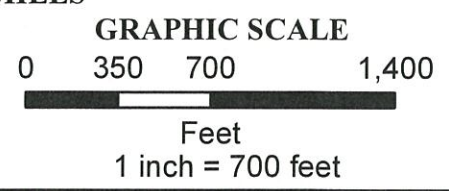


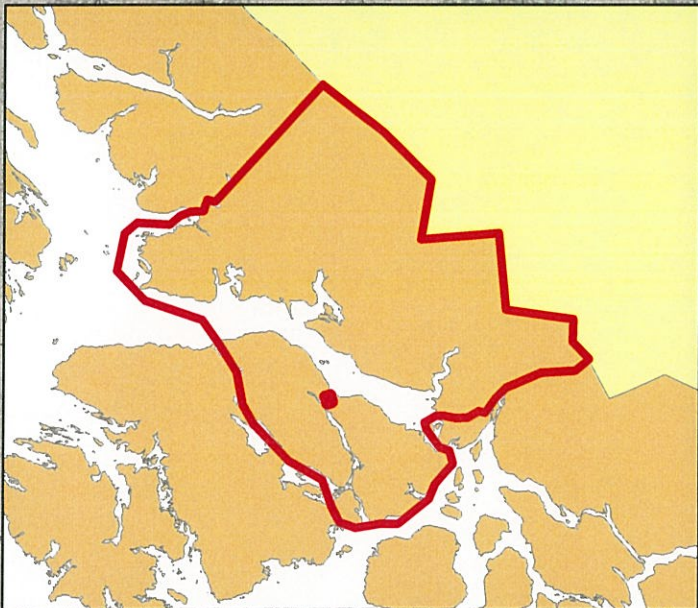
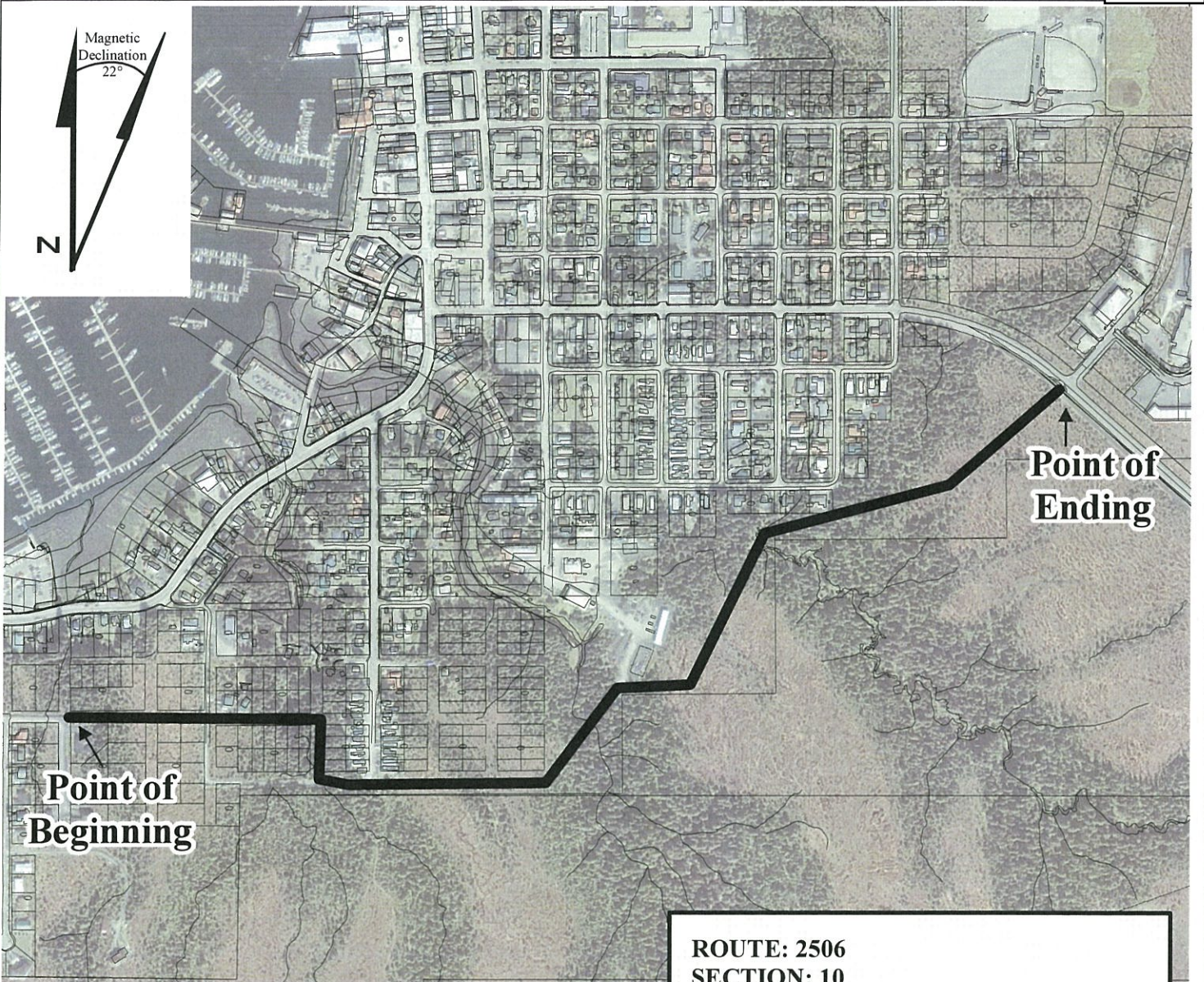
ROUTE: 2505
SECTION: 10
NAME: CITY CREEK TRAIL LOOP

LOCATION:
STATE OF ALASKA
COUNTY 280
PETERSBURG INDIAN ASSOCIATION
CONGRESSIONAL DISTRICT 01

POSITION:
P.O.B. 56.803791° N 132.919521° W
P.O.E. 56.800742° N 132.896793° W

LENGTH
0.9 MILES





ROUTE: 2506
SECTION: 10
NAME: USPO SEVERSON TRAIL

LOCATION:
STATE OF ALASKA
COUNTY 280
PETERSBURG INDIAN ASSOCIATION
CONGRESSIONAL DISTRICT 01

POSITION:
P.O.B. 56.807469° N 132.966528° W
P.O.E. 56.811334° N 132.945225° W

LENGTH
1.0 MILES

GRAPHIC SCALE
 0 325 650 1,300
 Feet
 1 inch = 650 feet

GETTING SOUTHEAST BACK TO BUSINESS



SOUTHEAST
CONFERENCE

Presented to
PETERSBURG ASSEMBLY
May 16 2022

ABOUT SOUTHEAST CONFERENCE

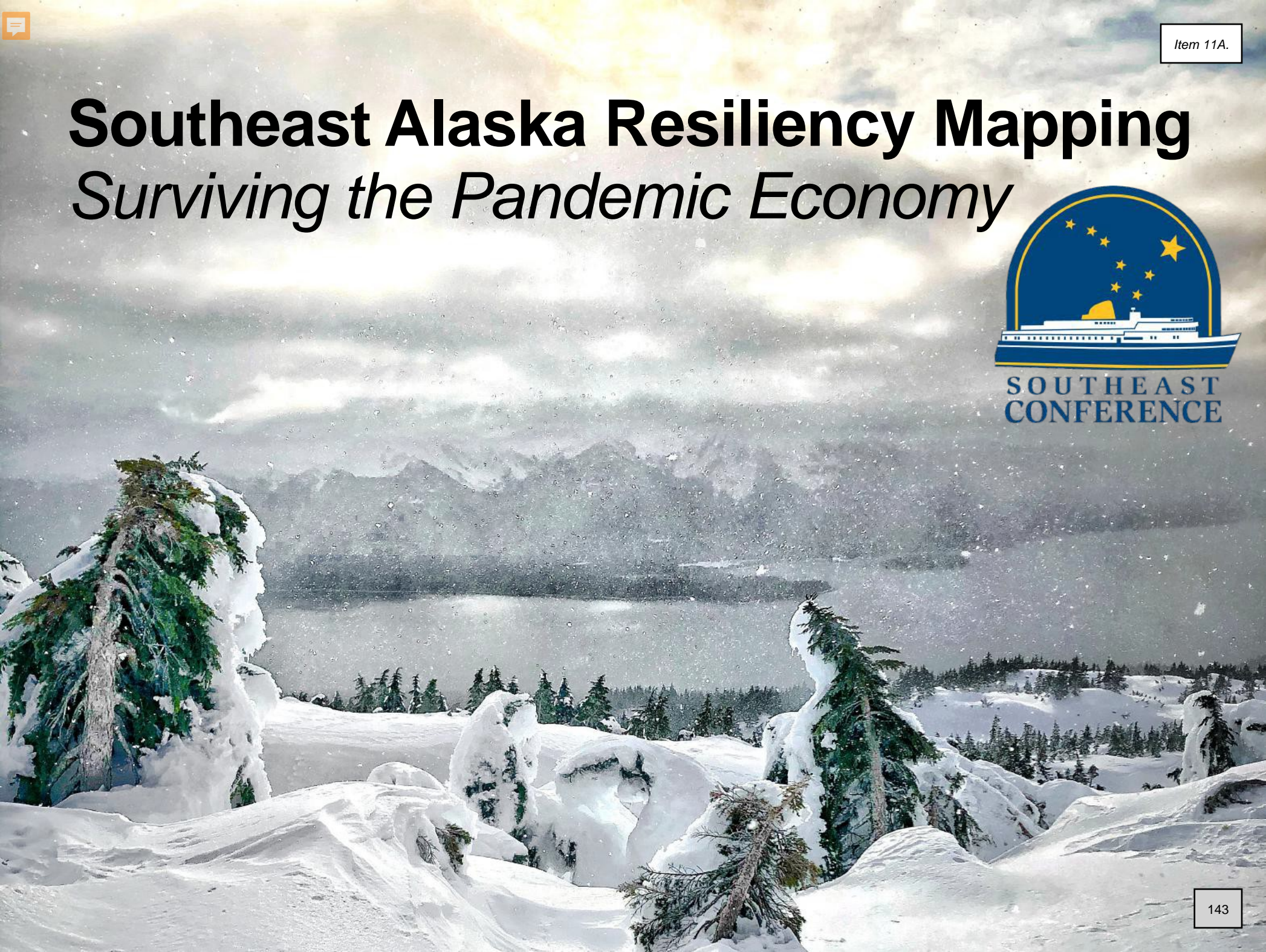
- Southeast Conference was incorporated in 1958, primarily to advocate for the creation of the Alaska Marine Highway System. First meeting held in Petersburg!
- After that success, stayed together to continue to advocate for issues that are key to the southeast region as a whole.
- Looks for consensus for the betterment of the region.
- Members from nearly every community, chamber of commerce, and economic development organization in the region.
- Conduct economic planning through CEDS process and implement CEDS, providing technical assistance and project development support.
- Southeast Conference is the federally designated Regional Economic Development District and the State-designated Alaska Regional Development Organization.





Southeast Alaska Resiliency Mapping

Surviving the Pandemic Economy

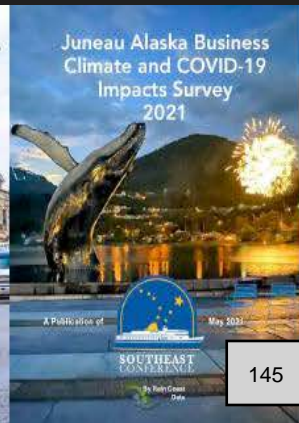
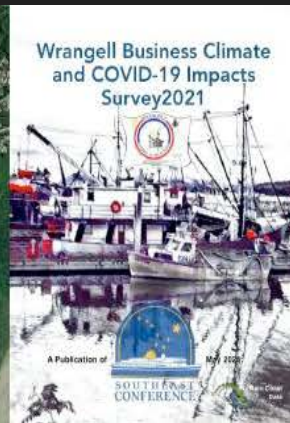
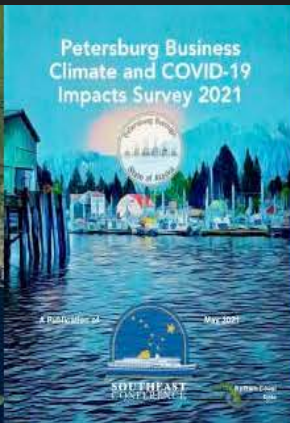
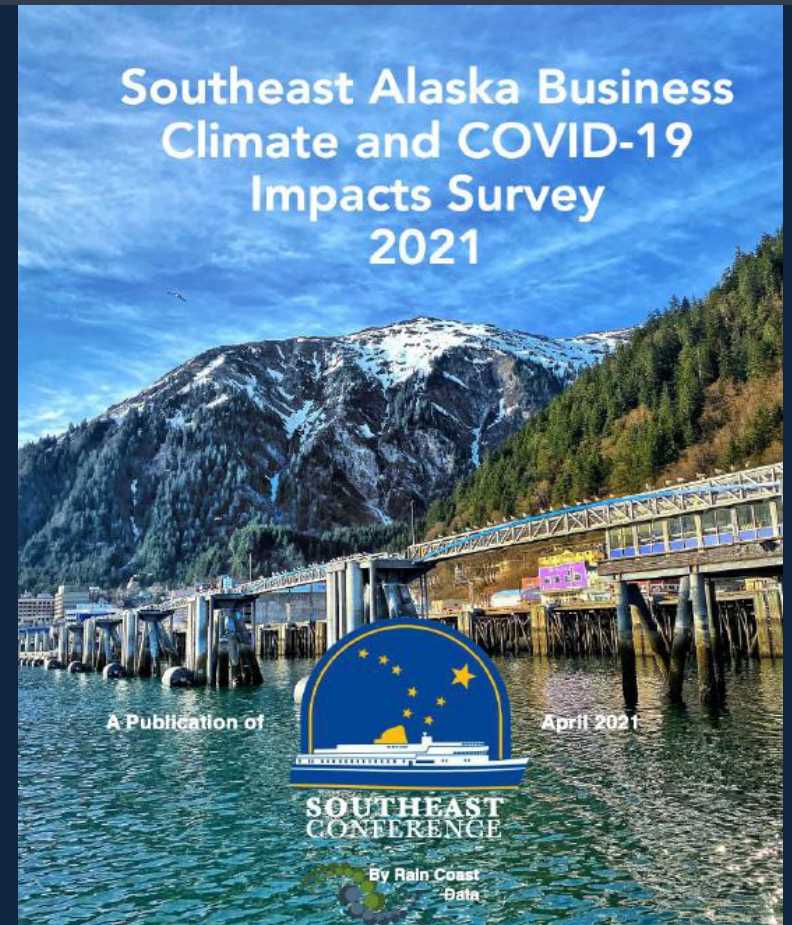


Getting to 2022: *Short-Term Southeast Alaska Resilience Plan* What do we need to do immediately?

- 1. Support Expedited Vaccine Distribution**
- 2. Revitalization of Air, Ferry, Cruise, and Freight Transportation Services**
- 3. Regrow the Visitor Industry**
- 4. Economic Disaster Declaration Request**
- 5. Plan for a post COVID-19 Southeast Alaska Health Care System**
- 6. Ensure the Short-term Viability of the Seafood Sector**
- 7. Keep Southeast Alaskans in their Homes**
- 8. Advocate for Childcare Prioritization in an Effort to Restart the Economy**
- 9. Support Expedited Resolution to Solid Waste Shipping**
- 10. Request Tariff Relief**

BUSINESS LEADER SURVEYS

Data is important, but the best understanding of the economy comes from taking the temperature of the business community.



Calling all business leaders in Southeast Alaska!

Item 11A.



2022 SOUTHEAST ALASKA BUSINESS CLIMATE SURVEY

Please take a few minutes to provide feedback.



This critical data will be used to focus economic relief efforts moving forward and is open to all regional businesses.



PARTNERSHIPS ACROSS SOUTHEAST ALASKA





Southeast Businesses COVID-19 Impacts

Southeast Alaska business leaders were asked how COVID-19 is impacting their businesses. Responding employers have already laid off 30% of their total workforce due to the COVID-19 virus. Regional business revenue was down 42% so far due to the pandemic. Twenty-two percent of respondents say that they are at risk closing permanently, while 39% say that they are not at risk.

Total Businesses Responding = 440

Please estimate the percent revenue decline to your business due to COVID-19 so far.

= -42% overall

78% of responding businesses received COVID relief funding

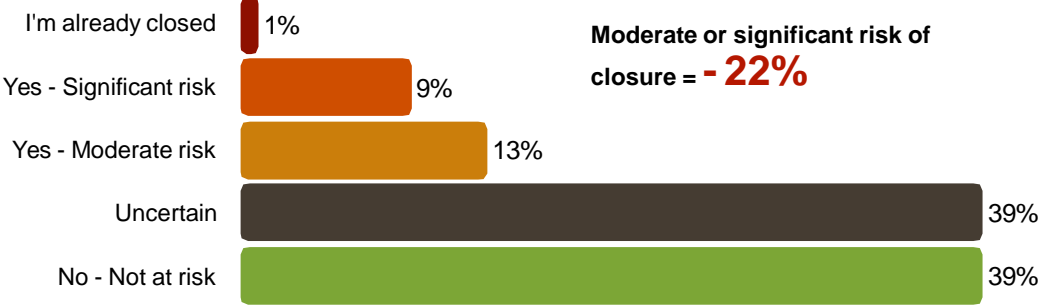
Respondents have laid off **30%** of existing staff so far due to COVID-19

15% expect to make more employment cuts in the future due to COVID-19

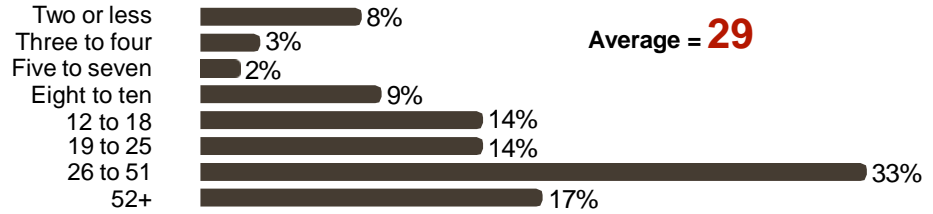
Average current workers per organization = **15**

Average workers laid off so far per business = **-7**

Is your business at risk of closing permanently because of impact caused by COVID-19?

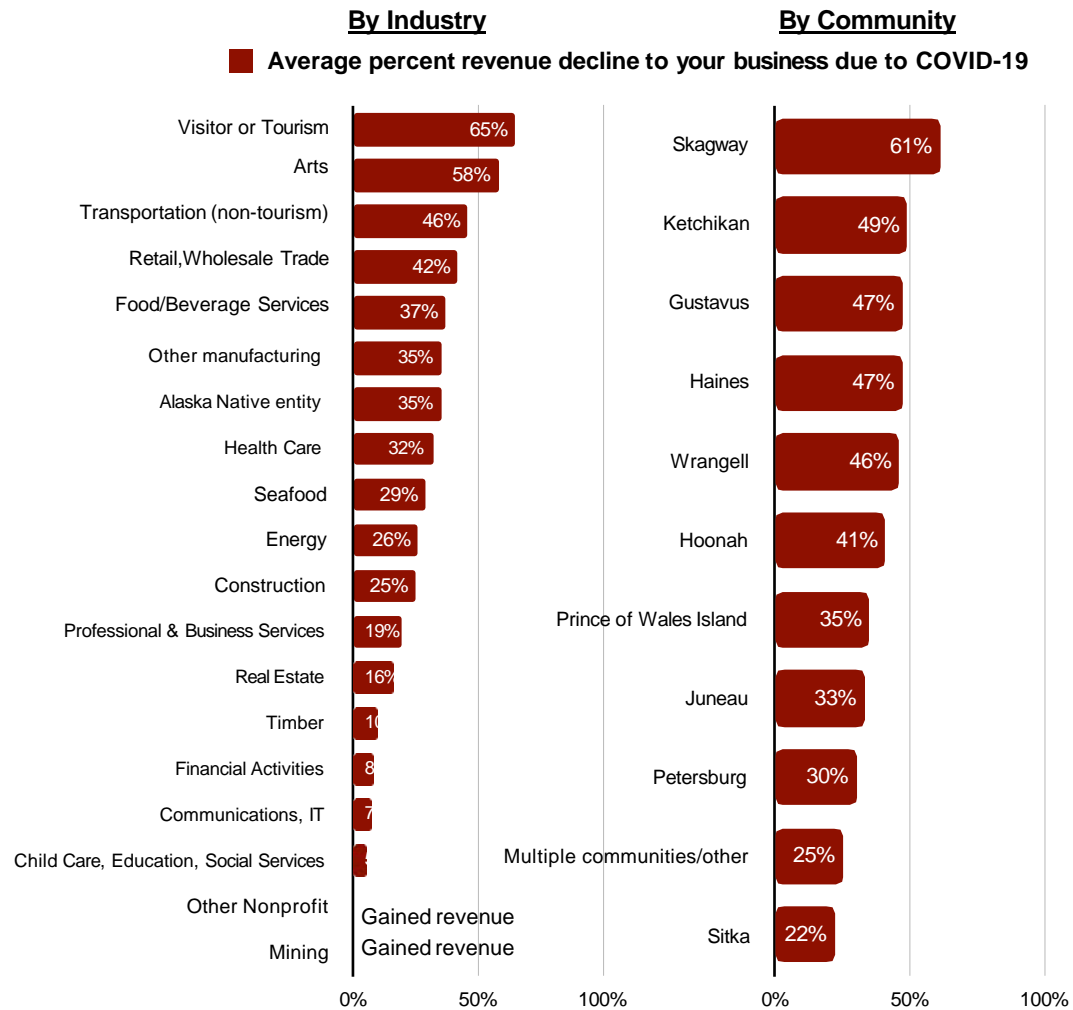


If you answered "yes" above, how many weeks of the current situation do you think you will be able to survive?



Please estimate the percent revenue decline to your business due to COVID-19: By Industry and Community

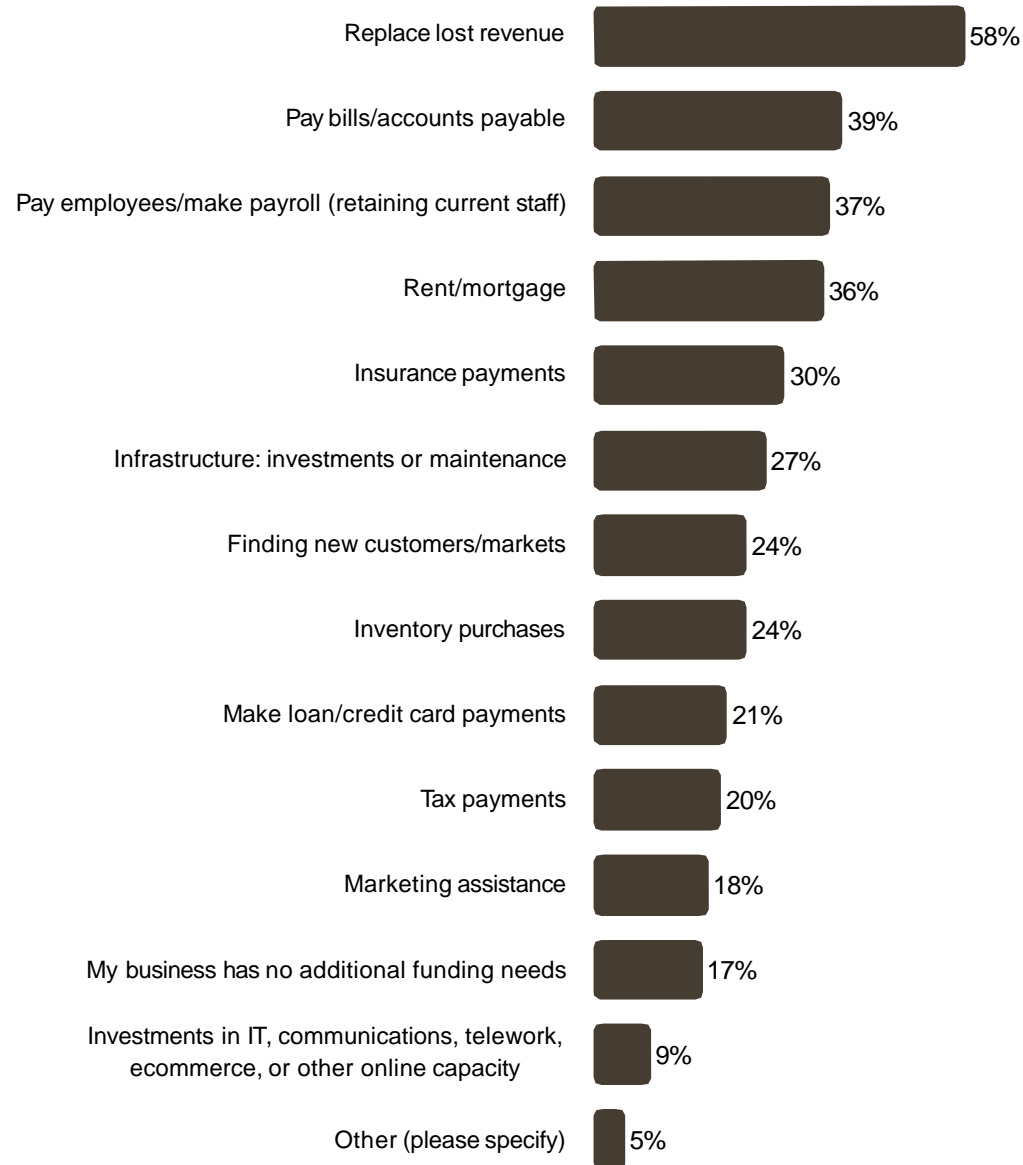
On average, reporting businesses have lost **42%** of their revenue due to COVID-19. However, there is significant variation between industry in community impacts. Businesses in the tourism sector are down by 65%, while arts sector is down by 58%. The mining and nonprofit entities were the only sectors to be revenue positive. By community, Skagway businesses have lost the most, with reported average revenue loss of 61%, followed by Ketchikan, Haines, and Gustavus. Sitka businesses report the smallest average revenue decline of “only” 22%.





What does your business need funding for most moving forward? (check all that apply)

Business leaders were asked what help they most want and need moving forward. Top answers include replacement of lost revenue, help paying bills, making payroll, and mortgage and rent payments.

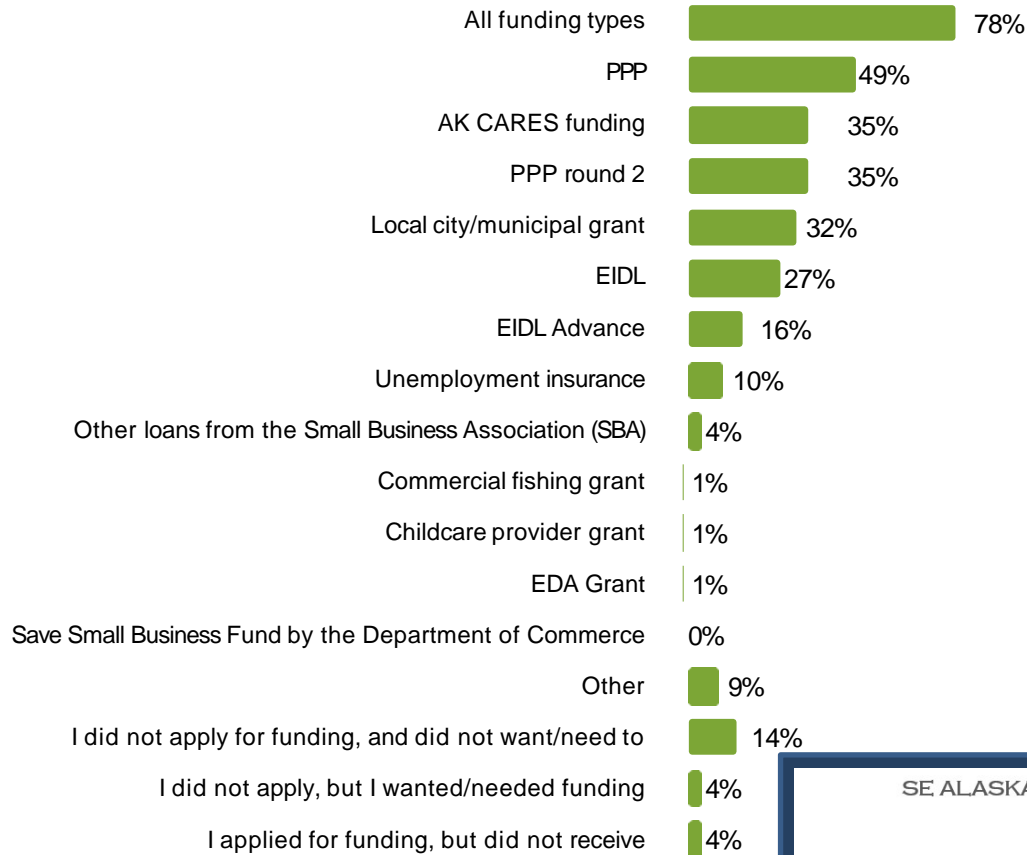




Did you receive any COVID-19 grants or loans to support your business? (check all that apply)

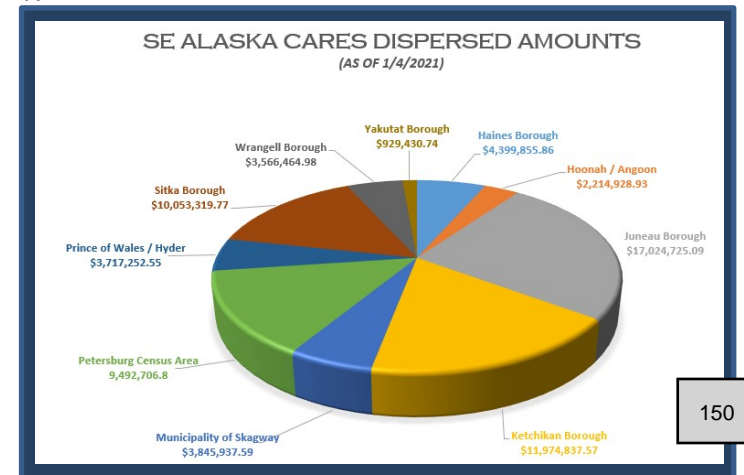
Item 11A.

More than three-quarters of all reporting business leaders had received COVID relief funding for their organizations, including 49% who received the funds from the Payment Protection Program. Not everyone applied for funding, with 18% reporting not applying at all. An additional 4% said that they had applied for funding, but not received the funds.



Businesses receiving grants or loans = 78%

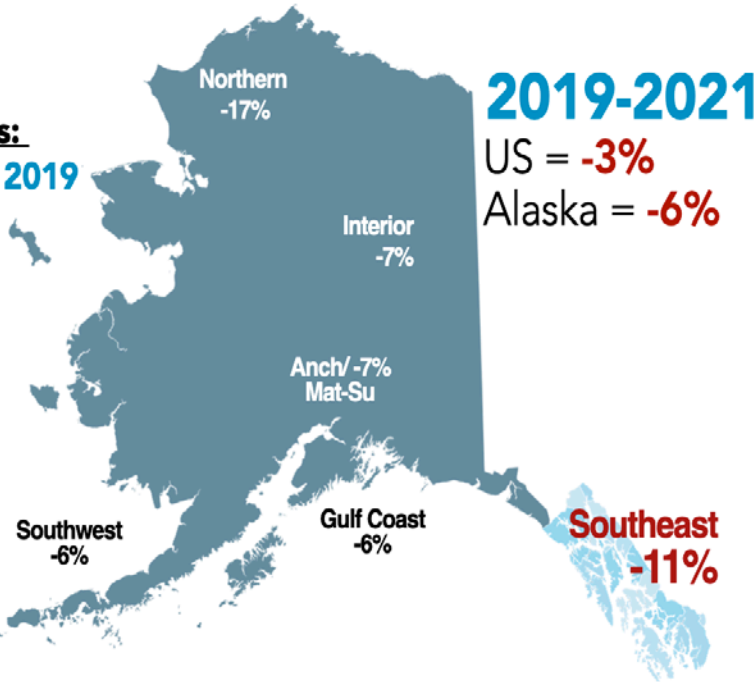
SE Conference provided technical assistance to businesses to access the Alaska CARES program which distributed 67.2 million dollars in aid to the region, helping 1,388 individual businesses.



How do COVID Southeast job losses compare statewide?

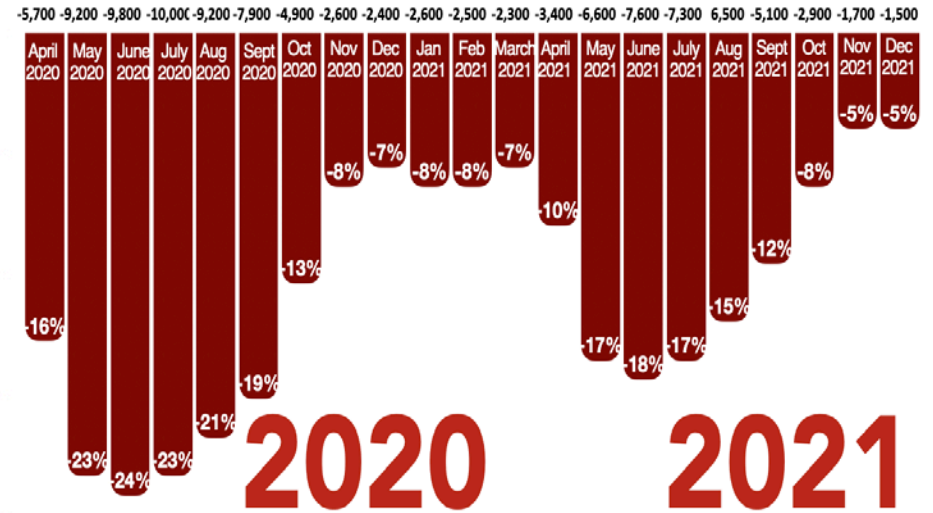
Loss of Alaska Jobs:
2021 compared to 2019

2021



21 Months of COVID-19 Job Losses

Compared to the same pre-pandemic month in 2019



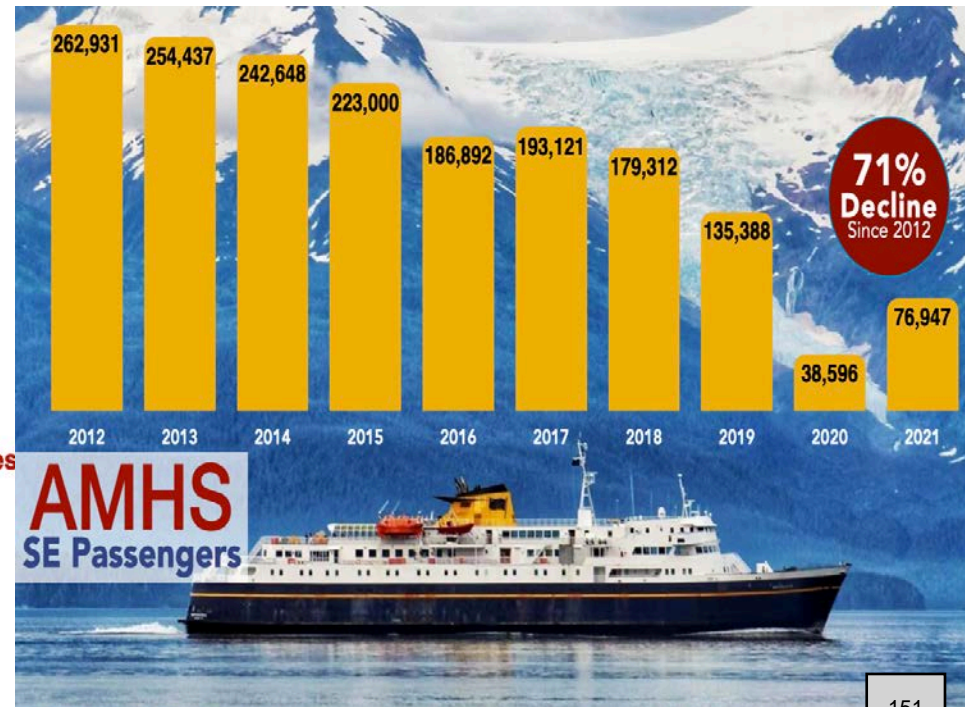
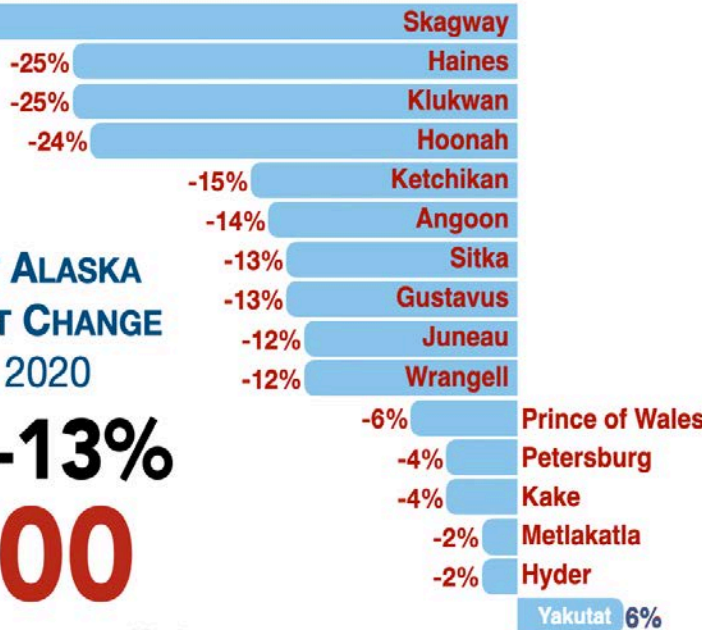
-48%

2020

SOUTHEAST ALASKA EMPLOYMENT CHANGE
2019 TO 2020

Jobs -13%
-6,000

Source: Alaska Department of Labor



Cruise Passengers

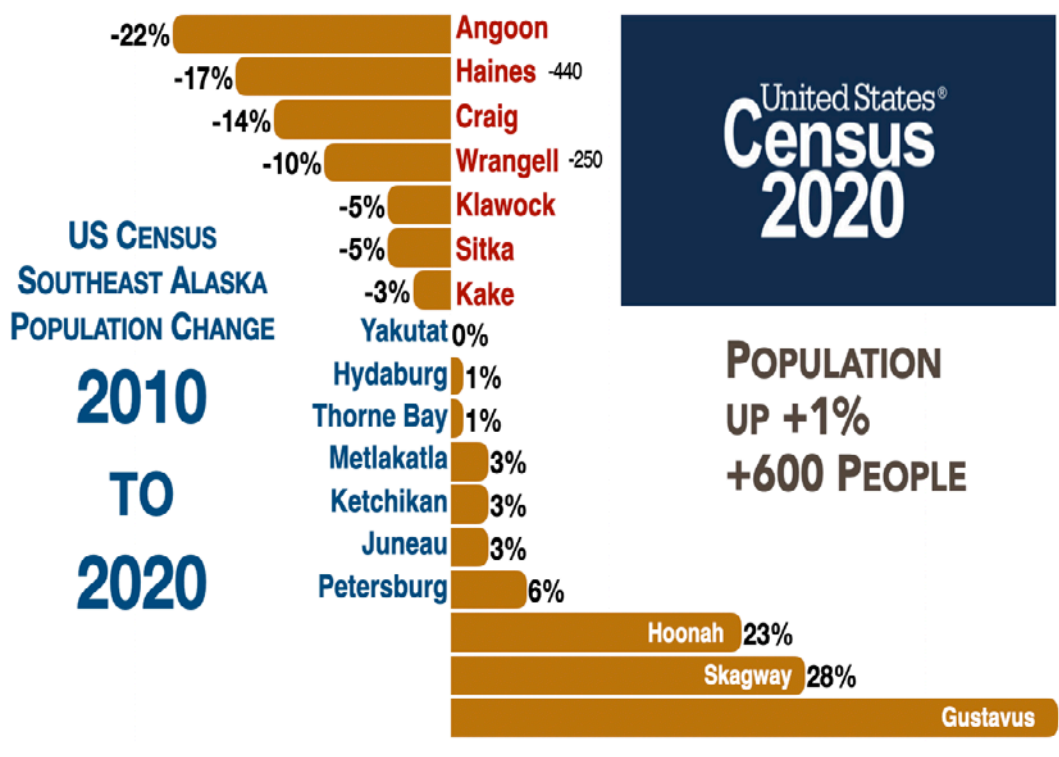


2021 SALMON CATCH COMPARED TO 2020

Item 11A.

+44 million fish X 4
+124 million pounds X 2.7
+\$82 million value X 2.6

The Southeast Alaska pink salmon harvest in 2022 is predicted to be weak



Infrastructure Bill: Alaska

\$5 Billion

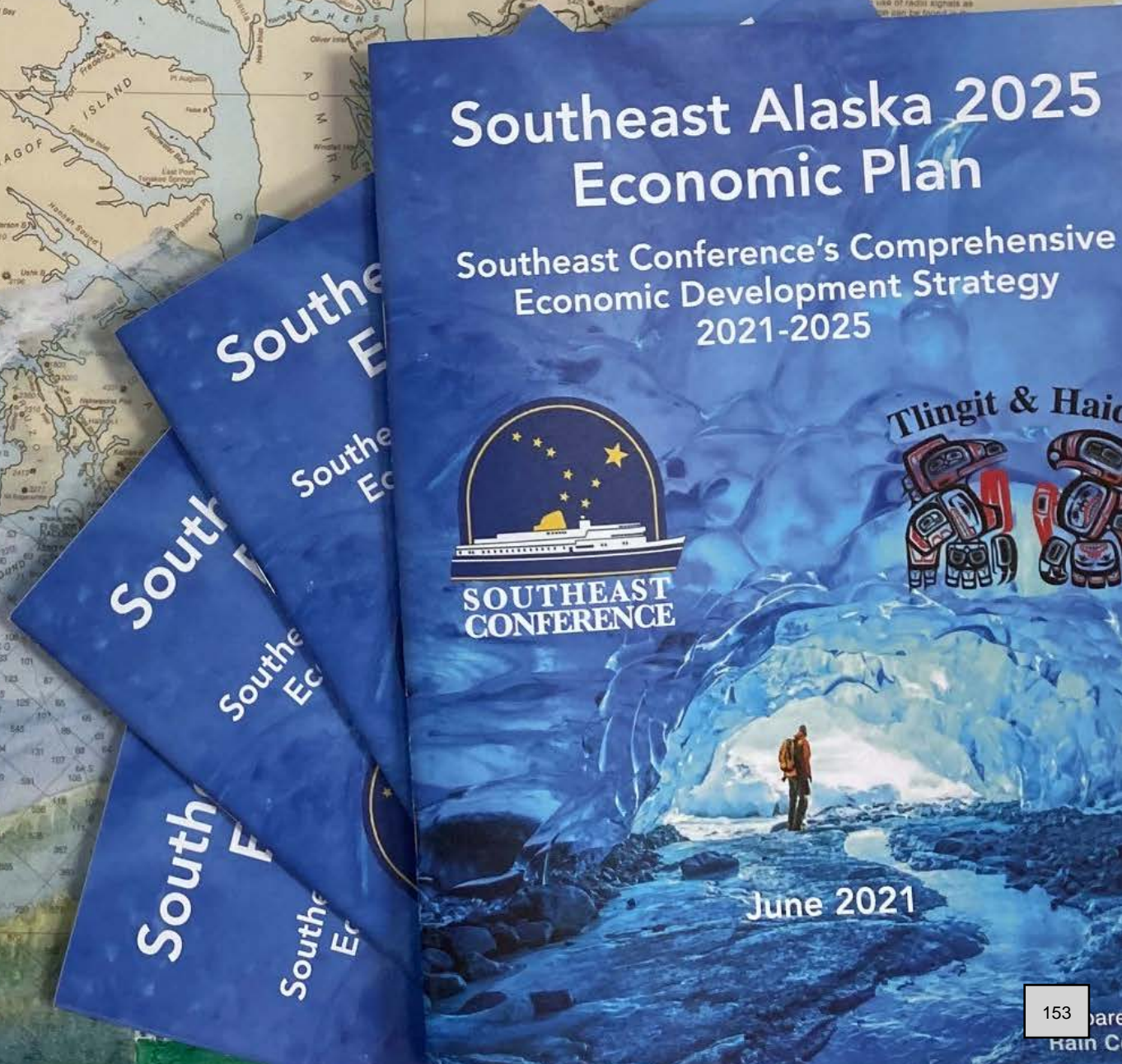
\$3.5 billion for highways
\$1 billion for the ferry system +
\$73 million for new ferries
\$225 million for bridges
\$180 million for water, wastewater projects

Highest spending per cap. benefit **5 YEARS**

2025 SOUTHEAST ALASKA ECONOMIC PLAN

Item 11A.

Recipient of the 2021 NADO Impact Award



1
YEAR

9
COMMITTEES

36
MEETINGS

400
STAKEHOLDERS

50
ECONOMIC
INITIATIVES

4
PRIORITY
OBJECTIVES



USE OF COMMITTEES

	Transportation	Energy	Timber	Seafood	Health Care	Tourism	Mining	Other CEDS
Winter 2020	●	●	●	●	●	●	●	●
Spring 2020	●	●	●	●	●	●	●	●
Summer 2020		●	●	●				
Fall/Winter 2020	●	●	●	●		●	●	●
Spring 2021	●	●	●	●		●	●	●

SOUTHEAST ALASKA'S STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS



Southeast Alaska SWOT Analysis: Strengths, Weaknesses, Opportunities and Threats 2020

At Southeast Conference's February 2020 Mid Session Summit, nearly 300 people representing small businesses, tribes, native corporations, municipalities and community organizations participated in two types of SWOT analyses: one for the region overall, and sector specific SWOTs within the Southeast Conference committee areas. Follow up work occurred between March through October in Zoom meetings and through surveys to improve and prioritize the sector-specific SWOTs. **This document is a summary of each of these Southeast Alaska SWOT analyses.**

A SWOT analysis is an in-depth analysis of strengths, weaknesses, opportunities, and threats. These regional SWOT analyses identify the region's competitive advantages along with internal or external factors that keep us from realizing our potential. It helps answer the question, "Where are we now?" by identifying critical internal and external factors that speak to the region's unique assets that we can leverage to maximize the economic potential of Southeast Alaska.

The sectors that received their own SWOTs include seafood, mining, energy, transportation, health care, tourism, and timber.

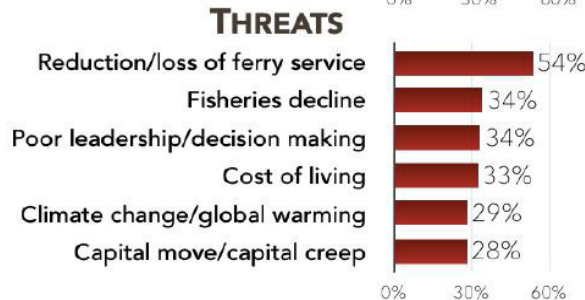
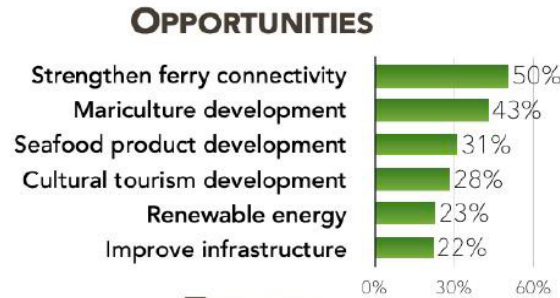
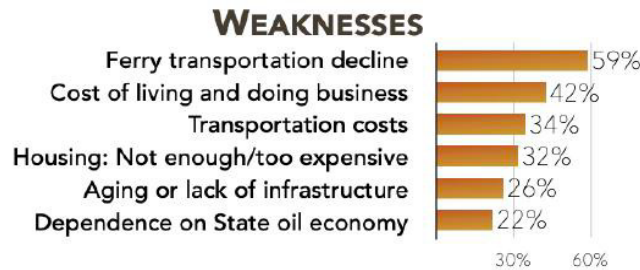
Conducting a SWOT analysis was the first step in a year long planning effort to develop the Southeast 2025

Economic Plan: A five-year economic development strategy that will act as a blueprint for regional collaboration and growth. In order to develop the elements of this plan—a clearly defined vision with prioritized goals & measurable objectives and a strategy-driven Southeast Alaska action plan—it was critical that an analysis of the region's competitive strengths and weaknesses were assessed so that the foundation of the plan could be built upon a common understanding and set of goals.

The first step for each SWOT was asking participants to write down their thoughts, and in doing so generated more than **2,500 individual written comments** that became part of this analysis. Once categories were solidified, Southeast Conference members participated in a series of prioritization exercises to determine the most significant components of the SWOT.

A full analysis of all 2,500 comments was conducted, and is presented on the following pages. A radical decline in ferry service drove three of the four top responses for each overall regional category:

- Top Strength: **Beauty and Recreation Opportunities**
- Top Weakness: **Decline of the Ferry Transportation**
- Top Opportunity: **Strengthening Ferry Connectivity**
- Top Threat: **Loss of Ferry Service**



REGIONAL SWOT SUMMARY

This page provides a summary of the full SWOT process, both for the overall SWOT of the Southeast Alaska economy, as well as for the sector specific SWOTs for seven regional industries.

Seafood

- Top Strength: **High quality product**
- Top Weakness: **Changing ocean conditions**
- Top Opportunity: **Increase value added processing**
- Top Threat: **Ocean acidification & changing conditions**

Health Care

- Top Strength: **Personalized care delivery**
- Top Weakness: **State budget cuts reduce workforce development options**
- Top Opportunity: **Development of health care courses at the university**
- Top Threat: **Growing health care costs**

Visitor Industry

- Top Strength: **Natural beauty of region**
- Top Weakness: **Community communications**
- Top Opportunity: **Collaborate with Alaska Native entities on cultural tourism**
- Top Threat: **COVID 19**

Mining

- Top Strength: **Provides high paying jobs**
- Top Weakness: **Extreme opposition by environmental groups**
- Top Opportunity: **Explore and develop new mineral deposits and expand existing mines**
- Top Threat: **Environmental groups/lawsuits**

Timber

- Top Strength: **High quality wood**
- Top Weakness: **Frequency of litigation**
- Top Opportunity: **Increased state and private lands**
- Top Threat: **Environmental litigation**

Transportation

- Top Strength: **Strong reliable airline services**
- Top Weakness: **AMHS service reductions**
- Top Opportunity: **Improve ferry service**
- Top Threat: **The demise of ferries**

Energy

- Top Strength: **Abundant hydropower**
- Top Weakness: **High costs of infrastructure**
- Top Opportunity: **Expand regional intertie**
- Top Threat: **An economic downturn**

COMPREHENSIVE ECONOMIC DEVELOPMENT STRATEGY (C INITIATIVES

*Southeast Conference worked with municipal government, business, and community leaders across Southeast Alaska to build the 20205 Economic Plan. The work was done through Southeast Conference's extensive stakeholder structure, including the seafood/maritime, transportation, energy, mining, timber, health, and economic development, and solid waste committees. The result is a comprehensive list of 59 prioritized initiatives, including **four priority objectives** that constitute the focus of the Southeast Conference's strategy over the next five years.*

TOP 50 ECONOMIC INITIATIVES

TRANSPORTATION

- 1. **Priority** Sustain and support the Alaska Marine Highway System
- 2. Develop a long-term, strategic, multi-modal, regional transportation plan
- 3. Ensure the stability of regional passenger transportation services
- 4. Move freight to and from markets more efficiently
- 5. Ports and harbors infrastructure improvements
- 6. Road Development



SEAFOOD & MARITIME

Seafood

- 1. **Priority** Mariculture development
- 2. Work to promote a year-round seafood economy
- 3. Further develop seafood markets
- 4. Maintain a stable regulatory regime
- 5. Research the effects of changing ocean conditions on the marine environment
- 6. Support regional processors becoming economically competitive
- 7. Communicate the importance of salmon hatcheries
- 8. Seafood sector workforce development
- 9. Full resource utilization & ocean product development

Maritime

- 1. Increase employment & training opportunities for Southeast Alaska residents in the Marine Industrial Support Sector
- 2. Increase energy efficiency & reduce energy costs

VISITOR INDUSTRY

- 1. **Priority** Market Southeast Alaska to attract more visitor spending and visitor opportunities
- 2. Grow cultural and arts tourism opportunities
- 3. Increase access to public lands and expand trail network
- 4. Increase yacht and small cruise ship visitation
- 5. Educate public on the economic value of tourism



ENERGY SECTOR

- 1. **Priority** Promote beneficial electrification
- 2. Continue to support rural Southeast communities with high-cost electric rates without access to lower cost hydroelectricity

- 3. Work with communities to create energy systems that provide sustainable, affordable, renewable thermal energy
- 4. Implement regional energy plan with a focus on "committed units" and deployment of renewables
- 5. Energy workforce development

MINING INDUSTRY

- 1. Proactively support mining operations and mineral exploration projects
- 2. Support efforts to increase access to minerals and energy sources for mining on state and federal lands
- 3. Mining and exploration workforce development
- 4. Preserve access to reliable, year-round transportation for miners living in rural Southeast Alaska
- 5. Attract mining capital

HEALTH CARE

- 1. Plan for a post COVID-19 health care system
- 2. Retain Alaska-trained health care students
- 3. Meet the health care needs of an aging population
- 4. Increase health care training within the region and state



TIMBER INDUSTRY

- 1. Provide an economically viable and dependable supply of timber from the Tongass National Forest to regional timber operators
- 2. Revise the Tongass National Forest Land Management Plan
- 3. Support an integrated timber industry that includes harvest of young growth and old growth
- 4. Community-based timber workforce development
- 5. Work with USFS to direct federal contracts and timber sale opportunities toward eligible locally owned businesses

OTHER OBJECTIVES

- 1. **Child Care:** Increase child care capacity
- 2. **Housing:** Support the sustainable development of housing
- 3. **Communications:** Improve communications access
- 4. **Education Objective:** Partner with University of Alaska Southeast and K-12 districts to build career pathways and meet employer needs for a skilled workforce

2025 CEDS PRIORITY INITIATIVES

1. **Transportation:** Sustain and support the Alaska Marine Highway System
2. **Seafood:** Mariculture development
3. **Visitor's Industry:** Market Southeast Alaska to attract more visitor spending and opportunities.
4. **Energy:** Promote Beneficial Electrification

Welcome to

2022 SOUTHEAST CONFERENCE MID-SESSION SUMMIT

GETTING BACK TO BUSINESS



February 8-9, 2022



COVID- SAFE TRAVEL GRANT



\$253,415.00

Awarded June 7 -Aug 31

HAINES ♦ WRANGELL GUSTAVUS ♦ SKAGWAY

Used funds to promote and build promotion portfolio for under-represented communities

MISSION

Target Independent Travelers
Online Focus - social media
and electronic advertising
Build image portfolio to use in
promotions for future

DISASTER RECOVERY EFFORTS

Item 11A.



SEASWA TIRE CUTTER



REDA PROGRAM

Renewable Energy Development Assistance

Item 11A.



BENEFICIAL ELECTRIFICATION

Priority objective

STATEWIDE ASSISTANCE

for renewable energy adoption in the private sector

PARTNER ORGANIZATIONS

Innovation Insights, REAP, ACEP

GOALS

Renewable Energies in Rural Alaska

Tools for small businesses

Increase Capacity Building

Empower Local Champions

Fill in funding gaps

Bolster opportunities for success



FEBRUARY 10, 2022 JUNEAU, ALASKA

Transportation Resolutions

- 1 Supporting Funding for the Community Transportation Program
- 2 Supporting Direct Funding to Communities for Transportation Projects
- 3 Supporting Efforts to Implement in Alaska the Electric or Low-Emitting Ferry Pilot Program
- 4 Supporting changes to the Governance Structure of the Alaska Marine Highway System by Evaluating the Reassignment of the AMHS to the AK Dept of Commerce, Community and Economic Development
- 5 Supporting Multi-Use Waterfront Infrastructure
- 6 Supporting Strategic Use of Funds

LOW-EMISSIONS FERRY OPERATIONS FEASIBILITY Item 11A.

within the AMHS Service Area

1. Concept Vessel Design and Operation Analysis

Route and Service area, vessel needs assessment, propulsion systems, vessel construction, crew requirements, operational costs

2. Shoreside Infrastructure Analysis

Generation Capacity, Electrical Grid capacity, and port infrastructure

3. Financial and Economic Analysis.

Operating revenue and expenses, assessment of port community economic benefit analysis



COMING IN 2022

Reinventing the Tongass Economy

**MARICULTURE COMMUNITY
PROCESSING FACILITY**

An Industry "Incubator"





KETCHIKAN

Gravina Island

DECREASE FOREIGN DEPENDENCE

80% of metals currently coming from China –
used in screens, car computers,

UAS TRAINING FACILITY

Lab for mining students

BOLSTER ECONOMY

65 year-round, high paying jobs
Increase Tax Base





SMALL SCALE

containerized pellet mill

KETCHIKAN

Gravina Island

PROJECT BENEFITS

Fill need of regional demands

Utilize wasted biomass

Lower energy costs

Create local jobs

If successful, this mill can serve as
a prototype for other locations

MARICULTURE IS...



Enhancement, restoration and farming of shellfish and seaweeds.

WHY MARICULTURE?

Mariculture = Opportunities & Benefits for Alaskans

economic, industrial, environmental, cultural, and food security



Seagrove Kelp Company harvesting near Craig, Alaska

MARICULTURE'S MOMENT

USDA \$500,000 award for pre-construction activities for a shared processing facility on POW (funding proposed in Governor's budget)

BBB Finalist with Application for Mariculture support and development in the region.

International interest in coming to the region to invest in mariculture.

AK Mariculture Cluster – statewide!



ALASKA MARICULTURE CLUSTER

\$500,000 planning grant; chance for Phase 2 of \$50 million

(SEC = Lead, Coalition Steering Committee = KPEDD, PWSEDD, SWAMC, AFDF, AMA, University, ASG, ALFA, Central Council, State of Alaska)

FINALIST
\$1 Billion
Build Back Better
Regional Challenge

- 1) Alaska Integrated Hatchery Network
- 2) Capital to expedite private investment in mariculture development
- 3) Workforce development to support the mariculture industry
- 4) Vessel energy audits and efficiency improvements
- 5) Innovation Fund
- 6) Product and market development
- 7) Coordination between industry, university, government & Alaska Native participants
- 8) Public education & outreach for continued acceptance and support



SUPPORT FOR REGIONAL PROJECTS

Item 11A.



Supporting SOUTHEAST ALASKAN COMMUNITIES

Metlakatla ♦ Sitka ♦ Wrangell ♦ Petersburg
Yakutat ♦ Hoonah ♦ Ketchikan ♦ Haines
Angoon ♦ Juneau ♦ Gustavus



612 W. Willoughby Ave., Suite B
P.O. Box 21969, Juneau, AK 99802
Phone: (907) 586-4360
www.seconference.org
Email: info@seconference.org
SOUTHEAST ALASKA REGIONAL DEVELOPMENT ORGANIZATION

April 13, 2022

Senator Lisa Murkowski
522 Hart Senate Office Building
Washington DC 20510

Dear Senator Murkowski,

Southeast Conference supports federal funding for the "Capital City Civic Center" that, while located in Juneau, would be a regional asset for Southeast Alaska. This facility will be competitive for attracting conventions and serve a multitude of needs for the community, the region and all Alaskans that visit the capital city. Attracting visitors and economic development to the region begins in Juneau, then flows to the rest of the region. Southeast Conference supports and recognizes the value of this priority project of the City and Borough of Juneau, the Greater Juneau Chamber of Commerce and Travel Juneau.

The mission of the Southeast Conference is to undertake and support activities that promote strong economies, healthy communities, and a quality environment in Southeast Alaska. Since 1958, Southeast Conference has advocated for issues that are key to the southeast region as a whole - looking for consensus and areas that can work together for the betterment of the region. Southeast Conference is the State of Alaska Regional Development Organization for Southeast Alaska and the US Economic Development Administration's (EDA), designated Economic Development District (EDD) for the region.

Southeast Conference is responsible for developing a Comprehensive Economic Development Strategy (CEDS) for Southeast Alaska that is designed to identify regional priorities for economic and community development. Among the economic initiatives identified in Southeast Conference's 2025 Southeast Alaska Economic Plan are to market Southeast Alaska to attract more visitor spending and visitor opportunities, support the arts and grow cultural tourism opportunities. This Capital City Civic Center project is consistent with these regional priority initiatives.

The current outdated and poorly functioning facility, Centennial Hall, is nearly 40 years old. This Civic Center would be a centerpiece for the development of the Auke Village Arts District and a keystone for community events and competitive convention business. We encourage you to support funding for this project.

Sincerely,



Robert Venables
Executive Director





THANK YOU!



Robert Venables

robert@seconference.org 907.586.4360

Housing Meeting May 3, 2022

Present:

Jalyn Birchell, Housing Director with PIA

Liz Cabrera, Community Development Director

Steve Giesbrecht, Borough Manager

Ashley Kawashima, HIP Board President and Behavioral Health Clinician with PMC

James Kerr, Chief of Police

Erin Michaels, Public Health

Kris Norosz

Chelsea Tremblay, Assemblymember

Becky Turland, Community Wellness with PMC

AJ Ware, WAVE Prevention Coordinator

Chad Wright, PIA Tribal Administrator

Received an update from Manager Giesbrecht and Administrator Wright, that it is unlikely Tlingit and Haida has funds for larger development. Hopefully PIA will make progress on a new duplex or triplex in the coming year. They are in communication with the Borough on a possible piece of property.

The group heard an update on Vakker Sted apartments; the majority of units have been rented. As of the meeting there were only two vacancies. HIP has helped facilitate the application and rental process for some individuals who had previously been experiencing homelessness for the new property as well as other properties opening up due to that complex opening. This is part of their pilot program using flexible state funding to help get people housed and out of experiencing homelessness.

PIA rental units are currently at 100% capacity.

An update from Director Cabrera: Working on a plan to present to the Assembly that would expand on utility work already included in the budget to open new lots in Service Area 1, close to downtown. With additional work, using funds from Property development Fund, the properties platted behind Excel, extending Fram Street, could become viable lots for housing.

Chief Kerr expressed interest in the conversation, as the lack of housing opportunities limits who applies for jobs in Petersburg. Also sees the link between affordable housing and issues the police force deal with - if affordable housing were more accessible, would ease tension between individuals and present more options for community members who would benefit from changing situations.

Other themes discussed:

- The overall rigidity of the housing and property market, with property speculators buying and holding land that could otherwise be sold to prospective homebuilders.

- Possible changes to housing code at state level that would make it easier for smaller properties (under 400 square feet) to meet code
- Education and promotion programs for landlords to join Section 8 program

**Mayor's Report
May 16, 2022 Assembly Meeting**

1. Seeking Letters of Interest: The Petersburg Borough is accepting letters of interest from citizens who wish to serve the community by filling one of the vacant seats on the following Borough Boards/Commissions until the October 2022 Municipal Election:

Planning Commission – two vacant seats

Parks & Recreation Advisory Board – one vacant seat



**Borough Manager's Report
Assembly Meeting 16 May 2022**

- ❖ Recent fair weather gave the crew an opportunity to paint curbs and crosswalks in the downtown area.
- ❖ Sand pickup continues. Grading as weather permits.
- ❖ The tire shear unit belonging to the Southeast Solid Waste Authority (SEASWA) is in Petersburg and we are using it to cut up accumulated tires at the landfill prior to containerizing the tire pieces and shipping south. Landfill operators down south will not accept tires “in the round” since they fill with gasses and migrate up through the landfill. Once we are done with the tire shear on this rotation, we will forward it along to another SEASWA member community.
- ❖ Garbage bears are out and about and causing mischief. Public Works has issued a PSA and placed ads in the paper to remind folks to keep garbage secured or face possible citations and fines.
- ❖ Continue to distribute KN95 masks and at-home COVID antigen test kits. Test kits are available at the Police Dept, Library, Municipal, Fire Department, and Public Health Nurse’s Office.
- ❖ Recently discovered glass in the bay doors of Fire Station 1 is not compliant. In the process figuring out how to replace with tempered glass.
- ❖ COVID has been hitting the volunteers. Fortunately, we are only down one or two at a time. Most have had very minor or no symptoms at all.
- ❖ SPECIAL NOTE: When you see a volunteer... tell them Thank You!
- ❖ We are open for visitors at the Manor. Please don’t visit our residents if you are not feeling well. Please call Shelyn with any questions at 907-772-2445.
- ❖ The two empty apartments on the Assisted Living second floor will be filled with independent residents as we continue to go through the staffing shortages in town. Working down the wait list, so far one apartment is spoken for.
- ❖ Recertification with the State of Alaska complete for two more years as a Medicaid provider at the Manor.
- ❖ Water Staff is working with Boreal Controls out of Juneau for the replacement of three control panel battery backups in the treatment plant.
- ❖ A proposal is being sought for dam safety inspections at both the Cabin Creek and City Creek reservoirs.

- ❖ Wastewater Staff successfully set up the public restroom trailers for the summer season. The waste tanks are plumbed into the sewer system and the trailers are connected directly to municipal water for the season.
- ❖ WW Staff has started hauling wastewater from cruise ships using a repurposed street wash truck and the department's sludge tank.
- ❖ NC Machinery mobilized to Petersburg on April 18th to begin the Caterpillar 399 overhaul. The project was completed on May 9th after some trouble was had with remanufactured turbocharger cartridges. NC Machinery was great to work with and resolved the turbo issues as quickly as they could. The machine is working well and is ready for the June diesel run.
- ❖ Testing and maintenance of generator breakers at the downtown power plant and at Scow Bay is scheduled for the week of May 16th. The contractor will also check out a vacuum switch that is slated for install at the Blind Slough hydro substation and has been in storage.
- ❖ A reminder that the fuel adjustment rate will be in effect for the SEAPA maintenance run in June. All customers are highly encouraged to conserve power during the June billing period so that the adjustment rate will be minimized as much as possible. Conservation tips include Turning off lights when not in a room, unplugging electric space heaters, turning off ceiling fans, unplugging water pipe heat tape and turning down hot water heaters. It all adds up and will help to lessen the impact on everyone's power bills.
- ❖ Petersburg Parks and Rec will be CLOSING on May 20th at 1:00p to host Little Norway Festival events downtown. This marks the beginning of the annual Cleaning and Maintenance Closure. They will be CLOSED until Monday, June 13th at 6a.
- ❖ Parks and Recreation would like to congratulate our 3 graduating Seniors: Bergen Kludt-Painter, Britin Coulson, and Sean Spigelmyre! Thank you for being a part of our Lifeguard Team!
- ❖ Petersburg Triathlon Club is open for membership registration! Please contact Parks and Rec for more information.
- ❖ Park Restrooms at Sandy Beach and Outlook Park are now OPEN!
- ❖ The summer tour ship season has begun! Updated schedule can be found on the Borough website and posted weekly at the tops of each ramp. We have over 100 stops this year so the Drive Down and Loading zones will be busy.
- ❖ The Harbor Transient arrival list is full as well, lots of people heading our way this summer.
- ❖ Launch permits are out for purchase at the Harbor Office.
- ❖ Harbor is busy, stalls are full in all 3 harbors. We have a waiting list for all size class.
- ❖ I am continuing to work with ADOT and ADNR on the Papke's facilities. I will need Assembly approval on several items at the next meeting so I can complete the application process for acquiring the ADNR tidelands and uplands property.
- ❖ Borough staff and some volunteer help, participated in several initial interviews for the Manor Director, and Fire/EMS/SAR/EM Director positions. Final interviews will be scheduled for later this month.

**PETERSBURG BOROUGH
ORDINANCE #2022-05
AN ORDINANCE UPDATING CHAPTER 14.04.420 OF THE MUNICIPAL
CODE, ENTITLED “WATER RATE SCHEDULE AND FEES”**

Whereas, the rates for the Borough Water Utility have not been updated since 2018, and increases are needed to keep up with increased costs and expenses to the Borough.

Therefore, the Petersburg Borough Ordains, Section 14.04.420 of the Petersburg Municipal Code, entitled Water rate schedule and fees, is hereby amended as follows:

Section 1. Classification: This ordinance is of a general and permanent nature and shall be codified in the Petersburg Municipal Code.

Section 2. Purpose: The purpose of this ordinance is to update the rates found for water utility service set out in Section 14.04.420

Section 3. Substantive Provisions: Section 14.04.420 of the Petersburg Borough Municipal Code is hereby amended as set out below. The table containing the new proposed rates in paragraph A is highlighted in blue, with the old tables in pink and struck through. The proposed new language is in red and underlined:

14.04.420 Water rate schedule and fees.

A. Metered water rates shall be based on the size of service and shall be as follows:

	<u>Rate Schedule</u>				
	<u>FY22</u>	<u>FY23</u>	<u>FY24</u>	<u>FY25</u>	<u>FY26</u>
<u>Annual increase on July 1 of fiscal year</u>		<u>3% inc.</u>	<u>3% inc.</u>	<u>3% inc.</u>	<u>3% inc.</u>
<u>Monthly Base/Commodity Charge</u>					
<u>3/4" residential base charge +</u>	<u>\$35.21</u>	<u>\$36.37</u>	<u>\$37.46</u>	<u>\$38.58</u>	<u>\$39.74</u>
<u>3/4" residential charge per 1,000 gal</u>	<u>\$2.30</u>	<u>\$2.37</u>	<u>\$2.44</u>	<u>\$2.51</u>	<u>\$2.59</u>
<u>3/4" senior discounted base charge +</u>	<u>\$17.66</u>	<u>\$18.19</u>	<u>\$18.74</u>	<u>\$19.30</u>	<u>\$19.88</u>
<u>3/4" senior discounted per 1,000 gal</u>	<u>\$1.15</u>	<u>\$1.18</u>	<u>\$1.22</u>	<u>\$1.26</u>	<u>\$1.29</u>
<u>1" base charge +</u>	<u>\$47.39</u>	<u>\$48.81</u>	<u>\$50.28</u>	<u>\$51.78</u>	<u>\$53.34</u>
<u>1" charge per 1,000 gal</u>	<u>\$4.10</u>	<u>\$4.22</u>	<u>\$4.35</u>	<u>\$4.48</u>	<u>\$4.61</u>
<u>1.5" base charge+</u>	<u>\$118.48</u>	<u>\$122.03</u>	<u>\$125.70</u>	<u>\$129.47</u>	<u>\$133.35</u>
<u>1.5" charge per 1,000 gal</u>	<u>\$4.00</u>	<u>\$4.12</u>	<u>\$4.24</u>	<u>\$4.37</u>	<u>\$4.50</u>
<u>2" base charge +</u>	<u>\$248.81</u>	<u>\$256.27</u>	<u>\$263.96</u>	<u>\$271.88</u>	<u>\$280.04</u>
<u>2" charge per 1,000 gal</u>	<u>\$3.81</u>	<u>\$3.92</u>	<u>\$4.04</u>	<u>\$4.16</u>	<u>\$4.29</u>

3" base charge +	<u>\$544.98</u>	<u>\$561.33</u>	<u>\$578.17</u>	<u>\$595.51</u>	<u>\$613.38</u>
3" charge per 1,000 gal	<u>\$2.38</u>	<u>\$2.45</u>	<u>\$2.52</u>	<u>\$2.60</u>	<u>\$2.68</u>
4" base charge +	<u>\$829.33</u>	<u>\$854.21</u>	<u>\$879.84</u>	<u>\$906.23</u>	<u>\$933.42</u>
4" charge per 1,000 gal	<u>\$1.84</u>	<u>\$1.90</u>	<u>\$1.95</u>	<u>\$2.01</u>	<u>\$2.07</u>
	<u>\$1,244.0</u>				
6" base charge +	<u>2</u>	<u>\$1,281.34</u>	<u>\$1,319.78</u>	<u>\$1,359.37</u>	<u>\$1,400.16</u>
6" charge per 1,000 gal	<u>\$1.04</u>	<u>\$1.07</u>	<u>\$1.10</u>	<u>\$1.14</u>	<u>\$1.17</u>

Effective August 1, 2012

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$31.35	\$2.04
1	42.09	3.64
1 1/2'	105.20	3.55
2	220.93	3.39
3	483.93	2.11
4	736.42	1.66
6	1,104.65	0.92

Effective July 1, 2013—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$31.98	\$2.08
1	42.93	3.71
1 1/2'	107.31	3.62
2	225.35	3.45
3	493.61	2.15
4	751.15	1.69
6	1,126.74	0.94

Effective July 1, 2014—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$32.62	\$2.12
1	43.79	3.78
1 1/2'	109.45	3.69
2	229.86	3.52
3	503.48	2.20
4	766.17	1.72
6	1,149.28	.96

Effective July 1, 2015—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$33.27	\$2.16
1	44.66	3.86
1½'	111.64	3.77
2	234.45	3.59
3	513.55	2.24
4	781.49	1.76
6	1,172.26	.98

Effective July 1, 2016—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$33.94	\$2.21
1	45.55	3.94
1½'	113.87	3.84
2	239.14	3.67
3	523.82	2.29
4	797.12	1.79
6	1,195.71	1.00

Effective July 1, 2017—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$34.62	\$2.25
1	46.47	4.01
1½'	116.15	3.92
2	243.93	3.74
3	534.30	2.33
4	813.07	1.83
6	1,219.62	1.02

Effective July 1, 2018—2% increase

Service Size	Monthly Service Fee	Commodity Charge per 1,000 gallons
5/8'	\$35.31	\$2.30
1	47.39	4.10
1½'	118.48	4.00
2	248.81	3.81
3	544.98	2.38
4	829.33	1.87
6	1,244.02	1.04

B. Nonmetered water rate: \$5.00 per 1,000 gallons.

C. Fees for water utility services and administration shall be as follows:

Connect fee:	\$40.00 during normal business hours for each premises served. Actual labor cost, plus fifteen percent after business hours.
Meter testing fee:	Actual labor cost when test is performed during normal business hours.
New service fee:	\$150.00, plus the actual cost of the meter and fittings.
New service line installation:	Actual cost.
Shut-off due to unauthorized turn-on, fraud or abuse:	Actual cost to the borough, plus 15 percent.
Standby fire protection service:	No charge.
Transfer fee:	A. \$25.00, if the property owner only receives water service. The transfer fee covers the cost of name change and meter reading at two service locations and is billed to the new account.
	B. \$50.00, if the property owner receives additional borough utilities. In the case of multiple borough utilities, the transfer fee shall be divided and spread evenly between the utilities received and billed to the new account.

D. Interest shall accrue on past due accounts: Maximum rate allowable by state law.

E. Outside Service Area 1 rates and fees: Charges for all water services and fees for users outside Service Area 1 shall be twice the Service Area 1 rate.

F. Water Delivery Rates. Deliveries of potable water to Borough locations are made to properties that are accessible by road. Customers may be required to install piping from the closest accessible area to their cistern or storage tank if the tank is not readily accessible or the situation is unsafe for Borough staff. Rates for water delivery are based on overall time required to make a delivery, regardless if a customer's tank has the capacity to contain a full 3,000 gallon load. No splitting of loads between two customers is allowed. Rates per load are as follows and charged out based on each specific load delivered:

WD1: \$200 (1 hour or less required of staff)

WD2: \$250 (over 1 hour and up to 1.5 hours required of staff)

WD3: \$300 (deliveries that require over 1.5 hours)

FG. Water rates and fees shall be reviewed annually by the water utility and finance departments and a recommendation made to the borough manager for the increase or decrease of rates as needed for the sound financial management of the water utility. The borough manager shall review the findings and present the recommendation to the borough assembly.

Section 4. Severability: If any provision of this ordinance or any application to any person or circumstance is held invalid, the remainder of this ordinance and the application to other persons or circumstances shall not be affected.

Section 5. Effective Date: This Ordinance shall become effective immediately upon final passage.

Passed and approved by the Petersburg Borough Assembly, Petersburg, Alaska this ____ day of _____, 2022.

Mark Jensen, Mayor

ATTEST:

Debra K. Thompson, Clerk

Adopted:
Noticed:
Effective:

PETERSBURG BOROUGH
ORDINANCE #2022-06
AN ORDINANCE UPDATING VARIOUS SECTIONS OF CHAPTER 14.08 OF
THE MUNICIPAL CODE, ENTITLED “SEWER UTILITY”

Whereas, the rates for the Borough Sewer Utility have not been updated since 2018, and increases are needed to keep up with increased costs and expenses to the Borough, and

Whereas, the language of several other sections of Chapter 14.08 are also in need of update.

Therefore, the Petersburg Borough Ordains, Sections 14.08.050, 14.08.070, 14.08.130, and 14.08.320 of Chapter 14.08 the Petersburg Municipal Code, entitled Sewer Utility, are hereby amended as follows:

Section 1. Classification: This ordinance is of a general and permanent nature and shall be codified in the Petersburg Municipal Code.

Section 2. Purpose: The purpose of this ordinance is to update the rates for sewer utility service set out in Section 14.08.320, and to update the language of several other sections of Chapter 14.08.

Section 3. Substantive Provisions: Sections 14.08.050, 14.08.070, 14.08.130, and 14.08.320 of the Petersburg Borough Municipal Code are hereby amended as follows. The language proposed for addition is in red and underlined, and the language proposed for deletion is in blue and struck through. The table containing the new proposed commodity charge rate schedule in Section .320(A) is highlighted in blue, with the old table in pink and struck through:

Sections:

14.08.050 Private sewage disposal—Owner to operate and maintain.

14.08.070 Service outside Service Area 1 or municipal boundaries.

14.08.130 Substances prohibited in sewers designated.

14.08.320 Sewer collection rates.

14.08.050 Private sewage disposal—Owner to operate and maintain.

The property owner shall operate and maintain private sewage disposal facilities in a sanitary manner at all times, at no expense to the borough. Septic tanks shall be pumped a minimum of every 2 years.

14.08.070 Service outside Service Area 1 or municipal boundaries.

- A. The borough assembly may authorize the construction of sewer trunk lines outside Service Area 1 or the municipal boundaries. Applications for construction must be made in writing to the assembly by the person or persons interested in receiving service.
- B. Sewer trunk lines constructed outside Service Area 1 or municipal limits are subject to the provisions of chapter 14.18.

- C. Rates and fees charged for sewer services, including vector service and pumping of portable toilets shall be twice the Service Area 1 rate. outside of Service Area 1 shall be subject to a surcharge of \$150.

14.08.130 Substances prohibited in sewers designated.

Except as provided in this chapter, no person shall discharge or cause to be discharged any of the following discharge waters or wastes to any public sewer:

- A. Any liquid or vapor having a temperature higher than 150 degrees Fahrenheit;
- B. Any water or waste which may contain more than 100 parts per million, by weight, of fat, oil or grease;
- C. Any gasoline, benzene, naphtha, fuel oil or other flammable or other explosive liquid, solid or gas;
- D. Any garbage that has not been properly shredded;
- E. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure, "flushable" wipes, or any other fibrous, solid or viscous substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works;
- F. Any waters or wastes having a pH lower than 5.5 or higher than 9.0 or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the sewage works;
- G. Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, or constitute a hazard in the receiving waters of the sewage treatment plant;
- H. Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant;
- I. Any noxious or malodorous gas or substance capable of creating a public nuisance.

14.08.320 Sewer collection rates.

- A. The sewer utility rate shall apply to the owner of all houses, buildings or other structures designed or used for human occupancy, employment, recreation or other purpose provided that the public sewer is within 150 feet of the property line. The rate for the sewer utility shall be a minimum based on a unit fee predicated on the size of the water service, plus a water commodity charge as follows. In the event municipal water service is not connected, the monthly minimum for five-eighths inch service shall apply unless it is apparent to the borough that a larger amount of water is being used on the premises.

Sewer Utility Monthly Service Charge Rate Schedule

		<u>8/1/2012</u> <u>FY2022</u>	<u>7/1/2013</u> <u>FY2023</u> 4.53% inc.	<u>7/1/2014</u> <u>FY2024</u> 4.53% inc.	<u>7/1/2015</u> <u>FY2025</u> 4.53% inc.	<u>7/1/2016</u> <u>FY2026</u> 4.53% inc.	<u>7/1/2017</u> <u>FY2027</u> 4.53% inc.	<u>7/1/2018</u> 4.5% inc.
Service Description	Size of Water Meter	Service Charge \$/mth	Service Charge \$/mth	Service Charge \$/mth	Service Charge \$/mth	Service Charge \$/mth	Service Charge \$/mth	Service Charge \$/mth
Residential	<u>5/8-3/4"</u>	<u>31.02</u> <u>40.40</u>	<u>32.42</u> <u>41.61</u>	<u>33.88</u> <u>42.86</u>	<u>35.40</u> <u>44.15</u>	<u>36.99</u> <u>45.47</u>	<u>38.66</u> <u>46.83</u>	40.40
1" Sewer	1"	<u>69.50</u> <u>90.51</u>	<u>72.63</u> <u>93.23</u>	<u>75.90</u> <u>96.02</u>	<u>79.31</u> <u>98.90</u>	<u>82.88</u> <u>101.87</u>	<u>86.61</u> <u>104.93</u>	90.51
1½" Sewer	1½"	<u>167.26</u> <u>217.81</u>	<u>174.78</u> <u>224.34</u>	<u>182.65</u> <u>231.07</u>	<u>190.87</u> <u>238.01</u>	<u>199.46</u> <u>245.15</u>	<u>208.43</u> <u>252.50</u>	217.81
2" Sewer	2"	<u>334.52</u> <u>435.64</u>	<u>349.58</u> <u>448.71</u>	<u>365.31</u> <u>462.17</u>	<u>381.75</u> <u>476.04</u>	<u>398.93</u> <u>490.32</u>	<u>416.88</u> <u>505.03</u>	435.64
3" Sewer	3"	<u>644.39</u> <u>839.16</u>	<u>673.39</u> <u>864.33</u>	<u>703.69</u> <u>890.26</u>	<u>735.36</u> <u>916.97</u>	<u>768.45</u> <u>944.48</u>	<u>803.03</u> <u>972.82</u>	839.16
6" Sewer	6"	<u>1,682.96</u> <u>2191.66</u>	<u>1,758.70</u> <u>2257.41</u>	<u>1,837.84</u> <u>2325.13</u>	<u>1,920.54</u> <u>2394.89</u>	<u>2,006.97</u> <u>2,466.73</u>	2,097.28	2,191.66
Industrial Sewer		<u>405.92</u> <u>528.61</u>	<u>424.18</u> <u>544.47</u>	<u>443.27</u> <u>560.80</u>	<u>463.22</u> <u>577.63</u>	<u>484.07</u> <u>594.96</u>	505.85	528.61
Sewer 3/Base Conspt	<u>5/8</u> <u>"3/4"</u>	<u>93.06</u> <u>121.19</u>	<u>97.25</u> <u>124.83</u>	<u>101.63</u> <u>128.57</u>	<u>106.20</u> <u>132.43</u>	<u>110.98</u> <u>136.40</u>	115.97	121.19
DBL Base+Conspt/Res	<u>5/8</u> <u>"3/4"</u>	<u>62.04</u> <u>80.80</u>	<u>64.83</u> <u>83.22</u>	<u>67.75</u> <u>85.72</u>	<u>70.80</u> <u>88.29</u>	<u>73.99</u> <u>90.94</u>	77.32	80.80
Sewer Conspt-Res	<u>5/8-3/4"</u>	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewer Base	<u>5/8-3/4"</u>	<u>31.02</u> <u>40.40</u>	<u>32.42</u> <u>41.61</u>	<u>33.88</u> <u>42.86</u>	<u>35.40</u> <u>44.15</u>	<u>36.99</u> <u>45.47</u>	<u>38.66</u>	40.40
Sewer Conspt-Com		0.00	0.00	0.00	0.00	0.00	0.00	0.00

Sewer-Condos		<u>279.19</u> <u>363.58</u>	<u>291.76</u> <u>374.49</u>	<u>304.88</u> <u>385.72</u>	<u>318.60</u> <u>397.29</u>	<u>332.94</u> <u>409.21</u>	<u>347.92</u>	<u>363.58</u>
Sewer 3xBase +Conspt		<u>93.06</u> <u>121.19</u>	<u>97.25</u> <u>124.83</u>	<u>101.63</u> <u>128.57</u>	<u>106.20</u> <u>132.43</u>	<u>110.98</u> <u>136.40</u>	<u>115.97</u>	<u>121.19</u>
AK State Housing Apartments	5/8 "3/4"	<u>186.13</u> <u>242.39</u>	<u>194.50</u> <u>249.66</u>	<u>203.26</u> <u>257.15</u>	<u>212.40</u> <u>264.87</u>	<u>221.96</u> <u>272.81</u>	<u>231.95</u>	<u>242.39</u>
Commercial Swr Base		<u>69.50</u> <u>90.51</u>	<u>72.63</u> <u>93.23</u>	<u>75.90</u> <u>96.02</u>	<u>79.31</u> <u>98.90</u>	<u>82.88</u> <u>101.87</u>	<u>86.61</u>	<u>90.51</u>
Half Chg Senior Cit	5/8 "3/4"	<u>15.52</u> <u>20.21</u>	<u>16.21</u> <u>20.82</u>	<u>16.94</u> <u>21.44</u>	<u>17.71</u> <u>22.08</u>	<u>18.50</u> <u>22.75</u>	<u>19.34</u>	<u>20.21</u>

Sewer Utility Commodity Charge Rate Schedule

		<u>FY2022</u>	<u>FY2023</u> 3% inc.	<u>FY2024</u> 3% inc.	<u>FY2025</u> 3% inc.	<u>FY2026</u> 3% inc.
<u>Service Description</u>	<u>Size of Water Meter</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>
<u>All service levels</u>	<u>All</u>	<u>1.02</u>	<u>1.05</u>	<u>1.08</u>	<u>1.11</u>	<u>1.15</u>

Sewer Utility Commodity Charge Rate Schedule

		<u>8/01/2012</u>	<u>7/1/2013</u> 4.5% inc.	<u>7/1/2014</u> 4.5% inc.	<u>7/1/2015</u> 4.5% inc.	<u>7/1/2016</u> 4.5% inc.	<u>7/1/2017</u> 4.5% inc.	<u>7/1/2018</u> 4.5% inc.
<u>Service Description</u>	<u>Size of Water Meter</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>	<u>\$/Kgal</u>
<u>All-service levels</u>	<u>All</u>	<u>0.78</u>	<u>0.82</u>	<u>0.86</u>	<u>0.90</u>	<u>0.94</u>	<u>0.98</u>	<u>1.02</u>

The commodity charge is billed from the rate schedule as presented in this chapter, for each unit. A unit shall be each separate residence, house, trailer, apartment, commercial or industrial premises, public restroom or any structure designed or used for dwelling or business purposes.

B. Fees for sewer services and administration shall be as follows:

Connect/reconnect fee. If water valve seals have been used to disconnect a private water system and facilitate the disconnection of sewer service, a \$30.00 fee shall be assessed when service is reconnected. When borough water service is being connected or reconnected, the connect fee for the water utility shall be billed but no connection fee for sewer shall apply.

Disconnect fee. In the event borough water service is disconnected to a unit, sewer service charges may be discontinued. If a unit is not served by borough water service, disconnection of the unit's water supply and installation of a borough valve seal on an accessible water control valve will meet the requirements for discontinuation of sewer charges. The borough shall bill the property owner the actual cost to discontinue the service. If borough seals are tampered with or broken before being removed by the borough in preparation to reconnect services, the property owner will be backbilled for all waived charges during the disconnection period.

Charges for Service. If Borough staff responds to a call for service and the cause of the problem is found to be located on private property, the property owner is responsible for all labor and equipment costs for repair of service.

New service fee:	
Four- or six-inch sewer line	\$150.00
Eight-inch and larger sewer line	\$250.00
New service line installation:	Actual cost
Private sewage disposal:	\$4.00 per 100 gallons of liquid waste delivered to the wastewater treatment plant
	\$50.00 per 55 gallon volume of waste containing at least ten percent solids by weight
<u>Vactor Service:</u>	<u>Vactor service will be billed at actual costs for equipment and labor-\$750 per load flat fee for septic tanks, outhouse or vault toilet pumping.</u>
<u>Portable toilet service:</u>	<u>\$300 flat fee for pumping of temporary, rented or privately-owned portable toilets.</u>
<u>Marine pumping:</u> (Vessel pumps to Borough tanker)	<u>\$800 flat fee per load. Responsibility for wastewater spills lies solely with vessel owner during pumping.</u>
<u>Camera Inspection Equipment</u>	<u>An equipment fee of \$40 per hour is charged for pipeline inspection services on private sewer lines, with a 1 hour minimum. Actual personnel costs are charged in addition to the equipment fee.</u>
<u>Sewer Cleaning Equipment</u>	<u>An equipment fee of \$40 per hour is charged for clearing of blockages on private property, with a 1 hour minimum. Actual personnel costs are charged in addition to the equipment fee.</u>

- C. Nonresident rates and fees. Charges for all sewer services and fees for users outside Service Area 1 or the municipal limits shall be twice the Service Area 1 rate.
- D. Sewer rates and fees shall be reviewed annually by the sewer utility and finance departments and a recommendation made to the borough manager for the increase or decrease of rates as needed for the sound financial management of the sewer utility. The borough manager shall review the findings and present the recommendation to the borough assembly.
- E. Interest shall accrue on past due accounts: Maximum rate allowable by state law.

Section 4. Severability: If any provision of this ordinance or any application to any person or circumstance is held invalid, the remainder of this ordinance and the application to other persons or circumstances shall not be affected.

Section 5. Effective Date: This Ordinance shall become effective immediately upon final passage.

Passed and approved by the Petersburg Borough Assembly, Petersburg, Alaska this 18th day of May, 2022.

Mark Jensen, Mayor

ATTEST:

Debra K. Thompson, Clerk

Adopted:
Noticed:
Effective:

**PETERSBURG BOROUGH
ORDINANCE #2021-XX**

**AN ORDINANCE OF THE PETERSBURG BOROUGH ADOPTING THE BUDGET FOR THE FISCAL YEAR JULY 1,
2022 THROUGH JUNE 30, 2023**

Section 1. Classification: This ordinance is not of a permanent nature and shall not be codified in the Petersburg Municipal Code.

Section 2. Purpose: The purpose of this ordinance is to set forth budgetary requirements for the operation of the various divisions, departments and organizations of the Petersburg Borough for Fiscal Year 2023. Support to the Petersburg School District has been included in the General Fund Expenditures.

Section 3. Substantive Provisions: In accordance with Section 11.07 of the Charter of the Petersburg Borough, the budget for the fiscal period beginning July 1, 2022 and ending June 30, 2023 is hereby approved in the amounts and for the purposes as stated below. The supporting line item budget detail, as reviewed by the Assembly, is incorporated as part of this ordinance.

A. Fiscal Year 2023 Revenue and Expenditure Budget

<u>FUND</u>	<u>REVENUES</u>	<u>EXPENDITURES BUDGET</u>
GENERAL FUND		
General Fund	\$ 10,705,841	\$ 10,705,841
ENTERPRISE FUNDS		
Electric Fund	\$ 7,089,366	\$ 7,831,000
Water Fund	\$ 1,199,747	\$ 2,055,301
Wastewater Fund	\$ 910,834	\$ 1,454,560
Sanitation Fund	\$ 1,271,843	\$ 1,557,838
Harbor Fund	\$ 2,065,658	\$ 4,440,948
Elderly Housing Fund	\$ 453,401	\$ 571,775
Assisted Living Fund	\$ 1,795,338	\$ 2,149,728
INTERNAL SERVICE FUNDS		
Motor Pool Fund	\$ 1,017,321	\$ 1,681,433
DEBT SERVICE FUND	\$ 799,285	\$ 835,000
SPECIAL REVENUE FUNDS		
Miscellaneous Grants	\$ 31,607	\$ 31,607
Economic Development Fund	\$ 100,000	\$ 732,843
Secure Rural Schools Fund	\$ 450,000	\$ 700,000
Secure Rural Roads Fund	\$ 244,000	\$ 350,000
Property Development Fund	\$ 38,000	\$ 70,000
Transient Room Tax Fund	\$ 50,000	\$ 51,000
E911 Surcharge Fund	\$ 86,000	\$ 82,600
Marine Passenger Fee	\$ 35,000	\$ 50,000
Borough Organizational Fund	\$ -	\$ 61,128
Coronavirus Stet and Local Recovery Fund (ARPA)	\$ -	\$ 395,000
DCRA Local Government Lost Revenue Fund (ARPA)	\$ 1,430,893	\$ 1,430,892
Local Disaster - FEMA	\$ 620,000	\$ 620,000
CAPITAL PROJECTS FUNDS	\$ 1,614,000	\$ 12,342,004

Section 4. Severability: If any provision of this ordinance or any application to any person or circumstance is held invalid, the remainder of this ordinance and application to any person and circumstance shall not be affected.

Section 5. Effective Date: This ordinance shall become effective July 1, 2022.

Passed and approved by the Petersburg Borough Assembly, Petersburg, Alaska this 6th day of June, 2022.

Mark Jensen, Mayor

ATTEST:

Debra K. Thompson, Borough Clerk

Adopted:
Published:
Effective:

MEMORANDUM

TO: STEVE GIESBRECHT, BOROUGH MANAGER
 FROM: KARL HAGERMAN, UTILITY DIRECTOR *KH*
 SUBJECT: FY23 PROPOSED BUDGET - ERROR FOUND
 DATE: 5/10/2022
 CC: DEBRA THOMPSON, CLERK
 JODY TOW, FINANCE DIRECTOR


We've unfortunately found an error in the wages and benefits line items for the Electric Utility in the proposed FY23 budget. Upon a general review of the numbers in preparation for the budget work session, the decrease in wages and benefits from FY22 to FY23 made less sense to me. After looking into the issue, we found that wages and benefits for our lineman apprentice were inadvertently left out of the budget, and not corrected during ongoing budget development and review by my office.

The correct numbers for the Electric Fund budget are below:

410 000 500110	Salaries	\$820,053
410 000 500120	Overtime	\$52,659
410 000 500200	Benefits	\$530,306

I would greatly appreciate it if an Assembly member could correct this error by way of an amendment to the budget ordinance in its second reading.

The Electric department apologizes for this oversight. Thank you for your consideration.

<p>Petersburg Borough P.O. Box 329, PETERSBURG, AK 99833 (907) 772-4425 WWW.PETERSBURGAK.GOV</p>	 <p>PETERSBURG ALASKA</p>
---	---

January 3, 2022

Dear Community Organizations:

If your organization is requesting a grant from the Borough in the next fiscal year budget (July 1, 2022 – June 30, 2023), please fill out this form in its entirety. The information provided will be forwarded to the Borough Assembly for review. This form is due back to the Borough by March 21, 2022.

Sincerely,

Jody Tow
Finance Director
jtow@petersburgak.gov

1. Please list your organization’s name and contact information (contact name, email, mailing address and telephone number).

Name: Humanity In Progress
E-mail: board@psghumanity.org
Phone: (907)290-3034
Contact Names: Ashley Kawashima or Annette Bennett

2. Please list the amount of funding that your organization is requesting from the borough and how your organization will use these funds.

*At this time our non-profit is requesting \$40,000 . These funds will be used to help keep community members in their current housing situations to help stop the rising numbers of those experiencing homelessness in Petersburg by helping assist in financial hardships of rent and utility expenses that are creating housing insecurity situations. The funds will also be used to help currently homeless individuals to get into new housing situations by paying deposits and helping with starter costs for moving into a new place. A portion of these funds would also be used to purchase groceries for our current free food bag program for community members experiencing food insecurity. We currently give out roughly 400+ bags

a month, which the need is for more but that is what our current budget allows. A portion of funds would go towards providing community members with basic hygiene items such as toothpaste, toothbrushes, soaps, shampoos, menstruation products, deodorant, and etc.. Of this ask approximately \$22,500 would go towards salary for hiring a part-time employee to help us take some of the daily strain off of our volunteer board by helping to maintain our day to day needs, increase communication and access to our participants in a timely and efficient manner, help be a communication liaison between our volunteer board members and community members and organizations, and assist in running fundraising efforts as well as towards our space rent, garbage and internet costs for our day to day operations with participants.

3. Is this grant request a reoccurring request? Is it anticipated that it will be reoccurring in the future? If so, please explain.

*It is our hope to make this grant a reoccurring request for our non-profit as that would help HIP to ensure we can provide the best level of service and resource connection to our community possible. We run with a very small volunteer board and being able to spend more time on direct participant needs rather than trying to scrape together additional funding outside of our already busy grant and donation cycle searches would go a long way in making sure we are meeting as many needs as possible. We anticipate the needs of community members to increase over the coming years due to the rise in costs of daily living and struggle to find adequate and affordable housing so it would be amazing to know we could have a reoccurring and continued partnership with the borough to try and tackle some of these most basic needs of our citizens.

4. Please list the amount and source of any other grants (Federal, State, other) and contributions you have received in the last year. Please also list any funds you expect to receive this next year.

Alaska Housing Finance Corp, Alaska Housing Stabilization and Recovery Program, Received \$20,000, can receive up to \$200,000 for housing needs. These funds are for direct expenses of participants enrolled in the program.

Rassumson, \$6200, storage supplies.

We do not have any other funds expected at this time.

5. Have you ever received Borough Funding in the past? If so, how were the funds used?

*Humanity In Progress has not received any previous Borough funding.

6. What is the primary mission of your organization and how will this funding help you to provide this service?

*The mission of HIP is to provide connection of basic needs for people experiencing housing insecurity while educating the community on the importance of housing first and preventing homelessness in Petersburg. This funding will go directly towards our mission by providing community members with access to the funds and support they need to stay in their current housing with the hopes of moving away from housing insecurity or to get into new housing and transition out of experiencing homelessness.

- 7. What are your organizations primary objectives? On each objective, over the past 12 months, do you feel your organization has met or exceeded your primary goals? How is this measured? Where does additional work need to be done? How do you expect the Borough’s contribution to help make this occur?

*Our main objective is to meet people experiencing housing insecurity or homelessness where they are at with respect and help get them connected with the tools, funding and resources they need to feel secure in their ability to meet their most basic needs. Our goal over the past 12 months was to get our housing/utility support program officially launched and increase our free food bag program capacity, we have far exceeded this expectation which is reflected in the numbers of individuals we have helped to house and keep housed as well as our increase of almost doubling the amount of free food bags we give out monthly.

*Our second objective is to educate individuals and organizations on the current housing insecurity and homelessness that is occurring within our community and ways we can work together to minimize the hardships and increase access to resources. Over the past 12 months we have worked diligently on promotion of our various basic needs programs and their importance via PSG Pilot, KFSK interviews, social media posting and flyers, we have worked to form new education around our Project Connect Point In Time Count Event and spoke at monthly meetings with our local SHARE coalition on our mission, vision and progress. We feel we have met this goal but have a lot of work to do in order to continue gaining understanding and support from community members on the importance and value of all community members having access to basic need resources.

By showing the community that the Borough stands with HIP and also wants to address the basic needs of our community members and find some solutions to some of our most difficult problems being face by community members not only will the financial support work to directly help participants but we believe it will help to open the eyes of many more community members on the realities of some of these issues and show that Petersburg stands together to help out and show up for it’s most vulnerable populations.

- 8. Please list who and how many community members would be served and the consequences of not receiving funding.

HIP currently services hundreds of community members including individuals, families, adults and children currently experiencing housing insecurity and homelessness as well as food insecurity. Without this grant funding our ability to increase meeting the needs of

additional community members not able to access our services would be extremely limited at this time. We are doing what we can to get as many people struggling in our community connected with the support and funding they need to access their most basic needs but we need help and definitely know we can not do it alone or without the support of the Borough.

9. Please provide the number of full time equivalents (FTE) currently in your organization. If the Borough awards you a grant in the amount you have requested, will this increase your FTE count? If so, by how many? If the grant is not funded, will this affect the number of FTE's and by how many?

*Humanity In Progress is currently operated by a completely volunteer board and other volunteers, at this time due to the needs of the community we are using all grant and donated funds to do direct participant work other than the cost of our own space rent which we have worked to find separate funding for in order to decrease any impact on direct services we are able to provide.

10. Provide a copy of your annual financial statements from the most current completed year.

*We have attached our fiscal statement for the past year which runs June-July.

Document last updated on 1/3/2022.

Humanity In Progress

Statement of Financial Position

As of June 30, 2021

	TOTAL
ASSETS	
Current Assets	
Bank Accounts	
Checking	13,976.29
Savings	79.21
Total Bank Accounts	\$14,055.50
Other Current Assets	
Undeposited Funds	0.00
Total Other Current Assets	\$0.00
Total Current Assets	\$14,055.50
TOTAL ASSETS	\$14,055.50
LIABILITIES AND EQUITY	
Liabilities	
Total Liabilities	
Equity	
Retained Earnings	613.35
Net Revenue	13,442.15
Total Equity	\$14,055.50
TOTAL LIABILITIES AND EQUITY	\$14,055.50

**Petersburg Borough, Alaska
RESOLUTION #2022-08**

**A RESOLUTION ENCOURAGING THE PROMPT AND FULL CLOSURE AND CLEANUP OF THE
TULSEQUAH CHIEF MINE AND URGING THE B.C. GOVERNMENT TO OPPOSE ANY
EXTENSION OF THE RECEIVERSHIP PROCESS**

WHEREAS, The Taku River is usually Southeast Alaska's largest overall salmon producer, with Southeast's largest run of coho and king salmon. The Taku produces up to 100,000 Chinook, 300,000 coho, 400,000 sockeye, 50,000 chum and 1,000,000 pink salmon, as well as significant populations of steelhead trout, cutthroat trout, Dolly Varden char and eulachon and is of tremendous and unique ecological, customary and traditional use ("subsistence"), cultural, commercial and recreational fisheries value; and

WHEREAS, Petersburg commercial fishermen and commercial salmon processors have historically fished for and processed salmon returning to the Taku River; and

WHEREAS, The Tulsequah Chief mine has been discharging toxic acidic wastewater into the Taku watershed since it was abandoned in 1957. The ongoing pollution is detrimental to maximum salmon production and is in violation of the Canadian Fisheries Act, B.C. mine permits and water quality standards, and an agreement with the Taku River Tlingit First Nation. Despite numerous calls for cleanup, the pollution continues; and

WHEREAS, The Petersburg Borough Assembly passed Resolution #2019-20 on December 16, 2019, urging the State of Alaska to ensure the B.C. government implement an open and transparent process to clean up and close the Tulsequah Chief Mine, and Resolution #2021-11 on October 19, 2021, in support of a permanent ban on tailings dams and for a temporary pause in the permitting, exploration, development and expansion of Canadian mines along Alaska-B.C. transboundary salmon rivers until the U.S.-Canada Boundary Waters Treaty of 1909 and the U.N. Declaration on the Rights of Indigenous Peoples are upheld and an international agreement on watershed protections is implemented; and

WHEREAS, The Petersburg Borough Assembly as well as Alaska legislators, governors, members of congress, other community leaders, fishing and tourism groups, businesses and other Alaskans have made cleanup of the Tulsequah Chief a main goal in discussions with B.C. Provincial and Canadian federal officials for many years. This concerted pressure is finally showing results; and

WHEREAS, The Taku is the traditional territory of Tlingit people on both sides of the border. The Douglas Indian Association, the federally recognized tribe in Alaska, and the Taku River Tlingit First Nation, based in Atlin, B.C., have both called for the cleanup and closure of the Tulsequah Chief mine; and

WHEREAS, after decades of international controversy and two failed attempts to re-open this mine that have resulted in bankruptcies, it is clear the Tulsequah Chief is not a viable mine; and

WHEREAS, Chieftain Metals, the current owner of the Tulsequah Chief, is in a court-ordered bankruptcy receivership process that is scheduled to end this August. This process has hindered cleanup efforts; and

WHEREAS, there is concern that a creditor of Chieftain Metals could petition the court to extend the receivership process, which could significantly delay or prevent mine closure and cleanup;

WHEREAS, the government of British Columbia has made commitments to close and clean up the Tulsequah Chief and issued a draft reclamation plan in 2020. However, the acid mine drainage still continues, partly due to the receivership process restricting what actions B.C. can take; and

WHEREAS, Continued pressure and attention from Alaska will be critical to ensuring B.C. opposes any extension of the receivership process and moves aggressively to take over the mine, clean it up and close it down.

NOW THEREFORE BE IT RESOLVED, that the Petersburg Borough Assembly urges the B.C. government to oppose any extension of the receivership process; and

BE IT FURTHER RESOLVED, that the Petersburg Borough Assembly strongly urges the State of Alaska and United States federal government to make it clear to the B.C. and Canadian federal governments that the receivership process must end as scheduled this August and that B.C. should then move aggressively to take over the abandoned mine, close it down, and permanently stop the acid mine drainage.

Passed and Approved by the Petersburg Borough Assembly on May 16, 2022.

Mark Jensen, Mayor

ATTEST:

Debra K. Thompson, Borough Clerk

Katherine Holmlund
Good Beginnings & Kinder Skog
Director
PO Box 709
Petersburg, AK 99833
Work: (907-738-3044)
Email: kinderskogak@gmail.com
11 April 2022

Petersburg Borough Assembly
Mayor Mark Jensen
Vice Mayor Jeigh Stanton Gregor
Member Bob Lynn
Member David Kensinger
Member Thomas-Fine Walsh
Member Chelsea Tremblay
Member Jeff Meucci

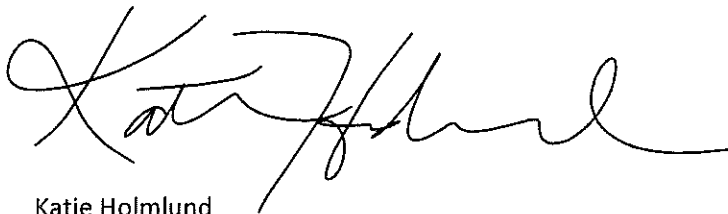
RE: Childhood Task Force

Dear members of the Petersburg Assembly,

I want to thank our assembly members for unanimously supporting the formation of the Childhood Task Force on the April 4th assembly meeting. I am hopeful this will be a huge step towards supporting professionals who support the growth and learning of our children. Thank you for recognizing the need for the Borough to be involved in future advocacy efforts.

I hereby express my interest in joining the Childhood Task Force. I have been involved with the SHARE Coalition for about five years, am the co-founder and director of Kinder Skog Nature Program, and the lead teacher and director of Good Beginnings Preschool. I feel my experience serving these various roles would benefit the Childhood Task Force and I look forward to being considered for this new role on the task force. Thank you for your consideration.

With Respect,

A handwritten signature in black ink, appearing to read 'Katie Holmlund', written in a cursive style.

Katie Holmlund

Becky Regula

From: Denise Gubernick <btrfleye3@yahoo.com>
Sent: Monday, April 11, 2022 1:49 PM
To: Becky Regula
Subject: Childcare Task Force

Follow Up Flag: Follow up
Flag Status: Flagged

Hello. My name is Denise Gubernick. I would like the borough assembly members and the task force committee to know that I am interested in joining. I feel like I have a lot of experience and ideas to contribute. Thank you for your time.

Sent from Yahoo Mail for iPhone



PETERSBURG INDIAN ASSOCIATION
PO Box 1418
15 N. 12th Street
Petersburg, Alaska 99833
Phone: 907-772-3636
Fax: 907-772-3637

April 19, 2022

Clerk Thompson
Petersburg Borough
P.O. Box 322
Petersburg, Alaska 99833

Dear Clerk Thompson,

Please accept this letter as a request to serve on the Early Childhood Education Task Force. Affordable, quality child care for the Tribe has been identified as a priority in the strategic plan for Petersburg Indian Association (PIA). Insufficient child care has been a major topic of concern for PIA for many years and the identified need continues to grow into the current times. PIA believes that child care is the most essential service we can provide to our Tribal citizens that will enhance their lives and the community of Petersburg overall.

I look forward to serving on this taskforce and collaborating with others to help find solutions. Thank you for your consideration.

Sincerely,

Chad Wright
Tribal Administrator

Debra Thompson

From: Jeff Meucci <jrmeucciscuba@gmail.com>
Sent: Tuesday, April 19, 2022 3:57 PM
To: Debra Thompson
Subject: Early Childhood Education Task Force

Hi Debbie, I am interested in serving on the Early Childhood Education Task Force a in the borough assembly seat. Thank you, Jeff

Sent from my iPad

Debra Thompson

From: Jessica Tucker <jt09ece@yahoo.com>
Sent: Thursday, April 21, 2022 1:04 PM
To: Debra Thompson
Subject: Task Force Interest

To Whom it May Concern,

My name is Jessica Doril. I am currently a lead preschool teacher at the Petersburg Children's Center. I have been working in the Early Childhood field for more than twenty years. I started my career here in Petersburg and have since worked in many states and taught internationally. I have a degree in Early Childhood Education and am back in school to further my own education. I take the work I do very serious and I am interested in joining the Early Childhood Task Force in Petersburg. I have done countless hours of training and have years of experience. I have been a presenter at conferences, been a peer mentor, as well as have been on many professional panels. I would like to be a representative of my field and help others gain a better understanding of what we do. The work I do for children is always with intent and purpose while meeting the needs of individual child as best I can. I have worked with children ranging in age from six weeks through 12 years in childcare settings (for profit and non profit), private schools, and with a home provider. I have been a classroom teacher and worked as an administrator. I am also a parent. I have a lot of experience through a wide lens and feel like I have more to offer this group in support of the children, families, staff and community you are reaching. I would be an asset to this forum. I bring all my experience and education with me from within the field of Early Childhood Education. Thank you for your consideration.

Jessica Doril



Petersburg Children's Center
 Eagle's Nest
 P.O. Box 138
 Petersburg, AK 99833
 (907)772-3419 Fax (907)772-3452
 pccen1@gmail.com

The mission of the Petersburg Children's Center is to promote the healthy development of children and families in Petersburg by offering dependable, high-quality child care and by actively working toward the positive growth and development of all children in the community.

Sharlay Mamoe
 c/o Petersburg Children's Center Inc.
 P.O. Box 138
 Petersburg, AK 99833

May 3, 2022

Petersburg Borough Assembly
 P.O. 329
 Petersburg, AK 99833

Dear Petersburg Borough Assembly Members,

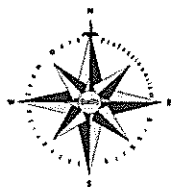
My name is Sharlay Mamoe. I am the Executive Director of the Petersburg Children's Center (PCC/the center), a mother, wife, and a community member. I have been involved in early childhood since I officially moved to Petersburg in 2015. I was the president of the board of directors for the time of 2015 until 2018 when I officially took the role of the Executive Director.

My time with the center from 2015 to now was always the same adage; we would get great staff, but we would not be able to pay them a decent wage because we don't want to cause a burden for parents. This pandemic has truly shown us how important we are to a working economy; however, we are not paid a wage that truly reflects the work we do every day with other people's kids. Our job is extremely important, however a person just starting in our center is only making \$12 starting. In some cases, this is the same wage that a person can start making at a job in Petersburg, with a lot less responsibility and knowledge required to perform the responsibilities. My hope is that this industry gets taken seriously, we are considered professionals and we get some support in doing a very important career.

I plan to work hard for the community on this task force. I plan to work hard for the children in this community, and the caregivers that give so much of themselves for the children and families in their care.

Thank you!

Sharlay Mamoe
 Sharlay Mamoe



Petersburg Medical Center

103 Fram Street
PO Box 589
Petersburg, Alaska 99833

Phone: 907-772-4291
Fax: 907-772-3085

May 6, 2022

Assembly Members
Petersburg Borough
12 S. Nordic Drive
PO Box 329
Petersburg, AK 99833

RE: Early Childhood Education Task Force

Petersburg Borough Assembly Members,

Please except my letter of interest for the Early Childhood Education Task Force on behalf of Petersburg Medical Center. My name is Becky Turland and am interested in serving on the task force underneath my professional title of Community Wellness Specialist.

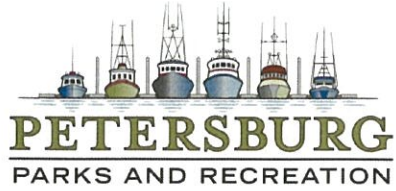
As many are aware, I've been working with the Early Childhood subgroup of the Petersburg's SHARE Coalition on this topic and am deeply embedded in the work that has already taken place to get to where we are now. Early Childhood Education is a community issue that has been around for a very long time but brought to light during the pandemic. I would like to continue this initiative with a larger group of people who can possibly take it further up the chain, to the state and federal level, while also addressing it locally.

Petersburg is a unique place that has its own unique challenges around Early Childhood Education, and we need to address these issues from multiple angles for the betterment of our children's, our community's, and our economic future here in Petersburg.

If elected to serve on this task force I will not only be coming with my professional hat on but also as a single parent who relied heavily on Early Childhood education, the President of Petersburg Little League, a Middle School Cheer Coach and as a Board Member for Devil's Thumb Shooters. As you can see, I'm heavily invested in the youth of our community and believe Early Childhood Education is the key to future success on multiple levels.

Sincerely,

Becky Turland, BBA
Community Wellness Specialist
Petersburg Medical Center



To Clerk Thompson,

My name is Stephanie Payne and I am interested in joining the Early Childhood Education Task Force that has formed in Petersburg to address the childcare dilemma that our community is facing. I am not sure how Petersburg Parks and Rec can assist with this issue but hope that I can help problem solve with others in our community.

Thank you for your consideration.

Stephanie Payne
Director, Petersburg Parks and Recreation

Received 5/9/2022

May 12, 2022

To the Assembly,

I am interested in serving as a member of the Early Childhood Education Task Force.

I have experience serving as an active member of both the Petersburg Visitor Industry Task Force and the Poverty and Opportunity Task Force organized by State Representatives Tarr and McCarty. Through these experiences I have seen benefits of a collaborative approach that is solution-oriented, as well as the downsides of being too open ended without established frameworks in play. I value the time of everyone seeking to participate in this conversation and want to help make sure we make the most out of this opportunity.

In addition to having experience with group dialogue I am skilled with detailed notes and reports, which will be helpful as we keep the rest of the Assembly up to date with how the conversation is progressing.

I also have a formal educational background in social science policy analysis and development.

I am aware this overlaps with the formal end of my term, but I will be seeking re-election. If that does not happen I trust the assembly to find a suitable replacement.

Thank you for your consideration,

Chelsea Tremblay

Debra Thompson

From: Glorianne Wollen
Sent: Thursday, May 12, 2022 10:00 AM
To: Debra Thompson
Subject: Childcare Task Force

Good morning Debbie and Assembly,

I would like to be considered for a position on the Childcare Task Force as a representative of PEDC. As a parent of young children and a Borough supervisor I have great interest in helping with the ongoing community discussion on issues related to childcare in Petersburg.

Thanks for the opportunity.

Glo Wollen

***Glorianne Wollen, Harbormaster
Petersburg Borough
Port and Harbor Dept.***

PO Box 329

Petersburg, AK 99833

Phone: 907-772-4688

Fax: 907-772-4687

Email: gwollen@petersburgak.gov



Debra Thompson

From: Hannah Flor <studiohannahflor@gmail.com>
Sent: Thursday, May 12, 2022 10:18 AM
To: Debra Thompson
Subject: Letter of interest for the Early Childhood Education Task Force

My name is Hannah Flor and I'm interested in serving on the Early Childhood Education Task Force. I'm a single mother of a pre-school age child and in early 2021 I struggled to find the childcare necessary when I went back to work after a Covid-related job loss. I don't have any particular expertise in the area other than my lived experience but my career prior to the pandemic was based in problem solving. Now, I work in public radio and have learned a great deal about the power of listening to people as a way to gain understanding and find solutions. The problem of available quality childcare is inextricably linked to our local economy, quality of life for both parents and children, and the necessary retention of young families in Petersburg. I've spent a lot of time in the last year thinking about ways to mitigate the problem on a local level, and while I don't know that I have any real answers, it's a problem I can't seem to stop mulling over. I hope you will consider me as a member of the Early Childhood Education Task Force. Thank you.

Hannah Flor

**Petersburg Borough
Priority Community Projects as Established December 6, 2021**

Project Title	Est. Project Cost	Funding Already Secured	Funding Required	Capsis Y/N
Paving Borough Residential Streets (annual cost)	\$ 250,000		\$ 250,000	Y
Petersburg Medical Center, Site Selection	\$ 100,000		\$ 100,000	Y
Petersburg Medical Center Replacement - Get to Construction Ready Status	\$ 16,100,000		\$ 16,100,000	Y
Roof Replacement (Votech, Middle School, High School)	\$ 4,500,000		\$ 4,500,000	Y
Scow Bay Haul out & Wash down Pad	\$ 7,240,000	\$ 500,000	\$ 6,740,000	Y
Papke's (parking lot, dock, floats and ramp) Estimate.	\$ 4,200,000	\$ 30,000	\$ 4,170,000	Y
	\$ 32,390,000	\$ 530,000	\$ 31,860,000	

--

**Petersburg Borough
Additional Capital Project Requests**

Project Title	Est. Project Cost	Funding Potentially Secured	Funding shortfall	Capsis Y/N
Harbor Department (In priority order)				
South Harbor Maintenance Dredge	12,000,000	5,700,000	\$ 4,600,000	N
North Harbor - sheet pile and parking	\$ 2,530,000	\$ -	\$ 2,530,000	Y
Scow Bay Boat Harbor	\$ 62,000,000	\$ 30,000,000	\$ 32,000,000	Y
Harbor Maintenance Shop upgrade (if the Petro building is not aquired)	\$ 700,000		\$ 700,000	Y
South Harbor Utility Float Reconstruction	\$ 400,000	\$ -	\$ 400,000	Y
Harbor Office/Shower/Restroom facility redesign and reconstruction	\$ 500,000		\$ 500,000	Y
South Harbor Ramp Replacement	\$ 2,000,000	\$ 200,000	\$ 1,800,000	Y
Purchase of private land adjacent to Harbor	\$ 900,000		\$ 900,000	Y
Increase South Harbor Launch Ramp Capacity & Parking	\$ 1,580,000	\$ -	\$ 1,580,000	Y
Berthing Dolphin at Petro Dock	\$ 400,000	\$ -	\$ 400,000	Y
Parks and Recreation Department (In priority order)				
Aquatic Center Refurbishment - \$3M (painting, mechanical, control systems, etc)	\$ 3,000,000	120,000	2,880,000	Y
Eagles Roost Stair Replacement (or ADA option would be about \$500K)	\$ 45,000		\$ 45,000	Y
Playground equipment for IRA II	\$ 60,000		\$ 60,000	Y
Lighting for Ballpark and Ice Rink	\$ 125,000		\$ 125,000	Y
Expansion of Weight Room Facility	\$ 150,000		\$ 150,000	Y
Climate Controlled storage building near the Community Center	\$ 150,000		\$ 150,000	Y
Story Poles for Sandy Beach Park	\$ 160,000		\$ 160,000	Y
Trail Kiosks with trail guides and local interest information	\$ 40,000		\$ 40,000	Y
Historical and Education signs along trails and at parks	\$ 30,000		\$ 30,000	Y
Entrance driveway to second Sandy Beach Shelter	\$ 5,000		\$ 5,000	Y
Public Address System for Community Center	\$ 35,000		\$ 35,000	Y
Mathisen Fishing Pier	\$ 1,350,000	\$ 150,000	\$ 1,200,000	Y
Public Works Department (In priority order)				
Fram Street infrastructure repairs	\$ 500,000		\$ 500,000	Y
Frederick Road resurfacing	\$ 225,000	\$ 45,000	\$ 180,000	N
Rasmus Enge Bridge Replacement	\$ 2,500,000		\$ 2,500,000	N
Paving Dump Hill	\$ 201,000		\$ 201,000	N
Petersburg School District (In priority order)				
Mitkof Middle School/PHS Auditorium Foundation Repair	\$ 500,000	\$ -	\$ 500,000	Y
Siedman Elementary Plumbing System Replacement	\$ 750,000	\$ -	\$ 750,000	Y
Middle School/High School Digital HVAC Controls	\$ 250,000	\$ -	\$ 250,000	Y
Districtwide ADA Renovations	\$ 1,000,000	\$ -	\$ 1,000,000	Y
Middle School/High School Electrical Upgrades	\$ 1,000,000	\$ -	\$ 1,000,000	Y
Water Department (In priority order)				
Storage Tank Piping Improvements	40,000	\$ 25,000	\$ 15,000	N
Fram Street - Transite Water Main Replacement	\$ 200,000	\$ 200,000	\$ -	N
Rasmus Enge Bridge Water Main Replacement	\$ 325,000		\$ 325,000	N
Clear Well Replacement (Water)	\$ 1,000,000		\$ 1,000,000	N
Hammer Slough Water Main Replacement	\$ 300,000		\$ 300,000	N
Sandy Beach Road Water Main Replacement	\$ 3,150,000		\$ 3,150,000	Y
Lake Street Water Main	\$ 450,000		\$ 450,000	N

Wastewater Department (in priority order)				
Pump station 4 Upgrade and Force Main Replacement	\$ 1,100,000	\$ 330,000	\$ 770,000	N
Wastewater SCADA system	\$ 542,500	\$ 42,500	\$ 500,000	N
Pump station 3 Upgrade	\$ 650,000		\$ 650,000	N
Lake Street Sewer Main	\$ 300,000		\$ 300,000	N
Skylark Pump station Rehabilitation	\$ 550,000		\$ 550,000	N
Rasmus Enge Bridge Sewer Main project	\$ 250,000		\$ 250,000	N
Power and Light Department (in priority order)				
Blind Slough Hydro Rehabilitation	\$ 7,227,635	\$ 727,635	\$ 6,500,000	Y
Scow Bay Generator 2	\$ 1,450,000	\$ 50,000	\$ 1,400,000	Y
AMI Infrastructure Project	\$ 360,000	\$ 20,000	\$ 340,000	N
24.9 Rebuild - Airport 2400 Conversion (in-house)	\$ 162,000	\$ -	\$ 162,000	N
Downtown Streetlights (in-house)	\$ 220,000	\$ 195,000	\$ 25,000	N
Storage Yard Relocation - Storage Sheds (2)	\$ 125,000	\$ 118,316	\$ 6,684	N
EMD 16 Overhaul	\$ 250,000		\$ 250,000	N
Petersburg Medical Center (in priority order)				
Emergency Room Doors	\$ 40,000	\$ 25,000	\$ 15,000	N
Public Safety and Support (not in priority order)				
Petersburg Mental Health- ADA Renovations/Totem Arms	\$ 1,000,000		\$ 1,000,000	Y
Shooting Range Structure Rehabilitation	\$ 50,000	\$ -	\$ 50,000	Y
Shooting Range Trap & Skeet Equipment Upgrades	\$ 25,000	\$ -	\$ 25,000	Y
Shooting Range Boardwalk Improvements	\$ 30,000	\$ -	\$ 30,000	Y
Sanitation (in priority order)				
Fire Sprinkler System Replacment - Baler	\$ 75,000		\$ 75,000	N
Recycling drop off Center	\$ 20,000		\$ 20,000	N
Enviro rack Car Disposal System	\$ 25,000		\$ 25,000	N
Waste Oil Storage System Upgrades	\$ 20,000		\$ 20,000	N
Landfill Fencing repairs/replacement	\$ 50,000		\$ 50,000	N
Storage Quonset Hut Replacement	\$ 150,000		\$ 150,000	N
Baler Roof Replacement	\$ 200,000		\$ 200,000	N
Sanitation Security Upgrades (camera and gate)	\$ 25,000		\$ 25,000	N

Alaska Department of Transportation Needs List

April 27, 2022

Potential Projects for Needs List

1. Scow Bay Boat Yard
2. Airport Access Road
3. Banana Point
4. Scow Bay Harbor
5. Sandy Beach bike/walking trail
6. Safe Schools Routes (sidewalks)
7. Severson's subdivision to Airport trail
8. South Harbor Parking Lot
9. North Nordic/Hungry Point snow removal issue
10. Papke's Landing Facilities
11. Improved Gravel Road around the whole island?
12. Paving and widening Frederick Road
13. Road Connection to Frederick Point East subdivision
14. Fram Street and Infrastructure

Projects currently on the needs list

Need Id 32905 South Harbor ADA and Pedestrian Safety

Need Id 28970 Wrangell Narrows Ferry Terminal

Need Id 28969 Wrangell Narrows Shuttle Ferry

Need Id 28812 Sing Ling Alley Viaduct Replacement (change name to Rasmus Enge Bridge)

Need Id 27730 Paving from South Mitkof Ferry terminal to end of road – currently some chip seal in place

Need Id 27715 Resurface Scow Bay Loop -

Need Id 25781 Petersburg Street Paving, including sidewalks (Excel, Fram, Gjoa, Harbor Way and Second Street)

Need Id 24320 Greens Camp Road -loop and driveway

Need Id 24319 Improve drop off at Stedman Elementary, including parking, sidewalks and crosswalks

Need Id 23435 Boardwalk trail along a mile of beachfront to replace the historic Frederick Point Trail

Need Id 18989 Petersburg Shuttle Ferry Terminal -

Need Id 18488 Wrangell Narrows Shuttle Ferry

Need Id 18487 Kupreanof Shuttle Ferry Terminal



**Top Petersburg Borough Projects
FY 2023**

Reviewed and approved in a public meeting February 22, 2022, by the Petersburg Assembly

1. Achieve construction ready status for a replacement hospital for the Petersburg Borough by completing the conceptual design, site selection and permits, geotechnical analysis, and final design documents at an estimated cost of \$16.2M. \$8M of this is currently included in the FY22 appropriations bill approved in the Senate.
2. Marine Transportation Access Improvements for the Borough – As an island community, transportation for people, goods and services is heavily reliant on water transportation. Reductions in State support of the Alaska Marine Highway System (AMHS) has resulted in reduced services and severe impacts on residents and commercial enterprises. The Petersburg Borough Assembly has prioritized several marine access improvement projects to facilitate growth in our local economy and support for the residents.
 - a. Expansion and improvements for the Banana Point Boat facilities that improves transportation of goods and passengers between Petersburg and other communities in Southeast Alaska. \$2.0M
 - b. Dock, ramp, and floats for Papke’s Landing Facility to improve transportation for off island residents and hunting and fishing lodges in the area. \$4.0M
3. Addition of ADA ramps for the South Harbor to help facilitate easier access to the main Petersburg commercial district for visitors and residents, \$3.0M.
4. Development and hard surface paving for the Airport (Petersburg) Bypass Road. Widen road to achieve two 12’ lanes, provide base course and pave with 3” asphalt. Paving to extend from Haugen Drive/Quarry Road intersection to Hungerford Hill and on to Mitkof Highway. Rough construction cost \$2.2 million. Survey/Engineering \$200,000. Permitting \$100,000. Total cost \$2.5M.
5. Scow Bay Boat Haul out and wash down facility – Development of a small vessel haul out and work yard for use by commercial fishing, sport/tour/charter, and private recreational vessels. Improvements include replacement of a deteriorated and inadequate ramp for hauling boats in and out of the water, vessel washdown pad, and water, sewer and electrical service-related improvements are also needed. Engineering is 35% complete, with a total estimated cost of approximately \$8.0M.
6. Water Treatment Plant Clear Well Replacement - Project will replace a 250,000 gallon open top steel tank that is used to store treated and filtered water that is utilized for backwashing the plant filter bays. The project will replace the 50-year-old tank with a new covered tank at the same site to ensure efficient, sanitary operations at the water treatment plant. Temporary means of storing backwash water will also be a part of the project. Cost estimated at \$2 million.

7. Sandy Beach Road Water Main Replacement - This project will replace approximately 3.5 miles of ductile iron water main that is deteriorating. The main was installed in the 1980's and has experienced isolated failures due to pipe corrosion issues. The project will replace the existing water main with HDPE piping and patch all disturbed asphalt during the work. Estimated cost is \$8 million.
8. Pump Station 4 Force Main Replacement - This project will replace a 1000' long wastewater force main that has been corroded due to tide water influences. The project will reroute the force main to higher ground in an undeveloped right of way and upgrade the pump station to replace aged and obsolete pumps. Estimated cost is \$2 million.

April 29, 2022

Petersburg Pilot

Petersburg Borough Assembly

Dear Editor and Honorable Assembly Members:

Just finished looking over the proposed Papke's Landing Conceptual Design and had a couple of thoughts.

We all know that when a project proposed to be funded by government has a cost estimate attached, the actual price is going to be double. \$6.5 million will become \$13 million. Too much! I think we could make major improvements for much less.

What is really needed out there can be boiled down to two things, replace the existing dock with an upgraded version and improve the parking.

The parking can be improved by expanding the existing area and removing abandoned and derelict vehicles. Some grading, some fill and removal of junked vehicles could probably be done for 1/10 of the actual budget of the proposed project, or \$1.3 million. No expert here, just talked to a few fellow users and that seems to be a reasonable cost.

Replacing the dock will probably take almost as much as we are sure there are upgrades that will be required by ordinance or regulation. Adding some lights would be nice.

We don't need the Taj Mahal of boat launch facilities, just a bit of improvement over the one we have been making work for the past 39 years that I have been using it.

One thing we certainly don't need is an outhouse built just outside the picture window of a house that has been there for decades. If one is added, it could be placed where it won't be the focal point of an otherwise beautiful view.

A little common sense. A reasonable improvement at a reasonable cost. That is the ticket.

George Cole
PO Box 2107
Petersburg

Debra Thompson

From: Max Worhatch <mnmnwiv60@gmail.com>
Sent: Monday, May 2, 2022 7:57 AM
To: Assembly
Subject: S 3269

Honorable Assembly-

I would like to voice my opposition to support of S 3269. The areas included in this land grab are well used by the entire community. If this bill were adopted, it would likely exclude non-native use for subsistence or recreating. It would also negate any control that the borough has to how these lands will be developed.

Passage of this bill will also set a precedent. If this is granted, there will be more requests to follow, as ANILCA has shown us.

It seems foolish to support a land grant that takes from everyone, for the benefit of a few. Especially if it is based on an entity that didn't exist prior to development. The native community in Petersburg is made up of natives that trace their roots to other villages, recognized villages, in the region.

I appreciate your consideration of my position.

Thanks,

Max Worhatch
253.279.0707

**PETERSBURG INDIAN ASSOCIATION****PO Box 1418
Petersburg, Alaska 99833****Phone: 907-772-3636****Fax: 907-772-3637**

May 2, 2022

To Whom It May Concern;

In 2017, the Petersburg Indian Association (PIA) proposed the construction and maintenance of a pedestrian trail from the Severson Subdivision to Haugen Drive adjacent to the Fire Hall. In April 2017, the Petersburg Planning and Zoning Commission recommended that the Borough Assembly support PIA's proposal and further recommended that parking areas be constructed at either end of the trail. In May 2017, the Borough Assembly wrote a letter of support for this project as recommend by Planning and Zoning. Additionally, there seemed to be an overwhelming sense of support from the community for the trail.

Unfortunately, all momentum on the project came to a halt after receiving a letter from the Alaska Department of Transportation and Public Facilities. The letter addressed reasons why PIA could not be granted access to the unused land for the purpose of building the trail.

Recently there has been a renewed interest in this project. In October 2021, the Petersburg Parks and Recreation Board held a public work session to take input on local trail development. When asked about existing trails and trail development, the most common comment from the public was to add more trails and trail connectivity in our community. The second most common comment was to move forward with a cross-town trail connection, specifically the proposed trail link between the Severson Subdivision and the Fire Hall.

The Severson Subdivision trail would offer many benefits, including providing more access and a safer route for pedestrians. PIA continues to support this project for the betterment of our community.

Please contact Chad Wright at tribaladmin@piatribal.org or (907) 650-7769 if you have any questions about the content of this letter.

Sincerely,

A handwritten signature in black ink that reads "Cris Morrison". The signature is written in a cursive, flowing style.

Cris Morrison
Tribal Council President

Debra Thompson

From: Aardvark LLC <architectureoffaith@gmail.com>
Sent: Tuesday, May 10, 2022 8:29 AM
To: Assembly; Orin Pierson; pilotpub@gmail.com; Jeff Meucci; Chelsea Tremblay
Subject: AK Judicial Council phone-in meeting today at 12:15pm

Dear Assembly,

The Alaska Judicial Council(AJC) will be holding a public hearing on the applicants for the vacancy in the judgeship that once belonged to Petersburg. The AJC will choose a replacement amongst the applicants for the position at that meeting, which is to be conducted at 12:15pm. The public and press are allowed to participate and make comments during this meeting, and I think that we should, being that this matter is in our immediate interest.

This is for the Trevor Stephens vacated judgeship that will have a lasting effect on Petersburg if it is not restored to its rightful location. To wit, this judgeship has been stolen from Petersburg and placed in Ketchikan, leaving Petersburg bereft of any legal authority beyond a Magistrate, which has very limited legal powers.

It is our sincere belief that this very meeting should be held in Petersburg instead of Ketchikan, as this is the cause of great interest to our community and estate.

Please see the AJC website for information and details. The URL for AJC is:

<http://www.ajc.state.ak.us/index.html>

Debra Thompson

From: Aardvark LLC <architectureoffaith@gmail.com>
Sent: Wednesday, May 11, 2022 7:15 AM
To: Chelsea Tremblay; Jeff Meucci; Assembly
Subject: Re: In re: #918 Summary of what we've lost

I asked Fred a few directed questions about what we would be losing judicially without the Superior Judgeship, and I thought I'd forward you guys his response above.

On Tue, May 10, 2022 at 5:41 PM Aardvark LLC <architectureoffaith@gmail.com> wrote:

----- Forwarded message -----

From: Fred Triem <triemlaw@gmail.com>
Date: Tue, May 10, 2022 at 5:03 PM
Subject: In re: #918 Summary of what we've lost
To: <architectureoffaith@icloud.com>, <architectureoffaith@gmail.com>, Joshua Adams <ranchodepancho@icloud.com>

What is lost by not having a superior court judge and instead having the only judicial officer be a magistrate?

Answer: *Everything.* Taking your examples:

- What does a superior judgeship do that a magistrate cannot? Some answers
- Divorces? *No, and no child custody or adoption proceedings, either.*
- Land disputes? *No. Only the superior court can adjudicate quiet title and land boundary disputes. Most land purchase disputes and home buying cases are filed in the superior court, above the rank of a magistrate.*
- DUI? *Some lower ranking DUI and misdemeanor cases can be tried before a magistrate. But all criminal felony cases must be tried in the superior court; not by a magistrate.*

We are losing a lot by not having a superior court judge in Wrangell-PSG-Kake. Meanwhile, Ketchikan has three (3!) full judges (two superior court plus one district court) and it also has a magistrate for a total of four (4) judicial officers. But WRG + PSG + Kake have only one shared magistrate for the entire area.

Please share with Jeff and Chelsea & Co. FWT

On 5/10/2022 4:41 PM, Aardvark LLC wrote:

Debra Thompson

From: Jeff Meucci <jrmeucciscuba@gmail.com>
Sent: Wednesday, May 11, 2022 8:55 AM
To: Debra Thompson
Subject: Fwd: SE sea otter survey
Attachments: Leach et al_2021_Ecology_optimal design in ecological studies.pdf; Lu2022_Article_ImprovingWildlifePopulationInf.pdf; Eisaguirre_et_al_2021_diffusion_model_SE.pdf

Hi Debbie, could you please include this information in this week's packet. Just informational. Thanks

Sent from my iPad

Begin forwarded message:

From: "Schuette, Paul A" <paul_schuette@fws.gov>
Date: May 2, 2022 at 10:40:43 AM AKDT
To: Kathy Hansen <kathy@seafa.org>, "Cate, Jenipher R" <jenipher_cate@fws.gov>, Bo Meredith <bo.meredith@alaska.gov>, "Eisaguirre, Joseph M" <joseph_eisaguirre@fws.gov>, Ginny Eckert <gleckert@alaska.edu>, Jeff Muecci <jrmeucciscuba@gmail.com>, John Moller <jmofish@yahoo.com>, Katy Bear <KNalven@defenders.org>, "Lemons, Patrick R" <Patrick_Lemons@fws.gov>, "Larsen Tempel, Jenell T (DFG)" <jenell.larsentempel@alaska.gov>, Lynn Lee <lynn.lee2@canada.ca>, Mike Jackson <dot@kake-nsn.gov>, Mike Miller <go2tbird@hotmail.com>, Phil Doherty <info@sardfa.org>, Ralph Wolfe <rwolfe2@cchita-nsn.gov>, Sam Rabung <samuel.rabung@alaska.gov>, ttinker <ttinker@nhydra.com>, "Weitzman, Benjamin P" <benjamin_weitzman@fws.gov>, Kate Sullivan <ksullivan@sardfa.org>, Maya Becker <maya_becker@murkowski.senate.gov>, Carly Besh <carly_besh@murkowski.senate.gov>, "Nichols, Carina (Sullivan)" <Carina_Nichols@sullivan.senate.gov>, "Lee Kadinger (lee.kadinger@sealaska.com)" <lee.kadinger@sealaska.com>, "O'Connor, Jamie (Murkowski)" <Jamie_O'Connor@murkowski.senate.gov>, "Cummings, Caroline E" <caroline_cummings@fws.gov>, Perry J Williams <perryw@unr.edu>, "Lemons, Patrick R" <Patrick_Lemons@fws.gov>
Subject: SE sea otter survey

Hello,

We wanted to provide everyone an update on our sea otter population survey across southeast Alaska. First, we will be working with Owyhee Air Research to conduct aerial, photo-based population surveys starting May 17, 2022. The survey will require two weeks of flight time, but we have allocated our time and resources to be available through June 30, if necessary, to accommodate poor weather.

Over the past two years, we have designed a sea otter population survey and will be analyzing the data with the most up-to-date methods (see attached papers). Given the high interest among stakeholders, we also wanted to give extra consideration to 10 communities. As a result, we have included transects within a 20km (12.4 mile) radius of each of these communities.

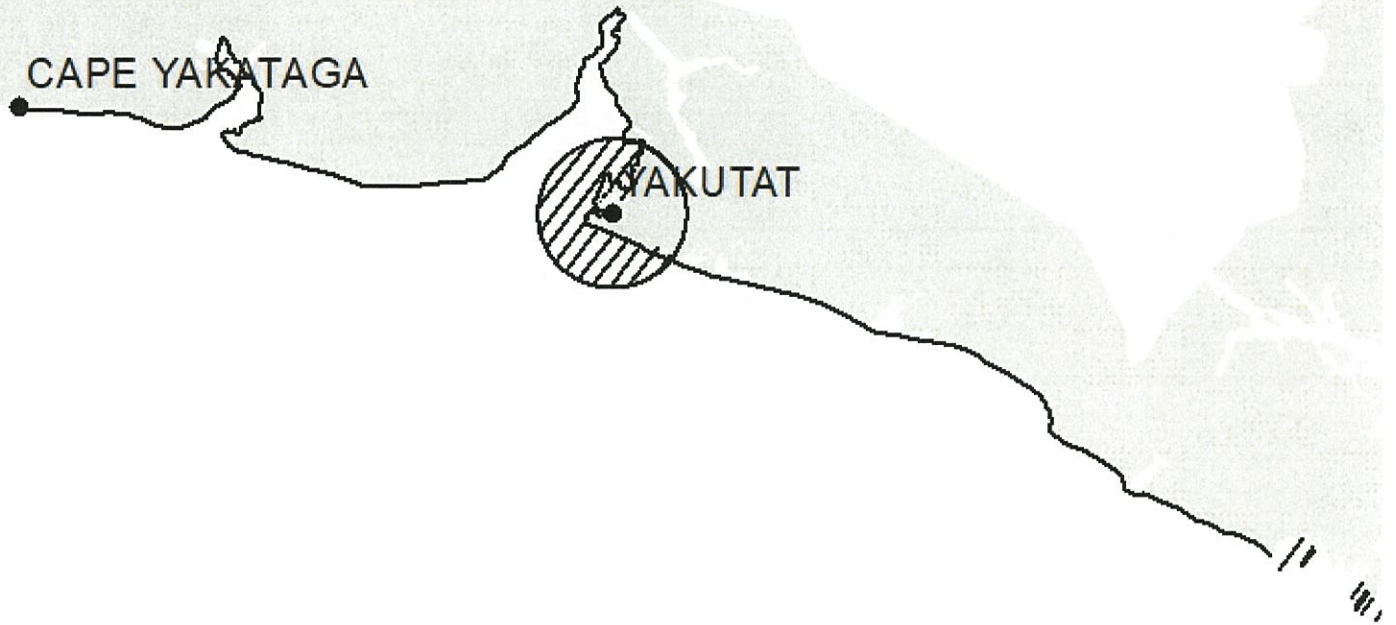
We wanted to share with you our survey maps in advance of the survey. Our hope is that you can view, discuss, and circulate these maps and provide us with any comments by May 9. We will do our best to address comments in advance of the start of the survey, working within the resources available to us (e.g. the amount of flight time we have available for the survey).

Second, we are planning to rotate our base of operations for the field team (2-4 FWS biologists) and the Owyhee flight team (pilot, camera operator) across Juneau, Sitka, Petersburg/Wrangell, and Ketchikan based on airstrip and fueling options to maximize efficiency. We will adapt when/where we are based depending on weather conditions. Although we hope to solidify lodging in advance, we anticipate we will sometimes have to make last-minute adjustments. We would welcome any recommendations for local, back-up options for places to stay (or camp) in case we get in a jam. Please feel free to send us any local options that come to mind.

Thank you for your input as this project has developed. We look forward to not only conducting the survey, but hopefully, finding a way to meet up with many of you informally during our time in southeast, if possible. We will do our best to keep you updated on our location as we move around the area.

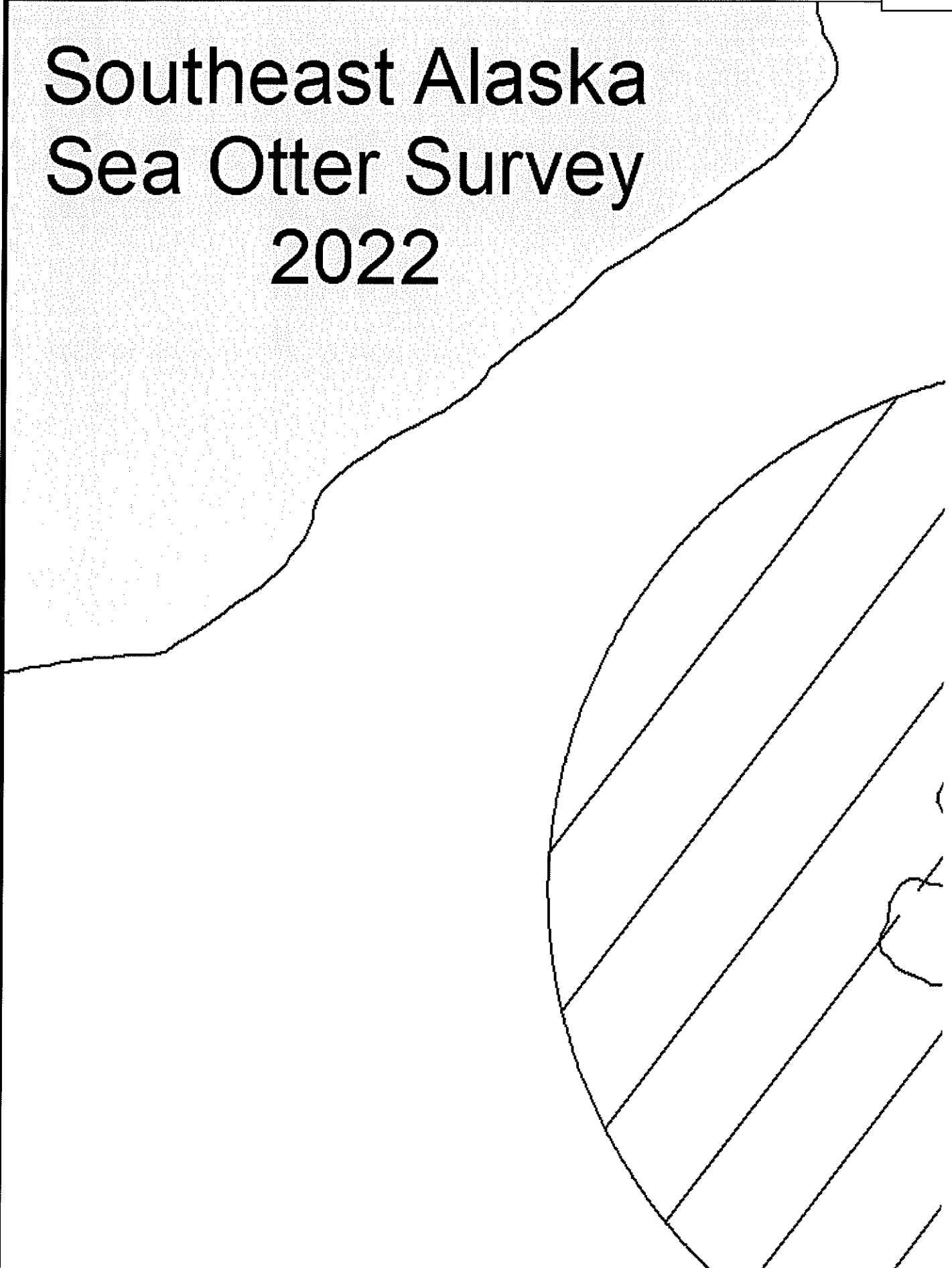
Best,
Paul

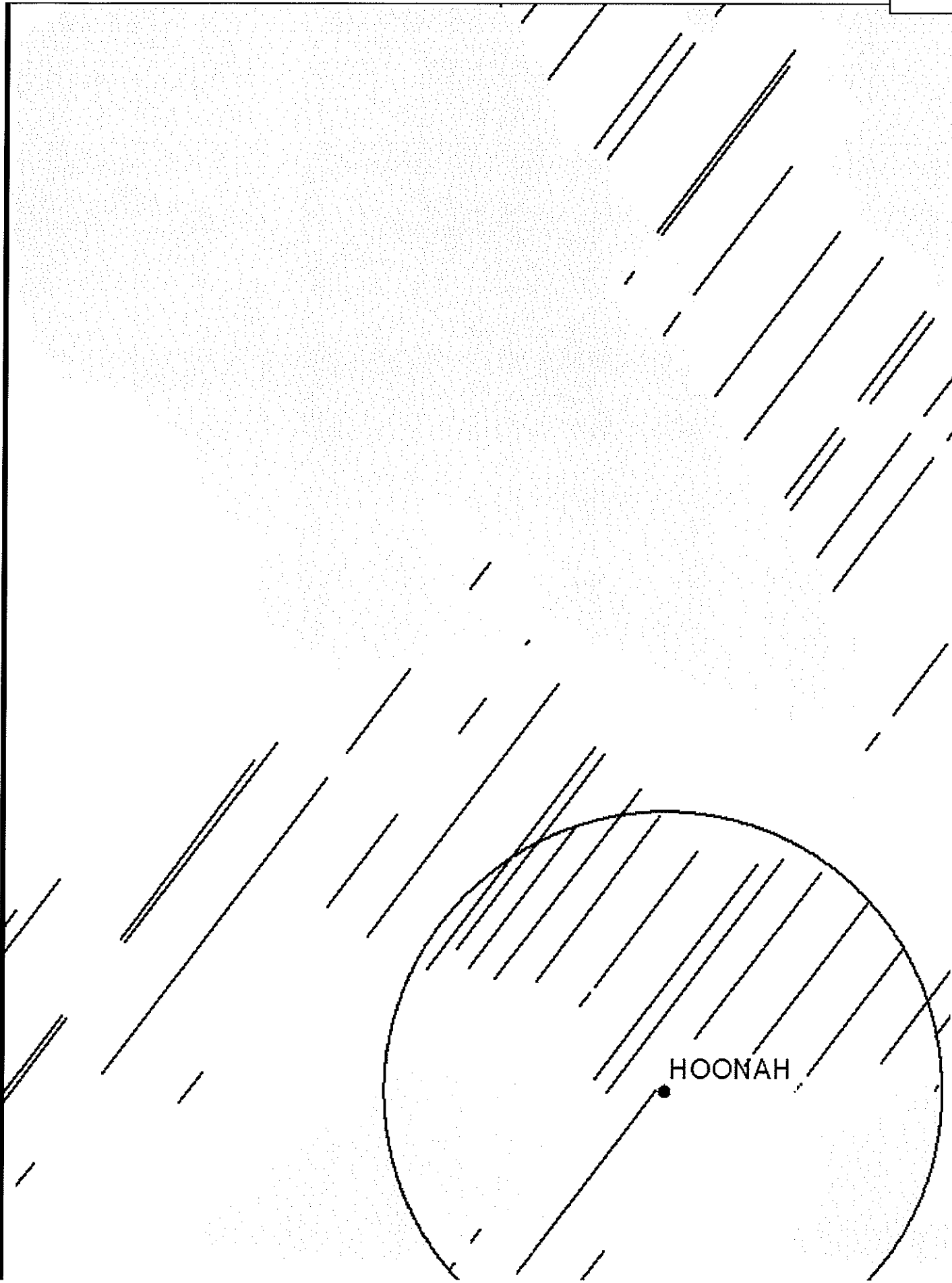
Paul Schuette, Ph.D.
Marine Mammals Management
U.S. Fish and Wildlife Service
1011 E. Tudor Rd., MS-341
Anchorage, AK 99503

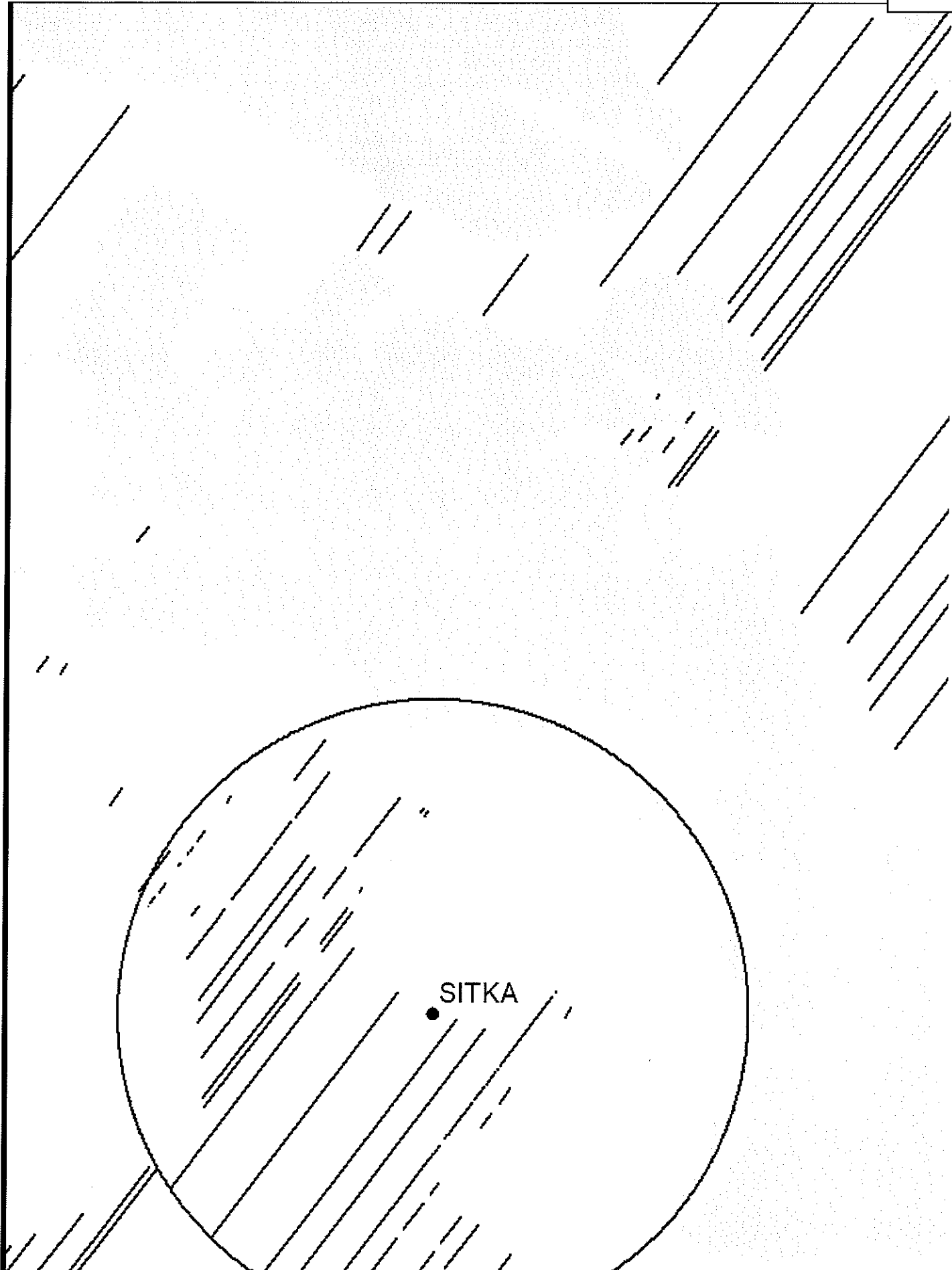


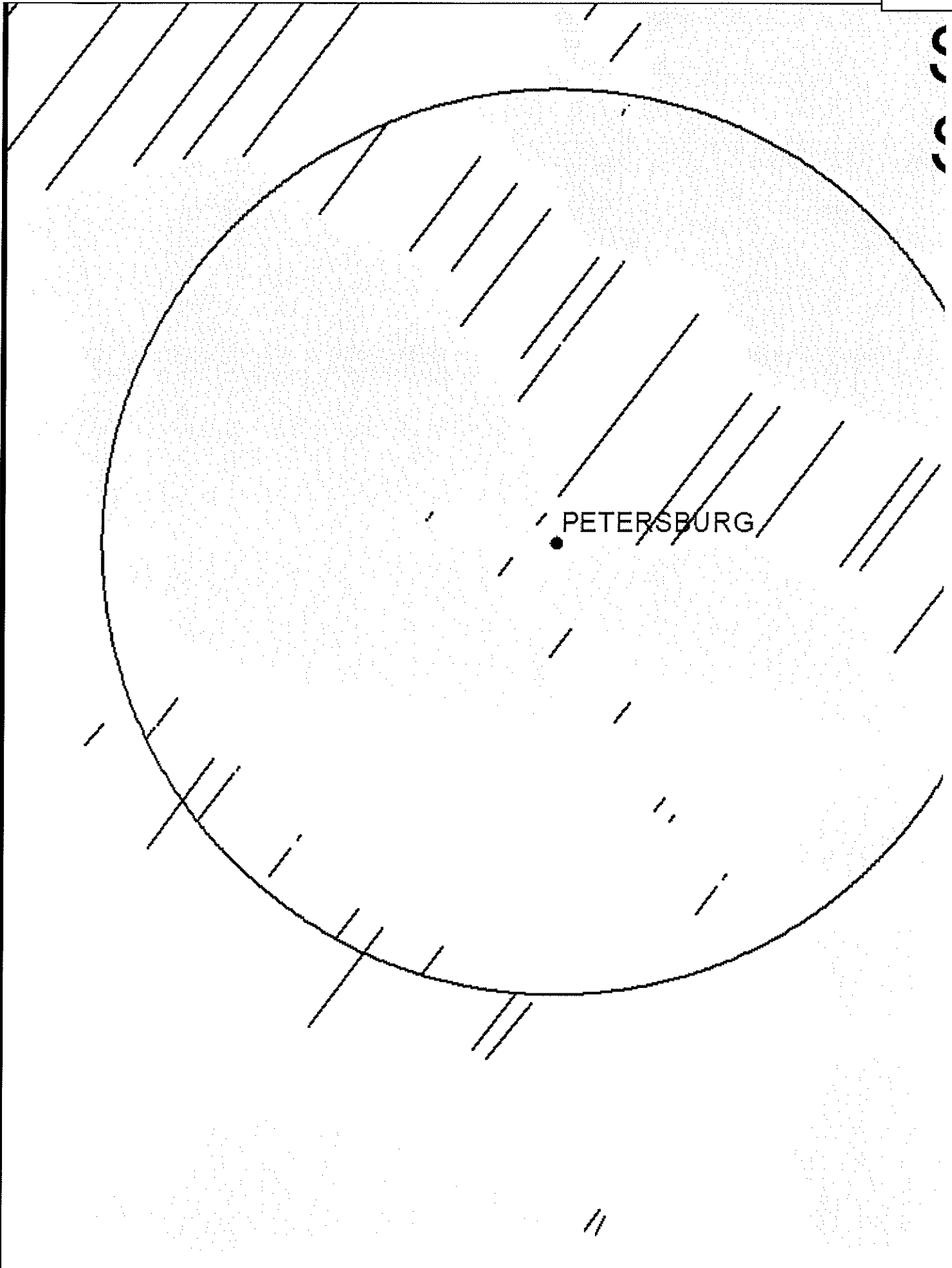
Transects (black lines)
Focal Communities (circles)
Glacier Bay (star, to be surveyed by NP)

Southeast Alaska Sea Otter Survey 2022

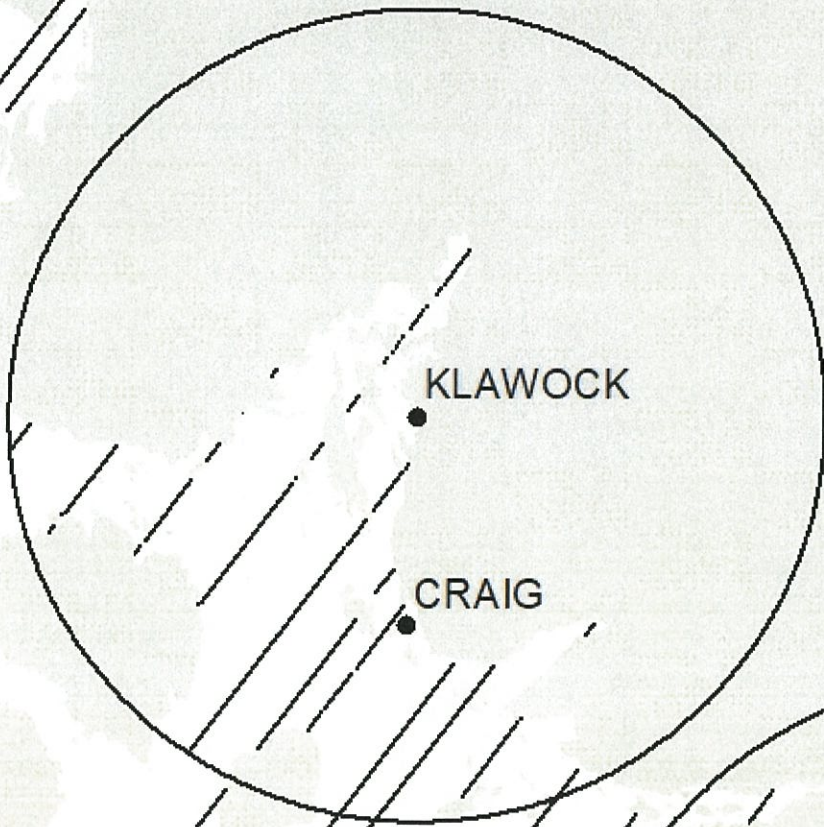












Southeast Alaska Sea Otter Survey 2022



Statistical Report

Ecology, 103(2), 2022, e03573
 © 2021 The Ecological Society of America. This article has been contributed to by US Government employees and their work is in the public domain in the USA.

Recursive Bayesian computation facilitates adaptive optimal design in ecological studies

CLINTON B. LEACH ^{1,8} PERRY J. WILLIAMS ² JOSEPH M. EISAGUIRRE ^{2,3} JAMIE N. WOMBLE ^{4,5}
 MICHAEL R. BOWER,⁴ AND MEVIN B. HOOTEN^{1,6,7}

¹*Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado 80523 USA*

²*Department of Natural Resources and Environmental Science, University of Nevada, Reno, Nevada 89557 USA*

³*U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska 99503 USA*

⁴*Southeast Alaska Inventory and Monitoring Network, National Park Service, Juneau, Alaska 99801 USA*

⁵*Glacier Bay Field Station, National Park Service, Juneau, Alaska 99801 USA*

⁶*U.S. Geological Survey, Colorado Cooperative Fish and Wildlife Research Unit, Fort Collins, Colorado 80523 USA*

⁷*Department of Statistics, Colorado State University, Fort Collins, Colorado 80523 USA*

Citation: Leach, C. B., P. J. Williams, J. M. Eisaguirre, J. N. Womble, M. R. Bower, and M. B. Hooten. 2022. Recursive Bayesian computation facilitates adaptive optimal design in ecological studies. *Ecology* 103(2):e03573. 10.1002/ecy.3573

Abstract. Optimal design procedures provide a framework to leverage the learning generated by ecological models to flexibly and efficiently deploy future monitoring efforts. At the same time, Bayesian hierarchical models have become widespread in ecology and offer a rich set of tools for ecological learning and inference. However, coupling these methods with an optimal design framework can become computationally intractable. Recursive Bayesian computation offers a way to substantially reduce this computational burden, making optimal design accessible for modern Bayesian ecological models. We demonstrate the application of so-called prior-proposal recursive Bayes to optimal design using a simulated data binary regression and the real-world example of monitoring and modeling sea otters in Glacier Bay, Alaska. These examples highlight the computational gains offered by recursive Bayesian methods and the tighter fusion of monitoring and science that those computational gains enable.

Key words: Bayesian hierarchical modeling; computational efficiency; monitoring; survey design.

INTRODUCTION

Ecological science involves both data collection and statistical modeling, but these two fundamental elements are often developed separately and sequentially in practice. Studies are commonly structured based on static random or space-filling designs. These designs have useful properties in some inferential settings, but may not represent the most efficient use of limited field resources, especially in complex, dynamic ecological systems. In fact, dynamically evolving processes may be monitored more efficiently with dynamically evolving designs (Hooten et al. 2009). Such designs can reduce redundancy in data collection (Wikle and Royle 1999) and produce higher

quality data and lower prediction uncertainty (Hooten et al. 2009). Moreover, static surveillance monitoring may not make use of existing ecological knowledge that can lead to improved study designs and inference (Nichols and Williams 2006). In contrast, optimal adaptive survey design recognizes that existing data (e.g., from a pilot study or previous monitoring work) provide ecological information that can be leveraged to ensure that future data collection efforts are set up to be efficient and informative (Wikle and Royle 2005, Hooten et al. 2009).

The optimal design process is iterative, and proceeds through the following steps: collection of data, development and fitting of a statistical model, generation of predictions, evaluation and selection of a new design based on the model and its predictions, collection of new data using that design, and so on (Williams et al. 2018, Hooten et al. 2019). Throughout this process, practitioners are required to make a number of choices. Among these is the choice of model framework and structure.

Manuscript received 3 February 2021; revised 7 July 2021; accepted 3 August 2021. Corresponding Editor: José Miguel Ponciano.

⁸ E-mail: clint.leach@gmail.com

Hierarchical Bayesian modeling has become widespread in ecology and is particularly well suited to integrating ecological processes with unknown parameters and noisy data (Berliner 1996, Wikle and Hooten 2010). This integration is achieved by specifying three levels of the statistical model (Berliner 1996): the data model that connects observations to the latent ecological process, the process model that describes that ecological process and its associated uncertainty, and parameter models that use prior information to constrain and inform the parameters of the data and process models.

Fitting these hierarchical models is computationally intensive and time consuming, especially for large spatiotemporal models (e.g., requiring more than 10 h in Williams et al. [2018]). Furthermore, evaluating a given design often requires generating predictions of the observations that design might produce in a future data collection effort, augmenting the original data with the predicted data, and fitting the model to the augmented data set. This fitted model then provides a means to evaluate how those new data would affect our understanding of the ecological process and its uncertainty. Finding an optimal design requires repeating this process (i.e., fitting the Bayesian hierarchical model) for every potential design. When the number of potential designs is large, the computational burden of each individual model fit renders this task computationally infeasible, requiring substantial cloud-based or cluster resources (e.g., Williams et al. 2018), or completely intractable.

The computational burden of the hierarchical Bayesian treatment has limited its application in optimal design settings, instead forcing practitioners to rely on other methods (e.g., Kalman filters; Wikle and Royle 2005, Hooten et al. 2009), or explore a relatively limited subset of designs (Williams et al. 2018). Thus, we currently lack the ability to carry the inference offered by modern Bayesian statistical models forward into the design phase without having to make compromises about the designs and models we consider. The main computational bottleneck involves updating an existing posterior distribution with predicted future data, which is the crux of Bayesian optimal adaptive design.

Recursive Bayesian inference provides methods that are well-suited to addressing this bottleneck. In particular, recursive methods enable a statistical model to be fit in a series of steps (e.g., to different groups of data, or to new data as it becomes available; Hooten et al. 2019). This partitioning of the statistical fitting procedure can offer large computational gains over fitting the full model every time new data need to be assimilated (Hooten et al. 2019). Recursive Bayesian methods have recently been used to facilitate computation in complex ecological models (e.g., Hooten et al. 2016, Gerber et al. 2018), but they have yet to be applied in the optimal design setting.

In what follows, we demonstrate how recursive Bayesian methods can be integrated into the optimal design workflow to substantially reduce the computational cost of assimilating new data from each potential design. We

first provide an overview of the optimal design process in a Bayesian hierarchical setting, and identify the crucial role that recursive Bayesian computing can play in reducing the computational burden. Then we demonstrate the recursive Bayes optimal design approach in an application using simulated data and a binary regression framework. Finally, we apply the recursive Bayes optimal design framework to a complex Bayesian hierarchical model of sea otter spatiotemporal dynamics, demonstrating the substantial computational gains that recursive Bayesian methods offer. These examples highlight the important role that recursive Bayesian methods can play in formally coupling optimal adaptive design and modern hierarchical Bayesian modeling, leading to improved ecological inference and closing the feedback loop between modeling and data collection.

METHODS

Evaluating a design

We represent all possible observations of an ecological process of interest as an $N \times 1$ vector \mathbf{y} (e.g., containing abundance or presence/absence at a complete set of sites in a study area). Then, we collect an initial sample of n_1 observations, \mathbf{y}_1 , produced by an $n_1 \times N$ design matrix \mathbf{K}_1 that maps the full domain to the initial observations such that $\mathbf{y}_1 = \mathbf{K}_1 \mathbf{y}$. The design matrix, \mathbf{K}_1 , is usually a (sparse) matrix composed of zeros and ones that selects the subset of \mathbf{y} that is observed. Given a Bayesian model with parameters θ , we obtain a sample from the first-stage posterior distribution $[\theta | \mathbf{y}_1]$ using an appropriate stochastic sampling algorithm (Gelfand and Smith 1990). Importantly, the recursive Bayes procedure outlined here is compatible with any valid first-stage sampling algorithm (Hooten et al. 2019), including Markov chain Monte Carlo (MCMC) and Hamiltonian Monte Carlo (HMC), and any software implementation thereof (e.g., NIMBLE [de Valpine et al. 2017] or Stan [Carpenter et al. 2016]).

In the optimal design framework, we use the existing data \mathbf{y}_1 and the fitted model to compare how different designs for future data collection affect our estimate of some target quantity (often a measure of uncertainty). Formally, we let $l = 1, \dots, L$ index the set of all possible designs, defined by $n_2 \times N$ design matrices $\mathbf{K}_2^{(l)}$, that would produce a new set of n_2 observations given by $\mathbf{y}_2^{(l)} = \mathbf{K}_2^{(l)} \mathbf{y}$. The first step of optimal design is to define a design criterion, $d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)})$, that summarizes some aspect of our understanding of the process given both the original and the new data. Choices of design criterion often include prediction variance (Hooten et al. 2009) or the variance of model parameters (Hooten et al. 2012) or derived quantities (e.g., abundance; Williams et al. 2018), in which case the goal of optimal design is to find the design that will yield the smallest variance (i.e., the least uncertainty).

Generally, the design criterion will depend either on the posterior predictive distribution of the full process

$$\left[\mathbf{y} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right] = \int \left[\mathbf{y} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)}, \boldsymbol{\theta} \right] \left[\boldsymbol{\theta} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right] d\boldsymbol{\theta}, \quad (1)$$

or directly on the posterior distribution of the model parameters $\left[\boldsymbol{\theta} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right]$. In principle, to evaluate the design criterion for a given $\mathbf{K}_2^{(l)}$, we need to measure the process (i.e., observe $\mathbf{y}_2^{(l)}$), augment the existing data with that measurement, and fit the statistical model to characterize $\left[\boldsymbol{\theta} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right]$ and hence the posterior predictive distribution $\left[\mathbf{y} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right]$. Thus, computing $d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)})$ given new (predicted) data requires fitting the model to the augmented data, which, in the case of modern Bayesian hierarchical models, may be computationally demanding. If the number of potential designs, L , is large, the standard Bayesian optimal design procedure becomes intractable.

However, we can further decompose the posterior distribution as

$$\begin{aligned} \left[\boldsymbol{\theta} \mid \mathbf{y}_1, \mathbf{y}_2^{(l)} \right] &\propto \left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1, \boldsymbol{\theta} \right] \left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right], \\ &\propto \left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1, \boldsymbol{\theta} \right] \left[\mathbf{y}_1 \mid \boldsymbol{\theta} \right] \left[\boldsymbol{\theta} \right], \end{aligned} \quad (2)$$

where $\left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right] \propto \left[\mathbf{y}_1 \mid \boldsymbol{\theta} \right] \left[\boldsymbol{\theta} \right]$ is available from the original model fit to \mathbf{y}_1 . This natural decomposition of the posterior distribution of $\boldsymbol{\theta}$ makes clear that the first-stage posterior distribution, $\left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right]$, serves as a prior on $\boldsymbol{\theta}$ in the second-stage analysis of the augmented data (Hooten et al. 2019). In prior-proposal recursive Bayes (PPRB), we also use $\left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right]$ as the proposal distribution in a Metropolis-Hastings MCMC algorithm to update the posterior distribution of $\boldsymbol{\theta}$ given the new data produced by a given design (Hooten et al. 2019).

At step k of the PPRB MCMC algorithm, we sample a proposal $\boldsymbol{\theta}^{(*)} \sim \left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right]$. We then accept that proposal and set $\boldsymbol{\theta}^{(k+1)} = \boldsymbol{\theta}^{(*)}$ with probability $\min(1, r)$, where

$$\begin{aligned} r &= \frac{\left[\mathbf{y}_2^{(l)} \mid \boldsymbol{\theta}^{(*)}, \mathbf{y}_1 \right] \left[\boldsymbol{\theta}^{(*)} \mid \mathbf{y}_1 \right]}{\left[\mathbf{y}_2^{(l)} \mid \boldsymbol{\theta}^{(k-1)}, \mathbf{y}_1 \right] \left[\boldsymbol{\theta}^{(k-1)} \mid \mathbf{y}_1 \right]} \frac{\left[\boldsymbol{\theta}^{(k-1)} \mid \mathbf{y}_1 \right]}{\left[\boldsymbol{\theta}^{(*)} \mid \mathbf{y}_1 \right]}, \\ &= \frac{\left[\mathbf{y}_2^{(l)} \mid \boldsymbol{\theta}^{(*)}, \mathbf{y}_1 \right]}{\left[\mathbf{y}_2^{(l)} \mid \boldsymbol{\theta}^{(k-1)}, \mathbf{y}_1 \right]}, \end{aligned} \quad (3)$$

where allowing the original posterior distribution to serve as both prior and proposal enables the cancellation and results in a ratio that depends only on the conditional likelihood of the new data. Note that, because we often have a finite MCMC sample from the first model fit (and thus a finite set of proposals, $\boldsymbol{\theta}^{(*)}$, for this stage), we can pre-compute $\left[\mathbf{y}_2^{(l)} \mid \boldsymbol{\theta}^{(*)}, \mathbf{y}_1 \right]$ for each design and proposal before the second stage and in parallel (Hooten

et al. 2019). This pre-computation, together with the relative simplicity of the above Metropolis-Hastings ratio, can lead to a substantial decrease in computation time compared to running the full sampling algorithm for every design. Code implementing PPRB for the following examples is available in Data S1 (archived in Leach 2021) and Data S2 (archived in Eisaguirre 2021).

Generating potential future data

The above discussion assumes that $\mathbf{y}_2^{(l)}$ is known, which, of course, it is not. In the case of Gaussian models (e.g., Wikle and Royle 1999), the design criterion $d^{(l)}$ depends only on $\mathbf{K}_2^{(l)}$ and the modeled dependence structure, and thus new data are not required. In more complex models, evaluating the design requires predictions of the new data $\mathbf{y}_2^{(l)}$ (Wikle and Royle 2005). These predictions can be readily generated by draws from the posterior predictive (or imputation) distribution of $\mathbf{y}_2^{(l)}$ produced from the first stage model

$$\left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1 \right] = \int \left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1, \boldsymbol{\theta} \right] \left[\boldsymbol{\theta} \mid \mathbf{y}_1 \right] d\boldsymbol{\theta}. \quad (4)$$

We can then use a multiple imputation approach (Rubin 1996, Scharf et al. 2017) to average the design criterion over the imputation distribution such that

$$\begin{aligned} d^{(l)}(\mathbf{y}_1) &= \int d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)}) \left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1 \right] d\mathbf{y}_2^{(l)}, \\ &= E\left(d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)}) \mid \mathbf{y}_1 \right) \end{aligned} \quad (5)$$

In practice, we can compute this expectation by first obtaining samples, $\mathbf{y}_2^{(l(m))} \sim \left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1 \right]$ for $m = 1, \dots, M$, from the first stage posterior predictive distribution. We then fit the model to each of the M augmented data sets $\left(\mathbf{y}, \mathbf{y}_2^{(l(m))} \right)$, obtain samples from each of the posterior distributions $\left[\boldsymbol{\theta} \mid \mathbf{y}_1, \mathbf{y}_2^{(l(m))} \right]$ using PPRB, and compute the mean of the corresponding design criteria:

$$d^{(l)}(\mathbf{y}_1) = \frac{1}{M} \sum_m d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l(m))}). \quad (6)$$

The accuracy of the expectation will improve as M grows larger, but often a relatively small M (on the order of 10) will be sufficient (Rubin 1996).

The multiple imputation procedure enables us to account for the uncertainty in the future data in the evaluation of the design criterion. Alternatively, if accounting for such uncertainty is not desired or necessary, we could generate a single point estimate of future data by computing the posterior predictive mean (or median or mode, as appropriate) of $\left[\mathbf{y}_2^{(l)} \mid \mathbf{y}_1 \right]$ or assigning a single fixed forecast of $\mathbf{y}_2^{(l)}$ from another source (e.g., expert opinion).

Optimization

Given an ability to rapidly compute the design criterion $d^{(l)}$, the optimal design can be obtained by finding the design that minimizes (or maximizes) $d^{(l)}$. In cases where the design space is relatively small, each design can be evaluated and the global optimum selected. If the design space is too large to evaluate every design, an optimization routine may be required (e.g., an exchange algorithm; Royle and Nychka 1998).

EXAMPLE: SIMULATED BINARY REGRESSION

Consider a situation in which we seek to predict the occupancy of a particular species across a spatial domain comprising 100 discrete units (e.g., plots or transects) over which we measure a covariate (e.g., through remote sensing), x_i for $i = 1, \dots, 100$ (Fig. 1b). Let \mathbf{y} be a vector comprising binary occupancy at all sites. An initial data collection effort randomly samples 10 of these sites, producing initial data set $\mathbf{y}_1 = \mathbf{K}_1\mathbf{y}$ with covariates $\mathbf{x}_1 = \mathbf{K}_1\mathbf{x}$, where \mathbf{K}_1 is a 10×100 matrix of zeros and ones, with a single one in each row identifying the sampled plot.

We model these data using binary regression, with a Bernoulli likelihood and a probit link function (Φ^{-1} , the inverse CDF of a standard normal distribution). The resulting full Bayesian model is as follows:

$$\begin{aligned} y_{1i} &\sim \text{Bernoulli}(p_i), \\ \Phi^{-1}(p_i) &= \beta_0 + \beta_1 x_{1i}, \\ \beta_0 &\sim \text{Normal}(0, \sigma_0^2), \\ \beta_1 &\sim \text{Normal}(0, \sigma_1^2). \end{aligned} \quad (7)$$

We use the data augmentation and Gibbs sampling approach of Albert and Chib (1993) to draw an MCMC sample from the posterior distribution of the regression coefficients ($[\beta|\mathbf{y}_1]$) and the posterior predictive distribution of occupancy across the study domain ($[\mathbf{y}|\mathbf{y}_1]$). This posterior sample could alternatively be generated using other algorithms (e.g., HMC) or software (e.g., brms; Bürkner 2017) without changing the following workflow. The goal of the optimal design framework is to use this initial data set and model output to select the next site (of the remaining 90) to be sampled. That is, each of the remaining 90 sites represent a potential design, indexed by l , that corresponds to a 1×100 design vector $\mathbf{K}_2^{(l)}$ that has a single 1 in the position of the sampled site and produces new data $\mathbf{y}_2^{(l)} = \mathbf{K}_2^{(l)}\mathbf{y}$.

To select the optimal design, we first specify a design criterion. Our goal is to predict occupancy. Thus we seek the design that minimizes the total posterior predictive variance given both the initial and new data

$$d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)}) = \sum_{i=1}^{100} \text{var}(y_i | \mathbf{y}_1, \mathbf{y}_2^{(l)}), \quad (8)$$

where $\text{var}(y_i | \mathbf{y}_1, \mathbf{y}_2^{(l)})$ is the pointwise posterior predictive variance calculated using the MCMC sample from

$[\mathbf{y}_i | \mathbf{y}_1, \mathbf{y}_2^{(l)}]$ produced by PPRB. To account for the uncertainty in predictions of the future $\mathbf{y}_2^{(l)}$, we average this design criterion over the imputation distribution $[\mathbf{y}_2^{(l)} | \mathbf{y}_1]$ to obtain $d^{(l)}(\mathbf{y}_1)$. In the binary case, imputed realizations $\mathbf{y}_2^{(l)(m)}$ can only take on values of 0 or 1, enabling efficient computation of this expectation (see Appendix S1).

Evaluating the design criterion requires sampling from $[\beta | \mathbf{y}_1, \mathbf{y}_2^{(l)(m)}]$ for all 90 designs and imputed future data sets. Rather than fit the model to the entire data set $(\mathbf{y}_2^{(l)(m)}, \mathbf{y}_1)$, we apply PPRB to use the existing output from the initial MCMC algorithm (i.e., the $\beta^{(k)}$ drawn from $[\beta | \mathbf{y}_1]$). At step k of the second-stage MCMC algorithm for design l and imputed data m , we implement PPRB as follows:

- 1) Sample a proposal $\beta^{(*)} \sim [\beta | \mathbf{y}_1]$ (i.e., selected randomly with replacement from the first stage MCMC sample).
- 2) Compute the PPRB Metropolis-Hastings ratio

$$r = \frac{[\mathbf{y}_2^{(l)(m)} | \beta^{(*)}]}{[\mathbf{y}_2^{(l)(m)} | \beta^{(k)}]}. \quad (9)$$

- 3) Accept the proposal $\beta^{(*)}$ with probability $\min(r, 1)$.

Using the second-stage samples $\beta^{(k)}$, we compute the design criteria for each potential design (averaging over the imputation distribution) and identify the optimal site for the next sample (Fig. 1c, d). The expected design criterion is largest (i.e., with the largest predictive variance) for sites with more extreme covariate values (Fig. 1c). Despite the fact that the inflection point (i.e., the x value where $p(x) = 0.5$) represents the largest Bernoulli variance, sampling locations with covariate values slightly larger than this inflection point produce the smallest total expected prediction variance. The positioning of the optimal design just off the inflection point highlights the fact that, even in simple models, the optimal design is often not intuitive and justifies the need for rigorous optimal design in ongoing ecological monitoring. In more complex spatiotemporal models, often with larger design spaces, it becomes even more difficult to identify effective designs a priori (Wikle and Royle 1999, 2005), further emphasizing the need for PPRB and the speed with which it enables us to evaluate a potentially large number of designs.

EXAMPLE: SPATIOTEMPORAL DYNAMICS

Sea otters (*Enhydra lutris*) are an apex predator of the nearshore marine community of the North Pacific Ocean and nearly went extinct at the turn of the 20th century. Reintroductions, translocations, and legal

protections allowed sea otters to recolonize much of their former range (Williams et al. 2019). The return of sea otters has influenced marine food webs, both directly and indirectly, with impacts on commercially important fisheries. Thus, information regarding the continued growth and expansion of sea otters is critical for predicting future expansion, understanding their role as a keystone species, and for informing natural resource management (Tinker et al. 2019). Sea otters are surveyed using aircraft over large spatial domains and flight time is typically restricted by range and fuel capacity of aircraft and operating conditions (Williams et al. 2017a). Sampling designs must balance requisite data collection with human safety, aircraft availability, and cost.

To estimate growth and colonization dynamics of sea otters in Glacier Bay, Alaska, Williams et al. (2017b)

developed a mechanistically motivated reaction-diffusion model known as ecological diffusion, embedded within a Bayesian hierarchical framework with data, process, and parameter levels (sensu Berliner 1996). This model was fit to sea otter aerial survey counts (Esslinger 2019), with data and process models specified as follows

$$\begin{aligned} \text{Data Model : } y_t(\mathbf{s}_i) &\sim \text{Binomial}(n_t(\mathbf{s}_i), \phi), \\ \text{Process Model : } n_t(\mathbf{s}_i) &\sim \text{Poisson}(u(\mathbf{s}_i, t)), \\ \frac{\partial u(\mathbf{s}, t)}{\partial t} &= \left(\frac{\partial^2}{\partial s_1^2} + \frac{\partial^2}{\partial s_2^2} \right) [\mu(\mathbf{s}, t)u(\mathbf{s}, t)] + \gamma u(\mathbf{s}, t). \end{aligned} \quad (10)$$

In Eq. 10, $y_t(\mathbf{s}_i)$ represents sea otter count data at locations \mathbf{s}_i for $i = 1, \dots, J$ during time t , $n_t(\mathbf{s}_i)$ is the

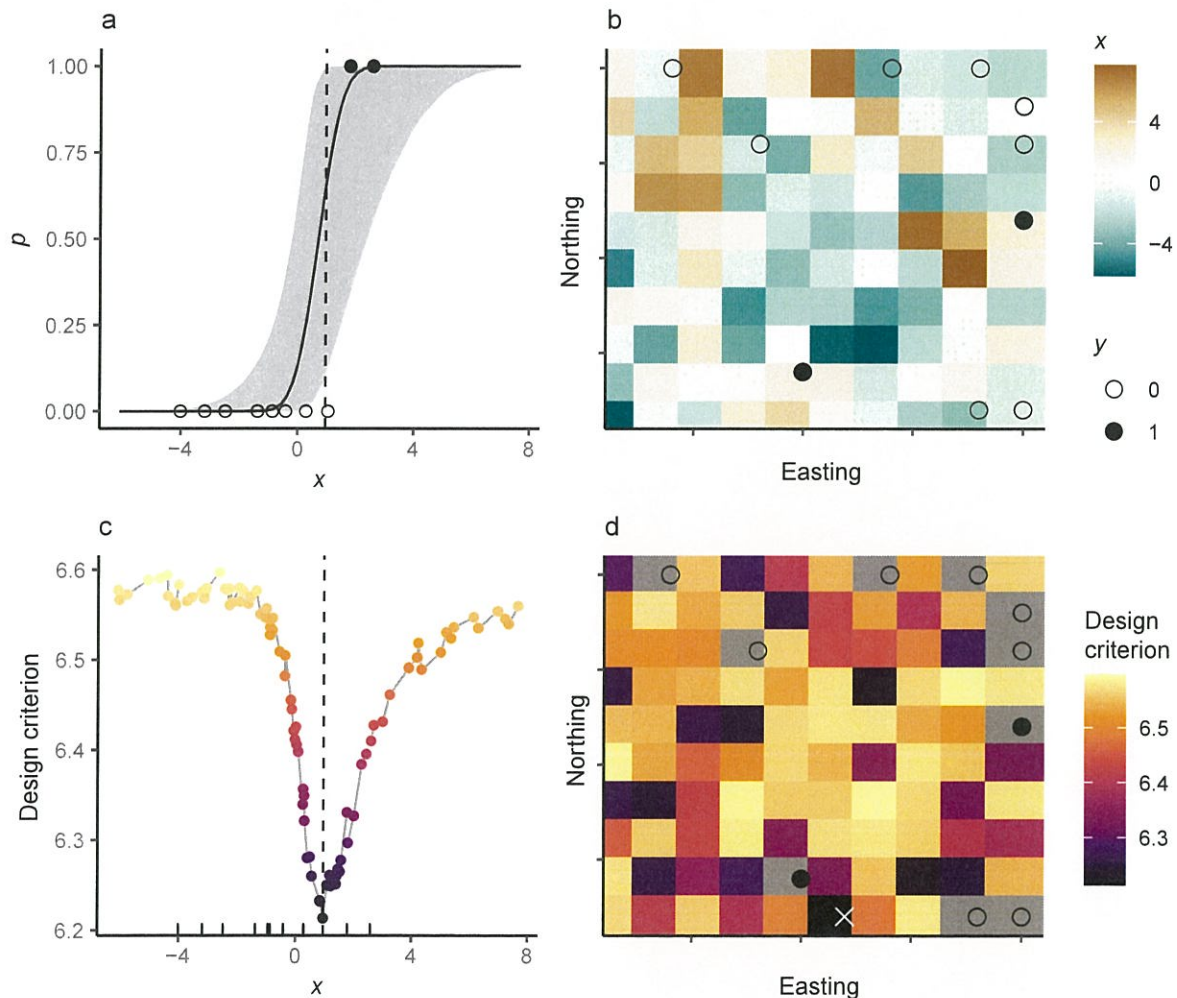


FIG. 1. Initial data collection effort and evaluation of the optimal design for a binary regression model. (a) The initial estimated occupancy probability p as a function of x , with the black line showing the posterior median and the gray ribbon showing the 95% credible interval. The points show the data obtained from (b) an initial random survey of the study domain. In panel b, each square is a sampling plot with measured covariate x indicated by the color of the fill. The points indicate the initial sites surveyed, with filled circles indicating the organism was present and open circles indicating absence. Each of the remaining plots represent a potential design for the next survey. (c, d) The computed design criteria for each of the 90 potential designs as a function of the x value at each plot (c) and mapped on the study domain (d). The dashed line in panels a and c indicates the x value of the optimal plot and the white \times identifies the optimal plot in panel d.

true latent abundance of sea otters, and ϕ is the individual sea otter detection probability. The dynamic abundance intensity process, $u(\mathbf{s}, t)$, was governed by an ecological diffusion PDE, with a constant instantaneous Malthusian growth γ and motility $\mu(\mathbf{s}, t)$ modeled as a function of spatially varying covariates. See Appendix S1 for the full model specification. The model described in Eq. 10 was fit to baseline data, \mathbf{y}_1 , collected for $t = 1993, \dots, 2012$, using a custom MCMC algorithm (Williams et al. 2017b). We used our algorithm to obtain three MCMC chains in parallel, with 50,000 draws per chain plus 10,000 for burn in. This required approximately 5 h per chain, for a total of 15 CPU hours.

Following the optimal design framework, our goal was to use the initial data \mathbf{y}_1 and corresponding model output to inform the collection of transects to be surveyed in a hypothetical 2013, producing new data $\mathbf{y}_2^{(l)}$. Rather than choosing a design criterion based on the posterior predictive density as in the binary regression example, in this example, we focused on the latent total abundance intensity in 2013, $u_{2013} = \int_S u_{2013}(\mathbf{s})d\mathbf{s}$. Our

objective was to minimize the variance of the total intensity $d^{(l)}(\mathbf{y}_1, \mathbf{y}_2^{(l)}) = \text{var}(u_{2013} | \mathbf{y}_1, \mathbf{y}_2^{(l)})$, where $\text{var}(u_{2013} | \mathbf{y}_1, \mathbf{y}_2^{(l)})$ is the predictive process variance calculated using the MCMC sample from $[u_{2013} | \mathbf{y}_1, \mathbf{y}_2^{(l)}]$ produced by PPRB. We used the multiple imputation approach described above to average this design criterion over the posterior predictive distribution of $\mathbf{y}_2^{(l)}$ using $M = 100$ draws of $\mathbf{y}_2^{(l)(m)} \sim [\mathbf{y}_2^{(l)} | \mathbf{y}_1]$, such that

$$d^{(l)}(\mathbf{y}_1) \approx \frac{1}{M} \sum_{m=1}^M \text{var}(u_{2013} | \mathbf{y}_1, \mathbf{y}_2^{(l)(m)}). \quad (11)$$

For each design l and imputed future data set m , we implemented the PPRB MCMC algorithm as follows:

- 1) Sample a proposal $(\mathbf{n}_{2013}^{(*)}, \mathbf{u}_{2013}^{(*)}) \sim [\mathbf{n}_{2013}, \mathbf{u}_{2013} | \mathbf{y}_1]$.
- 2) Compute the PPRB Metropolis-Hastings ratio

$$r = \frac{\left[\mathbf{y}_2^{(l)(m)} \middle| \mathbf{n}_{2013}^{(*)} \right]}{\left[\mathbf{y}_2^{(l)(m)} \middle| \mathbf{n}_{2013}^{(k)} \right]}. \quad (12)$$

- 3) Accept the proposal $(\mathbf{n}_{2013}^{(*)}, \mathbf{u}_{2013}^{(*)})$ with probability $\min(r, 1)$.

From the resulting MCMC chains, we computed $d^{(l)}$ for each candidate design. Given constraints associated with aircraft range and availability, approximately 20 transects can be flown per day in Glacier Bay, resulting

in $\left(\frac{170}{20}\right)$ possible survey designs given the dimensions of the survey area and the resolution of the data collection methods (Williams et al. 2018). While it was not feasible to assess all possible designs, the PPRB procedure allowed us to compare many more than was previously practical. Given that the ecological diffusion model required approximately 15 CPU hours to estimate parameters using an MCMC algorithm, previous optimization routines that fit the model for each design using MCMC would require 1500 CPU hours to assess just 1 design over 100 imputed data sets (Williams et al. 2018). In contrast, the PPRB approach permitted us to compute the design criterion of 1,000 designs (Fig. 2a) in about 480 CPU hours, which we reduced to < 5 h of run time by parallelizing evaluation over multiple CPUs. The survey design that optimized our design criterion (Fig. 2b) reduced the variance of the hypothetical 2013 sea otter abundance estimate by 38% over the average random design.

DISCUSSION

Applying the principles of optimal design to make efficient use of field resources requires methods that make efficient use of computational resources. This is especially true for ecological studies in which Bayesian hierarchical models are deployed. These models can capture rich mechanistic information (Wikle and Hooten 2010) but are often computationally demanding to fit. We proposed the use of PPRB (Hooten et al. 2019) to alleviate the computational burden and make evaluating a large number of designs feasible. We demonstrated this method using a binary regression model and highlighted that optimal designs may not always be intuitive without a comprehensive search of the design space (Wikle and Royle 1999, 2005). Furthermore, we applied the procedure to a complex Bayesian hierarchical model of sea otter spatiotemporal dynamics and demonstrated the substantial computational gains that PPRB produces relative to fitting the entire model for every considered design and possible data set.

The rapid and relatively extensive search of the design space allowed us to identify a collection of transects for a hypothetical 2013 sea otter aerial survey that would produce a more precise estimate of the total sea otter abundance in Glacier Bay than the average random design. Given that sea otters are a keystone species (Estes and Palmisano 1974) with a rapidly expanding range and abundance in Glacier Bay (Williams et al. 2019), accurately estimating their abundance is crucial for monitoring and conserving the nearshore ecosystem in the face of environmental and anthropogenic changes (Coletti et al. 2016, Tinker et al. 2019). We demonstrated that the optimal design framework, by leveraging existing knowledge of sea otter dynamics, learned through the combination of existing survey data and the mechanistic principles embedded in the reaction-diffusion PDE, can help make monitoring data as useful

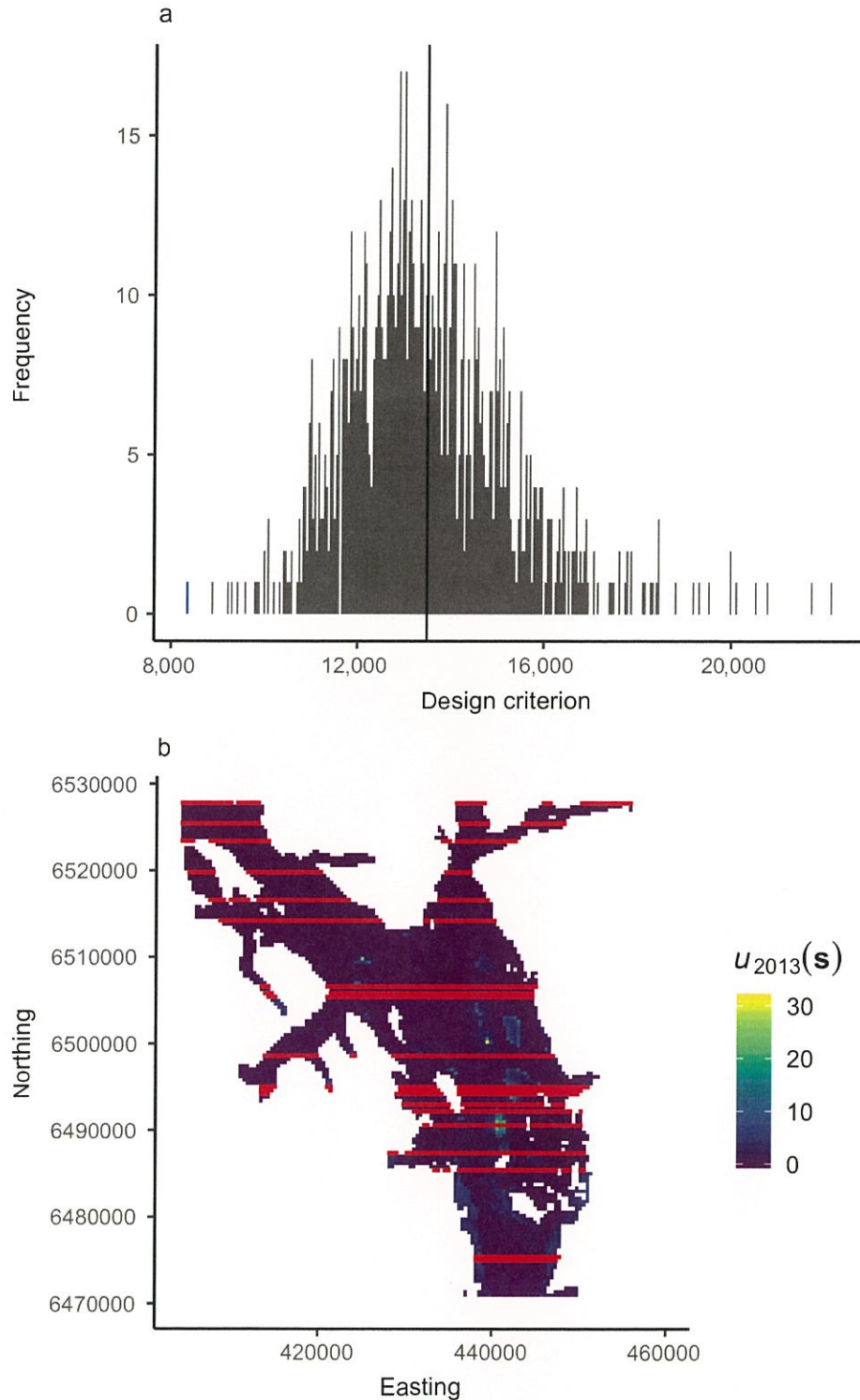


FIG. 2. (a) Histogram of design criteria computed for 1,000 randomly selected sea otter survey designs. The mean is given by the black line and the blue bar indicates the optimal survey design. Each design consisted of 20 transects to be flown over Glacier Bay in southeastern Alaska. (b) Forecasted sea otter abundance intensity across Glacier Bay in 2013, $u_{2013}(s)$, and optimal hypothetical survey design. Red lines correspond to the 20 transects representing the optimal design.

and informative as possible (Nichols and Williams 2006).

The challenges inherent in monitoring sea otters in Glacier Bay and across the North Pacific—costly data collection, dynamic spatiotemporal processes, and the need for quality data for conservation, management, and inference—are emblematic of the challenges faced throughout much of ecology. Both optimal design and Bayesian hierarchical modeling offer potential solutions to some of these challenges, and the use of PPRB allows them to be coupled more easily. This coupling will help to make the optimal design framework accessible to larger monitoring efforts across broader spatial domains and, in particular, may assist in the targeting of monitoring efforts across the sea otter range in the North Pacific (Eisaguirre et al. 2021).

Further, by reducing the computational burden of evaluating a given design, PPRB allows for greater flexibility in implementing the other components of the iterative optimal design framework, including the types of the data collected, the choice of design criteria, and the optimization framework. We focused on applications where the goal was to choose the locations at which to collect a single type of data, but the PPRB optimal design framework could be extended to target sampling across multiple data types (e.g., in integrated population modeling [Schaub et al. 2007] or multispecies studies). Further, we demonstrated two choices of design criterion based on predictive variance (in the binary regression example) and the variance of latent derived quantities (in the sea otter example). The choice of design criterion will depend on the goals of a particular study and could include other components, such as the costs of implementing a given design (Williams and Brown 2020), the benefits of any connected management actions (Williams and Brown 2020), or a measure of the strength of preferential sampling implied by a design (Diggle et al. 2010, Gelfand and Shirota 2019). Last, the approach we described can be enhanced by additional optimization strategies. The speed gains offered by PPRB may make the application of optimization frameworks (e.g., exchange algorithms, Royle and Nychka 1998) more feasible, and the identification of a global optimum more likely.

As we have demonstrated in our examples and discussion, recursive Bayesian methods offer to substantially ease the computational burden of coupling optimal design procedures with Bayesian hierarchical modeling. By facilitating this coupling, recursive Bayesian methods help close the feedback loop between data collection and data analysis, allowing the knowledge produced by Bayesian hierarchical modeling to inform monitoring efforts that improve and accelerate ecological learning and inference.

ACKNOWLEDGMENTS

Funding for this research was provided by the National Park Service Inventory and Monitoring Program and NSF DEB 1927177. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by

the U.S. Government. The findings and conclusions of the U.S. Fish and Wildlife Service authors in this article are their own and do not necessarily represent the views of the U.S. Fish and Wildlife Service. We thank the U.S. Geological Survey Advanced Research Computing team for use of the Yeti Supercomputer (<https://doi.org/10.5066/F7D798MJ>).

LITERATURE CITED

- Albert, J. H., and S. Chib. 1993. Bayesian analysis of binary and polychotomous response data. *Journal of the American Statistical Association* 88:669–679.
- Berliner, L. M. 1996. Hierarchical Bayesian time series models. Pages 15–22 *in* K. M. Hanson, and R. N. Silver, editors. *Maximum entropy and Bayesian methods*. Springer Netherlands, Dordrecht, the Netherlands.
- Bürkner, P.-C. 2017. brms: an R package for Bayesian multilevel models using Stan. *Journal of Statistical Software* 80:1–28.
- Carpenter, B., A. Gelman, M. Hoffman, D. Lee, B. Goodrich, M. Betancourt, M. A. Brubaker, P. Li, and A. Riddell. 2016. Stan: a probabilistic programming language. *Journal of Statistical Software* 76:1–32.
- Coletti, H. A., J. L. Bodkin, D. H. Monson, B. E. Ballachey, and T. A. Dean. 2016. Detecting and inferring cause of change in an Alaska nearshore marine ecosystem. *Ecosphere* 7:e01489.
- de Valpine, P., D. Turek, C. J. Paciorek, C. Anderson-Bergman, D. T. Lang, and R. Bodik. 2017. Programming with models: Writing statistical algorithms for general model structures with nimble. *Journal of Computational and Graphical Statistics* 26:403–413.
- Diggle, P. J., R. Menezes, and T. Su. 2010. Geostatistical inference under preferential sampling. *Journal of the Royal Statistical Society: Series C (Applied Statistics)* 59:191–232.
- Eisaguirre, J. M. 2021. jmeisaguirre/glba optimal design (v1.0.0). Zenodo. <https://doi.org/10.5281/zenodo.5172817>
- Eisaguirre, J. M., P. J. Williams, X. Lu, M. L. Kissling, W. S. Beatty, G. G. Esslinger, J. N. Womble, and M. B. Hooten. 2021. Diffusion modeling reveals effects of multiple release sites and human activity on a recolonizing apex predator. *Movement Ecology* 9:1–14.
- Esslinger, G. 2019. Sea otter aerial survey data from Glacier Bay National Park and Preserve, 1999–2012. U.S. Geological Survey data release. <https://doi.org/10.5066/P9SBAFF6>
- Estes, J. A., and J. F. Palmisano. 1974. Sea otters: their role in structure nearshore communities. *Science* 185:1058–1060.
- Gelfand, A. E., and S. Shirota. 2019. Preferential sampling for presence/absence data and for fusion of presence/absence data with presence-only data. *Ecological Monographs* 89:1–17.
- Gelfand, A. E., and A. F. M. Smith. 1990. Sampling-based approaches to calculating marginal densities. *Journal of the American Statistical Association* 85:398–409.
- Gerber, B. D., M. B. Hooten, C. P. Peck, M. B. Rice, J. H. Gammonley, A. D. Apa, and A. J. Davis. 2018. Accounting for location uncertainty in azimuthal telemetry data improves ecological inference. *Movement Ecology* 6:14.
- Hooten, M. B., F. E. Buderman, B. M. Brost, E. M. Hanks, and J. S. Ivan. 2016. Hierarchical animal movement models for population-level inference. *Environmetrics* 27:322–333.
- Hooten, M. B., D. S. Johnson, and B. M. Brost. 2019. Making recursive Bayesian inference accessible. *American Statistician* 75:185–194.
- Hooten, M. B., B. E. Ross, and C. K. Wikle. 2012. Optimal spatio-temporal monitoring designs for characterizing population trends. Pages 443–459 *in* R. A. Gitzen, J. J. Millsbaugh, A. B. Cooper, and D. S. Licht, editors. *Design and analysis of*

- long-term ecological monitoring studies. Cambridge University Press, Cambridge, Massachusetts, USA.
- Hooten, M. B., C. K. Wikle, S. L. Sheriff, and J. W. Rushin. 2009. Optimal spatio-temporal hybrid sampling designs for ecological monitoring. *Journal of Vegetation Science* 20:639–649.
- Leach, C. B. 2021. Simulated data example of recursive Bayesian computing for optimal design (v1.0.0). Zenodo. <https://doi.org/10.5281/zenodo.5172768>
- Nichols, J. D., and B. K. Williams. 2006. Monitoring for conservation. *Trends in Ecology and Evolution* 21:668–673.
- Royle, J. A., and D. Nychka. 1998. An algorithm for the construction of spatial coverage designs with implementation in SPLUS. *Computers and Geosciences* 24:479–488.
- Rubin, D. B. 1996. Multiple Imputation after 18+ Years. *Journal of the American Statistical Association* 91:473–489.
- Scharf, H., M. B. Hooten, and D. S. Johnson. 2017. Imputation approaches for animal movement modeling. *Journal of Agricultural, Biological, and Environmental Statistics* 22:335–352.
- Schaub, M., O. Gimenez, A. Sierro, and R. Arlettaz. 2007. Use of integrated modeling to enhance estimates of population dynamics obtained from limited data. *Conservation Biology* 21:945–955.
- Tinker, M. T., V. A. Gill, G. G. Esslinger, J. Bodkin, M. Monk, M. Mangel, D. H. Monson, W. W. Raymond, and M. L. Kissling. 2019. Trends and carrying capacity of sea otters in southeast Alaska. *Journal of Wildlife Management* 83:1073–1089.
- Wikle, C. K., and M. B. Hooten. 2010. A general science-based framework for dynamical spatio-temporal models. *Test* 19:417–451.
- Wikle, C. K., and J. A. Royle. 1999. Space-time dynamic design of environmental monitoring networks. *Journal of Agricultural, Biological, and Environmental Statistics* 4:489–507.
- Wikle, C. K., and J. A. Royle. 2005. Dynamic design of ecological monitoring networks for non-Gaussian spatio-temporal data. *Environmetrics* 16:507–522.
- Williams, B. K., and E. D. Brown. 2020. Scenarios for valuing sample information in natural resources. *Methods in Ecology and Evolution* 11:1534–1549.
- Williams, P. J., M. B. Hooten, G. G. Esslinger, J. N. Womble, J. L. Bodkin, and M. R. Bower. 2019. The rise of an apex predator following deglaciation. *Diversity and Distributions* 25:895–908.
- Williams, P. J., M. B. Hooten, J. N. Womble, and M. R. Bower. 2017a. Estimating occupancy and abundance using aerial images with imperfect detection. *Methods in Ecology and Evolution* 8:1679–1689.
- Williams, P. J., M. B. Hooten, J. N. Womble, G. G. Esslinger, and M. R. Bower. 2018. Monitoring dynamic spatio-temporal ecological processes optimally. *Ecology* 99:524–535.
- Williams, P. J., M. B. Hooten, J. N. Womble, G. G. Esslinger, M. R. Bower, and T. J. Heey. 2017b. An integrated data model to estimate spatiotemporal occupancy, abundance, and colonization dynamics. *Ecology* 98:328–336.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at <http://onlinelibrary.wiley.com/doi/10.1002/cey.3573/supinfo>


OPEN RESEARCH

Novel code is provided as Supporting Information and archived on Zenodo. The code for the simulated data example is archived with <https://doi.org/10.5281/zenodo.5172768> and the code from the sea otter example is archived with <https://doi.org/10.5281/zenodo.5172817>. The data used for the sea otter example are available from Esslinger (2019).

Supplementary materials for this article are available at <https://doi.org/10.1007/s13253-021-00484-w>.



Improving Wildlife Population Inference Using Aerial Imagery and Entity Resolution

Xinyi LU , Mevin B. HOOTEN, Andee KAPLAN, Jamie N. WOMBLE, and Michael R. BOWER

Recent technological advancements have seen a rapid growth in the use of imagery data to estimate the abundance and spatial distribution of animal populations. However, the value of imagery data may not be fully exploited under traditional analytical frameworks. We developed a method that leverages aerial imagery data for population modeling through entity resolution, a technique that stochastically links the same individual across multiple images. Resolving duplicate individuals in overlapping images that are distorted requires realigning observed point patterns optimally; however, popular machine learning algorithms for image stitching do not often account for alignment uncertainty. Moreover, duplicated individuals can provide insight about detection probability when overlaps are viewed as replicate surveys. Our model resolves individual identities by linking observed locations to latent activity centers and estimates total population as informed by the linkage structure. We developed a hierarchical framework to achieve entity resolution and abundance estimation cohesively, thereby avoiding single-direction error propagation that is common in two-stage models. We illustrate our method through simulation and a case study using aerial images of sea otters in Glacier Bay, Alaska.

Supplementary materials accompanying this paper appear on-line

Key Words: Bayesian; Data augmentation; Hierarchical model; Spatial capture-recapture.

1. INTRODUCTION

Aerial surveys are widely used to provide abundance information about terrestrial and marine species (Caughley 1974; Ver Hoef 2014). Compared to traditional observer-based surveys, imagery surveys have the advantage of reducing risk for observers and providing a permanent record that can be independently verified (Buckland et al. 2012). In addition to

X. Lu (✉) · A. Kaplan, Department of Statistics, Colorado State University, Fort Collins, CO 80523, USA (E-mail: xinyi.lu@colostate.edu). M. B. Hooten · M. R. Bower, Department of Statistics and Data Sciences, The University of Texas at Austin, Austin, TX 78705, USA. J. M. Womble · M. R. Bower, Southeast Alaska Inventory and Monitoring Network, National Park Service, 3100 National Park Rd, Juneau, AK 99801, USA. J. M. Womble, Glacier Bay Field Station, National Park Service, 3100 National Park Rd, Juneau, AK 99801, USA.

© 2022 International Biometric Society
Journal of Agricultural, Biological, and Environmental Statistics
<https://doi.org/10.1007/s13253-021-00484-w>

Published online: 12 January 2022

X. LU ET AL.

population counts, the imagery data (often referred to as photographs; Fig. 3 in Supplementary Material) provide individual-level information such as color, size, and location, which can be leveraged to identify animals without marking them (Williams et al. 2020). This gain in information leads to more reliable modeling of population abundance than using count data only (Dennis et al. 2015; Barker et al. 2018; Ketz et al. 2019). In what follows, we describe a Bayesian hierarchical model to identify unique individuals in overlapping images and estimate population size under a unified framework. We apply our model to analyze aerial imagery data of sea otters (*Enhydra lutris kenyoni*) in Glacier Bay, Alaska. During a survey, images are acquired at a regular time interval with overlapping regions in the direction of aircraft movement as it flies along transects that are systematically placed across the Glacier Bay. Sea otters in the images are located and counted by trained observers after the survey. Past studies using these data have either discarded overlapping images to meet the independent count assumption of binomial models (Lu et al. 2019), or treated counts from overlapping regions as temporal replicates in N-mixture models (Williams et al. 2017). We demonstrate the advantages of our method over the previously described methods in simulation.

The information we use to resolve individual identities are the observed locations of individuals in a sequence of images. However, individual positions may be distorted when the aircraft deviates from its scheduled trajectory due to a variety of reasons that can influence altitude and aircraft position, resulting in an artificial transformation of the image footprints. Further, micro-movement of sea otters and locating uncertainty during laboratory processing make exact matching of observed locations in overlapping regions nearly impossible. There exists a rich literature on image stitching where the common objective is to optimally combine a sequence of overlapping images into a composite image by minimizing a loss function (Levin et al. 2004; Szeliski 2006; Brown and Lowe 2015; Gross and Heumann 2016). However, optimization-based image stitching algorithms do not usually provide uncertainty about the stitching process and are seldom integrated into other models to provide additional learning about the system. On the other hand, the statistical literature associated with entity resolution, also known as record linkage when the objective is to merge multiple data files (in our case, images) in the absence of unique identifiers (in our case, individual tags, for example), may provide a theoretical basis for uncertainty quantification. We incorporate uncertainty in the record linkage process into a capture-recapture model for abundance estimation.

Traditional approaches to record linkage compare similarities between pairs of records from which matching decisions are made (Fellegi and Sunter 1969; Jaro 1989; Winkler 1995). Larsen and Rubin (2001) presented record linkage as a mixture of linkage probabilities between a model for probable links and a model for probable nonlinks. Fortini et al. (2001), McGlincy (2004), and Larsen (2004) developed the Bayesian approaches based on the same idea. However, comparison-based approaches are largely infeasible computationally, even when the number of possible links is moderately large (Winkler 2006). One way to reduce the computation cost of record linkage is by “blocking,” where records partitioned into different blocks are considered nonlinks *a priori* (Christen 2011; Steorts et al. 2014). Alternatively, record linkage can be presented as the clustering of observed records by unobserved identities (Copas and Hilton 1990; Tancredi and Liseo 2011; Liseo and Tan-

credi 2011; Steorts et al. 2015; Tancredi et al. 2018). Each latent identity has a “true” value and the associated records are modeled as stochastic distortions from the truth. Steorts et al. (2015) introduced the graphical record linkage model by representing the linkage structure as a bipartite graph between observed records and latent identities. By comparing records to latent identities instead of each other, the computation time to link d data files with a maximum of n records per file can be substantially reduced from $\mathcal{O}(n^d)$ to $\mathcal{O}(dn)$. One distinction between the graphical record linkage model and other non-parametric clustering methods such as Dirichlet process models and Pitman-Yor process models is that the latter often assume linear growth of cluster size with the size of data (Wallach et al. 2010; Betancourt et al. 2016), whereas in record linkage problems, co-referent clusters tend to stay small even when the number of records grows. Following Liseo and Tancredi (2011) and Steorts et al. (2015), we made use of a bivariate Gaussian model conditional on the latent truths to identify unique individuals in the imagery data.

The output of a record linkage model can be used to learn about population size. When uncertainty exists in linkage structure, record linkage and size estimation are often regarded as two separate stages (LaPorte et al. 1993; Anderson and Fienberg 1999; Lum et al. 2013). Sadinle (2018) proposed using “linkage-averaging” to transfer linkage uncertainty as quantified by Bayesian posterior samples into the subsequent stage of population size estimation. Although linkage-averaging facilitates model exploration by allowing the combination of different record linkage models with population models, any bias in the record linkage stage will propagate into the size estimation stage regardless of model choice (Tancredi and Liseo 2011). Our hierarchical framework naturally relates entity resolution and abundance estimation as one generative process, thereby allowing information exchange and feedback between these two model objectives. Other unified modeling approaches exist, including those presented by Link et al. (2009) and Wright et al. (2009) that incorporate misidentification into capture-recapture models by sampling from latent multinomial distributions, the hierarchical record linkage models proposed by Tancredi and Liseo (2011) and Liseo and Tancredi (2011) that reflect capture-recapture dynamics through latent matching matrices, and the latent Poisson process model proposed by Green and Mardia (2005) to align partially labeled protein structures. We propose a novel framework that combines a record linkage model and a spatial capture-recapture model (Royle and Young 2008) to align distorted animal locations and to account for heterogeneity in detection probability due to temporally changing survey units.

We present our hierarchical record linkage model in Sect. 2. In Sect. 3, we illustrate the model through simulation and a case study using aerial photographs of sea otters in Glacier Bay, Alaska. Finally in Sect. 4, we discuss possible extensions and broader applications of our model.

2. MODEL

2.1. DATA MODEL

Consider a sequence of T images with n_t observed individuals in image t , for $t = 1, \dots, T$ (see Fig. 2 in Supplementary Material, for example). Let $y_{i,t}$ be a two-dimensional

X. LU ET AL.

vector of latitude and longitude denoting the observed location of the i th individual in image t , and let $\mathbf{u}_{i,t}$ denote the true location of that individual. Distortion in $\mathbf{y}_{i,t}$ occurs in laboratory processing when the image footprint, \mathcal{F}_t , is artificially scaled and rotated to fit in a template, \mathcal{Q}_t , assuming the aircraft trajectory follows a fixed height and orientation. The image centers (latitude, longitude) were recorded by a GPS device on the aircraft in real time and are reliable to represent the truth. Using the known image center $\boldsymbol{\mu}_t$ as a reference point, we connect the distorted displacement of the observed location from the image center to that of the true location, $\mathbf{u}_{i,t}$, from the image center as

$$\mathbf{y}_{i,t} - \boldsymbol{\mu}_t = (1 + c_t) \mathbf{R}(\theta_t) (\mathbf{u}_{i,t} - \boldsymbol{\mu}_t), \quad (1)$$

where the counterclockwise rotation matrix is given by

$$\mathbf{R}(\theta_t) = \begin{pmatrix} \cos \theta_t & -\sin \theta_t \\ \sin \theta_t & \cos \theta_t \end{pmatrix}.$$

The scaling parameter, c_t , and the rotation parameter, θ_t , are modeled using basis function regression to ensure smoothness and flexibility in the aircraft trajectory (Hefley et al. 2017). We specify

$$\begin{aligned} c_t &= \mathbf{w}(t)' \boldsymbol{\alpha}, \\ \theta_t &= \mathbf{v}(t)' \boldsymbol{\beta}, \end{aligned} \quad (2)$$

where $\mathbf{w}(t)$ and $\mathbf{v}(t)$ are the basis functions evaluated at time t for scaling and rotation, respectively. Due to unknown distortion, the true image footprints are also unknown, and we model the four vertices of the rectangular image footprint \mathcal{F}_t through a georectification process from the known template \mathcal{Q}_t ,

$$\mathbf{v}_{j,t} - \boldsymbol{\mu}_t = \frac{1}{(1 + c_t)} \mathbf{R}(-\theta_t) (\mathbf{v}_{j,t}^* - \boldsymbol{\mu}_t), \quad j = 1, 2, 3, 4, \quad (3)$$

where $\mathbf{v}_{j,t}$ denote the vertices of \mathcal{F}_t and $\mathbf{v}_{j,t}^*$ denote the vertices of \mathcal{Q}_t .

We assume every observed individual has a latent identity, $\lambda_{i,t}$, that may be shared across images but not within the same image. The true locations, $\mathbf{u}_{i,t}$, are modeled as Gaussian conditioned on a transient activity center associated with the latent identity, $s_{\lambda_{i,t}}$, and movement uncertainty, $\sigma_u^2 \mathbf{I}$, such that

$$\mathbf{u}_{i,t} | s_{\lambda_{i,t}}, \sigma_u^2 \sim \mathbf{N}(s_{\lambda_{i,t}}, \sigma_u^2 \mathbf{I}).$$

Subsequently, the conditional distributions of the observed locations are expressed as follows,

$$\mathbf{y}_{i,t} | s_{\lambda_{i,t}}, \sigma_u^2, c_t, \theta_t \sim \mathbf{N}\left(\boldsymbol{\mu}_t + (1 + c_t) \mathbf{R}(\theta_t) (s_{\lambda_{i,t}} - \boldsymbol{\mu}_t), \sigma_u^2 (1 + c_t)^2 \mathbf{R}(\theta_t) \mathbf{R}^T(\theta_t)\right). \quad (4)$$

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

We note that reliable inference from our model depends on a small σ_u^2 relative to the amount of distortion due to scaling and rotation, and we return to this concept in Sect. 3.1. Based on the latent identities, the data model in (4) allows us to minimize the Procrustes distance (Dryden and Mardia 1998) between configurations of points in the overlapping regions, and the process model that we describe in what follows enables inference about the latent identities.

2.2. PROCESS MODEL

We adopt a parameter expanded data augmentation approach (Royle 2009; Royle and Dorazio 2012) and assume there is a super-population of size M much greater than the total number of observations in a study domain, \mathcal{D} , that contains the union of all image footprints. Each individual in the super-population has a binary variable, z_m , representing whether the individual belongs to the population being sampled, where $z_m \sim \text{Bern}(\psi)$ for $m = 1, \dots, M$. Conditional on the latent identities of the observed individuals, the augmented data are a zero-inflated version of the capture history. The prior specification on the zero-inflation parameter, ψ , along with the super-population size, M , implicitly suggests a prior for the unknown population size, N (Royle et al. 2007).

We let λ_t denote the vector of latent identities indexed by m for the observed individuals in image t . A plausible configuration of λ_t must satisfy two conditions: (a) there are no duplicate identities, and (b) any identity in λ_t must be detectable at time t . Otherwise the probability of observing λ_t is zero. Each individual in the super-population is associated with an activity center, s_m . We let the activity centers be uniformly distributed in the study domain *a priori*. We require that an individual is detectable at time t if and only if it is a member of the population being sampled ($z_m = 1$) and its realized location is inside the image footprint at time t ($\mathbf{u}_{m,t} \in \mathcal{F}_t$). In the spatial capture-recapture model by Royle and Young (2008), realized locations are fully augmented for all individuals in the super-population and unobserved $\mathbf{u}_{m,t}$ are treated as missing data (the model does not account for measurement error so the observations are the realized locations). However, when the observed individuals are unidentified, accounting for missingness becomes challenging. Therefore, we integrate $\mathbf{u}_{m,t}$ from the process model by letting $p_{m,t}$ denote the probability that $\mathbf{u}_{m,t}$ falls in \mathcal{F}_t conditional on \mathcal{F}_t , the activity center s_m , and the movement process variance σ_u^2 , such that

$$p_{m,t} = \mathbb{P}\left(\mathbf{u}_{m,t} \in \mathcal{F}_t \mid \mathcal{F}_t, s_m, \sigma_u^2\right) = \int_{\mathcal{F}_t} \frac{1}{2\pi\sigma_u^2} \exp\left(-\frac{(\mathbf{u} - s_m)'(\mathbf{u} - s_m)}{2\sigma_u^2}\right) d\mathbf{u}. \quad (5)$$

Let p_0 denote the baseline detection probability (e.g., sea otter detectability due to diving behaviors). Then we have

$$\mathbb{P}\left(\lambda_{i,t} = m \mid z_m, s_m, \mathcal{F}_t, \sigma_u^2, p_0\right) = \begin{cases} p_0 \times p_{m,t}, & \text{if } z_m = 1; \\ 0, & \text{otherwise.} \end{cases}$$

X. LU ET AL.

Assuming the individuals are independently detected, the probability of observing λ_t is as follows,

$$\mathbb{P}\left(\lambda_t \mid \{z_m\}_{m=1}^M, \{s_m\}_{m=1}^M, \sigma_u^2, \mathcal{F}_t, p_0\right) = \frac{1}{n_t!} \prod_{m:z_m=1} \{p_0 p_{m,t} \mathbb{I}(m \in \lambda_t) + (1 - p_0 p_{m,t}) \mathbb{I}(m \notin \lambda_t)\}, \quad (6)$$

where the factor of $\frac{1}{n_t!}$ indicates that all permutations of λ_t are equally likely *a priori*. The process model induces regularization on the number of unique latent identities by controlling the number of activity centers in an image that belong to the population being sampled. When the super-population is much larger than the total number of observed individuals, under-linkage is likely when each observation seeks its own activity center. However, to infer that a pair of observations in the overlapping region corresponds to different activity centers is to infer that each individual is detected once between two consecutive visits. Such inference, along with any extra activity center in the image that remain undetected, will be penalized by a high detection probability in the model for $\lambda_{i,t}$. The process model thereby motivates linkage between observed locations that are spatially proximal.

2.3. PARAMETER MODEL

We used an informative inverse-gamma prior for σ_u^2 because we have specific knowledge about the extent of sea otter movement that is physically possible between consecutive images (Williams 1989). We imposed a penalization on the second derivatives of the fitted B-splines through the prior variances of α and β . The penalty parameters were selected by cross-validation (Wahba 1978; Wood et al. 2016). We specified $\psi \sim \text{Beta}(0.001, 1)$ to approximate a scale prior for N ($[N] \propto 1/N$, Link, 2013), and we centered the prior for p_0 at 0.75 based on a prior data analysis and as suggested in past studies (Williams et al. 2017; Lu et al. 2019). A full description of prior distributions can be found in Appendix A.

The joint posterior distribution associated with our model is

$$\begin{aligned} \left[(\lambda_t)_{t=1}^T, \{s_m\}_{m=1}^M, \sigma_u^2, \alpha, \beta, \{z_m\}_{m=1}^M, p_0, \psi \mid \mathbf{Y} \right] &\propto \prod_{t=1}^T \prod_{i=1}^{n_t} \left[y_{i,t} \mid s_{\lambda_{i,t}}, \sigma_u^2, \alpha, \beta \right] \times \prod_{m=1}^M [s_m] \\ &\times \prod_{t=1}^T \left[\lambda_t \mid \{z_m\}_{m=1}^M, \{s_m\}_{m=1}^M, \sigma_u^2, \alpha, \beta, p_0 \right] \times [p_0] \\ &\times \prod_{m=1}^M [z_m \mid \psi] \times [\psi] \times [\sigma_u^2] \times [\alpha] \times [\beta]. \end{aligned}$$

The distortion parameters, c_t and θ_t , in Eq. 4 and the image footprint, \mathcal{F}_t , in Eq. 6 are deterministic functions of α and β , and are therefore replaced by the basis function coefficients in the above expression. We implemented our model using MCMC and provide a full description of the algorithm in Supplementary Appendix A.

3. APPLICATION

3.1. SIMULATION

We simulated a population of $N = 200$ individuals and sampled their activity centers s_m , for $m = 1, \dots, N$, uniformly from a $100 \text{ m} \times 2000 \text{ m}$ study domain, \mathcal{D} , to emulate the population intensity in the case study. For $t = 1, \dots, T$, $T = 50$, we sampled realized locations $\mathbf{u}_{m,t} \sim \text{N}(s_m, \sigma_u^2 \mathbf{I})$. We let σ_u^2 be 0.25 based on the estimated maximum underwater speed of sea otters according to empirical studies (Williams 1989). For the measurement process, we set the image centers to be equally spaced between $\boldsymbol{\mu}_1 = (50, 50)'$ and $\boldsymbol{\mu}_{50} = (1950, 50)'$ and let the footprint template at time t , \mathcal{Q}_t , be a $58 \text{ m} \times 58 \text{ m}$ square centered at $\boldsymbol{\mu}_t$ and parallel to the horizontal axis. We generated distortion parameters from cubic B-splines with coefficients $\boldsymbol{\alpha} = \boldsymbol{\beta} = (0.1, 0.2, 0.1, -0.1, -0.2)'$ and obtained the image footprint \mathcal{F}_t using Eq. 3. When $\mathbf{u}_{m,t} \in \mathcal{F}_t$, we detect individual m at time t with probability $p_0 = 0.75$ as informed by past studies (Williams et al. 2017; Lu et al. 2019). We recorded the distorted locations of the detected individuals by Eq. 1. Figure 1 illustrates the simulated image footprints and the true locations as well as the corresponding footprint templates and the observed locations.

In our implementation of the model, we let the super-population be of size $M = 3000$. We ran the MCMC algorithm in R version 3.0.2 (R Core Team 2019) for 15,000 iterations. Our algorithm took 2.5 hours on a 2.5 GHz Intel Core i5 processor. Advanced sampling strategies like the split-merge Metropolis-Hastings updates on the latent identities can be used to expedite computation (Jain and Neal 2004), and parallel computing techniques like recursive Bayesian methods can improve statistical scalability in future implementations (Hooten et al. 2021). We used a burn-in of 5000 iterations and obtained posterior realizations of population size as a derived quantity from the remaining $K = 10000$ posterior samples of z_m as

$$N^{(k)} = \sum_{m=1}^M z_m^{(k)}, \quad k = 1, \dots, K. \quad (7)$$

We obtained posterior realizations of the number of unique individuals from all observations by counting unique labels in the posterior samples of $\{\boldsymbol{\lambda}_t\}_{t=1}^T$ as

$$N_0^{(k)} = \left| \left\{ \boldsymbol{\lambda}_t^{(k)} \right\}_{t=1}^T \right|, \quad k = 1, \dots, K. \quad (8)$$

Our model captured the true parameters within their respective 95% credible intervals, which we summarize in Supplementary Table 1.

Two recent studies have used aerial photographs to estimate sea otter abundance in Glacier Bay, Alaska. Lu et al. (2019) proposed a nonlinear reaction-diffusion process model for population intensity, but used only every other image in accordance with the assumptions of their model. An arbitrary selection of images to use for data analysis may lead to bias in abundance estimation, especially if population intensity is spatially heterogeneous. Although our method is not directly comparable to that of Lu et al. (2019), we can compare the

X. LU ET AL.

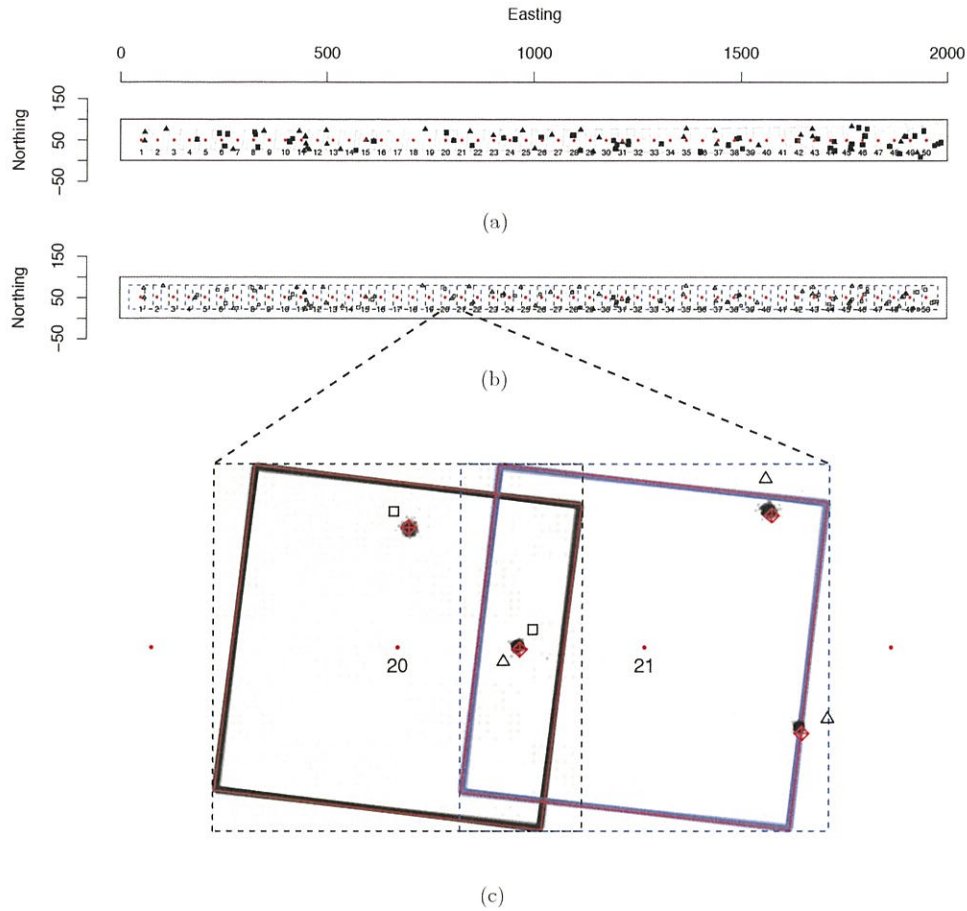


Figure 1. **a** Simulated image footprints, \mathcal{F}_t , overlaid with true locations, $u_{i,t}$. The time-indexed points represent image centers, μ_t . True locations are marked with “■” in even images and “▲” in odd images. The largest rectangle containing all images is the study domain, \mathcal{D} ; **b** simulated footprint templates (dashed rectangles), \mathcal{Q}_t , overlaid with observed locations, $y_{i,t}$, that are marked with “□” in even images and “△” in odd images; **c** a focused illustration on observed images 20 and 21 (dashed rectangles), overlaid with posterior samples of image footprints (solid rectangles) and activity centers (points) with their truths (crossed diamonds).

estimated number of unique individuals in all images because it refers to the observed abundance. We observed 111 locations from all images in the above simulation, which correspond to 90 unique individuals in truth. Our model estimated a posterior mean of 90 unique individuals. However, the number of unique individuals from counting all the odd images is 60, and the number of unique individuals from counting all the even images is 51. Discarding half of the images led to inconsistent and insufficient counts, whereas we improved abundance estimates by accounting for duplicate individuals in overlapping regions.

Williams et al. (2017) proposed an N -mixture model where the counts from overlapping images are considered temporal replicates. The model divides images into mutually exclusive regions of overlaps and non-overlaps and denotes $y(A_i, j)$ as the count from the j th overlap of region A_i , such that $\cup_{i=1}^n A_i = \cup_{t=1}^T \mathcal{F}_t$ and $A_i \cap A_j = \emptyset$, $i \neq j$. Under the

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

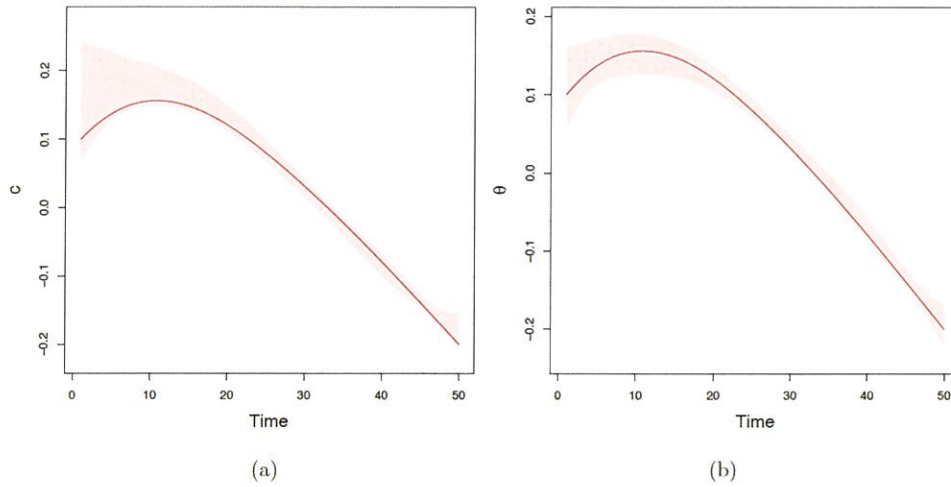


Figure 2. **a** Estimated point-wise 95% credible interval overlaid with the truth for the scaling parameter, c ; **b** estimated point-wise 95% credible interval overlaid with the truth for the rotation parameter, θ .

assumption of homogeneous detection probability p_0 and population intensity η , the counts are modeled by

$$\begin{aligned} y(A_i, j) &\sim \text{Binom}(N(A_i), p_0) \\ N(A_i) &\sim \text{Pois}(\eta|A_i|), \end{aligned} \quad (9)$$

where $|A_i|$ is the area of A_i . Although [Williams et al. \(2017\)](#) accounted for heterogeneity in p_0 and η based on spatial covariates, we fit the homogeneous version of their model in Eq. 9 to our simulated data using an MCMC algorithm. A posterior realization of population size is obtained as a derived quantity by $N^{(k)} = \eta^{(k)}|D|$, for $k = 1, \dots, K$ MCMC iterations. The estimated posterior mean abundance was 178 with a 95% credible interval (142, 216). Both the method by [Williams et al. \(2017\)](#) and our method were able to recover the true population abundance in simulation; nonetheless, our process model distinguished sea otter detectability due to diving from that due to temporary emigration from the image footprints ([Kendall et al. 1997](#)). In addition to abundance estimation, our estimated activity centers can be used to inform spatial heterogeneity of the population intensity and our estimated distortion parameters can be used to reconstruct the aircraft trajectory via trigonometric projections.

To evaluate our model performance in linkage estimation, we used false discovery rate (FDR) and false negative rate (FNR) as recommended by [Steorts \(2015\)](#) to account for the large number of non-links in our application. There are four possible results when comparing the estimated linkage and the truth:

1. True positive (TP): two individuals have the same latent identity in both the estimation and the truth;
2. False positive (FP): two individuals are estimated to have the same latent identity when they are actually different;

X. LU ET AL.

Table 1. True parameter values and marginal posterior means (95% credible intervals) for population size (N) and the number of unique individuals (N_0) under different simulated movement uncertainties (σ_u^2)

σ_u^2	N	Posterior mean (95% CI)	N_0	Posterior mean (95% CI)
0.25	200	192 (160, 233)	91	90 (90, 91)
1	200	191 (155, 241)	87	88 (87, 91)
2.5	200	251 (196, 327)	91	95 (93, 97)
10	200	364 (216, 668)	88	100 (93, 108)

3. True negative (TN): two individuals have different latent identities in both the estimation and the truth;
4. False negative (FN): two individuals are estimated to have different latent identities when they are actually the same.

We computed the posterior mean FDR and FNR as $\mathbb{E}[\text{FDR}|Y] = \frac{1}{K} \sum_{k=1}^K \frac{\text{FP}^{(k)}}{\text{FP}^{(k)} + \text{TP}^{(k)}} = 0.000001$ and $\mathbb{E}[\text{FNR}|Y] = \frac{1}{K} \sum_{k=1}^K \frac{\text{FN}^{(k)}}{\text{FN}^{(k)} + \text{TP}^{(k)}} = 0.001$ based on the model fit to the simulated data.

Posterior realizations of the scaling and rotation parameters, c and θ , were obtained as derived quantities using Eq. 2, and posterior realizations of the image footprints, \mathcal{F}_i , were obtained as derived quantities using Eq. 3. Figure 1 illustrates posterior samples of the image footprints and the activity centers overlaid with their truth for a subset of images (images 20 and 21). Our model performed well, linking observations that correspond to the same individual in the overlapping region and correctly estimating their activity centers despite distortion. Figure 2 demonstrates the point-wise 95% credible intervals for c and θ . The point-wise 95% credible intervals contained the true simulated values for both parameters.

Lastly, we demonstrate our model inference using simulated data with increasing levels of individual movement, σ_u^2 , while the other parameters are held constant. We note that any σ_u^2 significantly larger than 0.25 would be unrealistic for sea otters in southeastern Alaska; nonetheless, the following demonstration serves to emphasize a viable condition for applying our method in other survey scenarios. Table 1 summarizes the posterior distributions of the number of unique individuals and population size along with their truth under different values of σ_u^2 . The true numbers of unique individuals vary between simulations due to dependence on σ_u^2 . The estimated 95% credible interval for N_0 widens as individual movement increases, indicating less certainty in the linkage process. Consequently, the estimated 95% credible interval for N expands along with σ_u^2 , and the credible intervals when $\sigma_u^2 = 10$ did not contain the respective truths for N_0 or N .

3.2. CASE STUDY

Sea otter populations have undergone significant fluctuations throughout their range over the past two centuries (Jameson et al. 1982). After being hunted to near extinction during the maritime fur trade, sea otter populations have recovered in many areas due to a combination of conservation efforts, translocations, and environmental changes (Larson

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

Table 2. Marginal posterior means and 95% credible intervals for the case study

Parameter	Posterior mean (95% CI)
p_0	0.64 (0.52, 0.75)
ψ	0.19 (0.15, 0.24)
N	566 (453, 704)
σ_u^2	0.45 (0.34, 0.59)

et al. 2014; Eisaguirre et al. 2021). Monitoring sea otter colonization in Glacier Bay provides important insight into the ability of a keystone species to recover from near extirpation and to understand their role in structuring the nearshore food web in Glacier Bay (Williams et al. 2019). From 1993 to 2012, observer-based aerial surveys were conducted from small single-engine aircraft along systematic transects (Esslinger et al. 2015). Beginning in 2017, aerial photographic methods (Womble et al. 2018) were conducted using model-based optimized surveys (Williams et al. 2019). Aerial photographic images were post-processed by trained observers that counted the number of sea otters in each image. For our case study, we analyzed a sequence of 20 consecutive images with a total of 151 observations (see Fig. 3 in Supplementary Material for an example of real images). Sea otter locations were recorded for $60 \text{ m} \times 90 \text{ m}$ footprint templates with their long sides perpendicular to the direction of aircraft movement (vectors connecting consecutive image centers). Figure 3 illustrates the observed locations overlaid with footprint templates. Our study domain was a $300 \text{ m} \times 1000 \text{ m}$ rectangular region containing all image footprints as shown in Fig. 3.

We let the super-population be of size $M = 3000$ and ran the MCMC algorithm for 15000 iterations with a burn-in of 5000 iterations. Table 2 summarizes the marginal posterior distributions from the case study. Our estimated detection probability agrees with the estimates from previous studies (Williams et al. 2017; Lu et al. 2019). Posterior realizations of population size were obtained as derived quantities by Eq. 7.

Our model inferred a posterior mean of 125 unique individuals among the 151 observations using Eq. 8. We illustrate posterior samples of the image footprints, \mathcal{F}_t , obtained as derived quantities using Eq. 3 and posterior samples of the true locations, $\mathbf{u}_{i,t}$, obtained as derived quantities using Eq. 1 for a subset of images ($t = 8, 9$) in Fig. 3. Using our model, we estimated counterclockwise rotation as the distortion process for both images, thereby linking the two pairs of observations in the overlapping region. The posterior mean linkage probability was 0.98 for observation pairs (a, h) and (b, i), and all other observation pairs have less than 0.02 posterior mean linkage probabilities. Figure 4 demonstrates the point-wise 95% credible intervals overlaid with the posterior means for scaling and rotation, respectively.

4. DISCUSSION

We presented a novel method to perform entity resolution and population size estimation using individual locations obtained from aerial imagery data of sea otters. We coupled

X. LU ET AL.

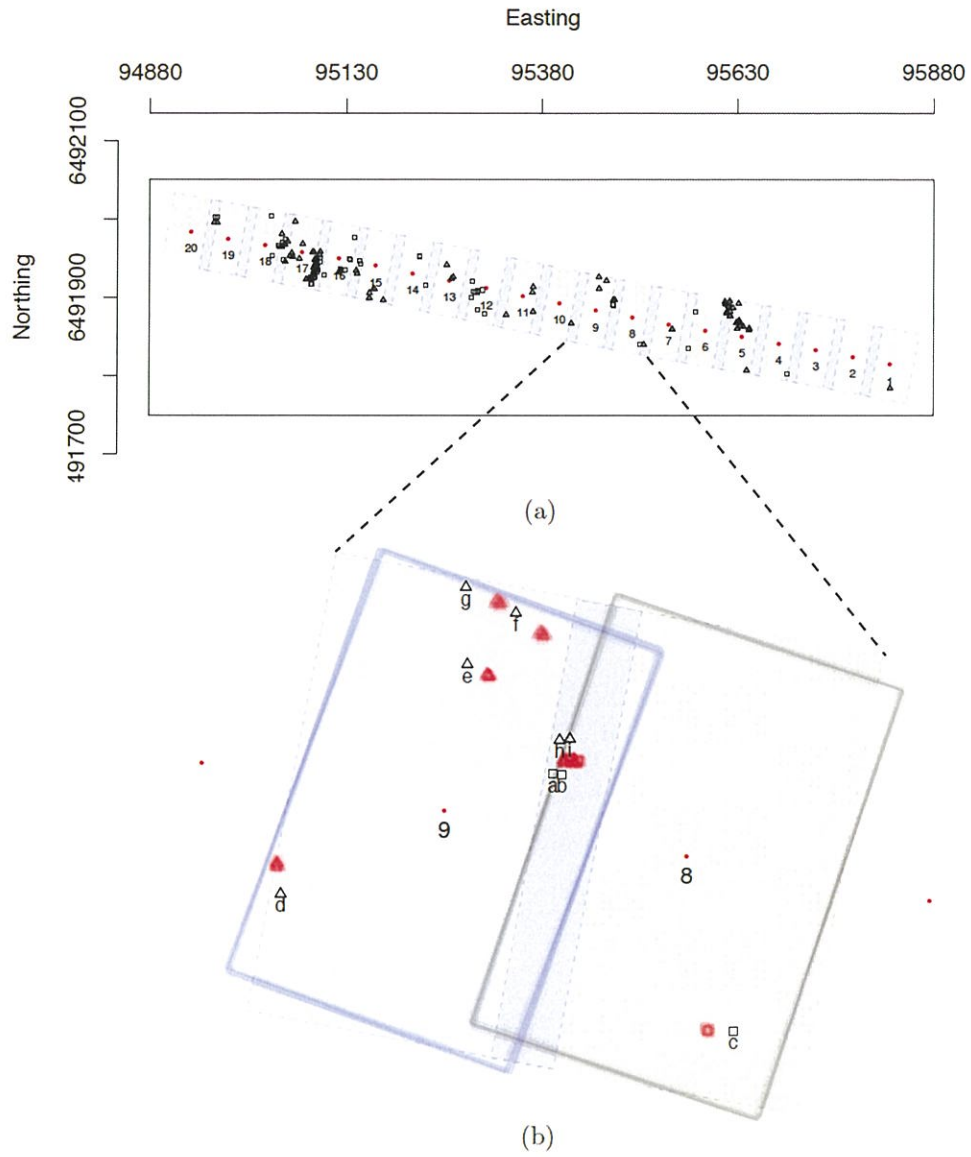


Figure 3. **a** Observations from the case study. Footprint templates (dashed rectangles), \mathcal{Q}_t , are overlaid with observed locations, $y_{i,t}$, that are marked with “□” in even images and “△” in odd images. The time-indexed points represent image centers, μ_t . The largest rectangle containing all templates is the study domain, \mathcal{D} ; **b** a focused illustration on observed images 8 and 9 (dashed rectangles), overlaid with posterior samples of image footprints (solid rectangles), \mathcal{F}_t . Observed locations are indexed by letters, and posterior samples of true locations, $u_{i,t}$, are shown in solid squares in image 8 and solid triangles in image 9.

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

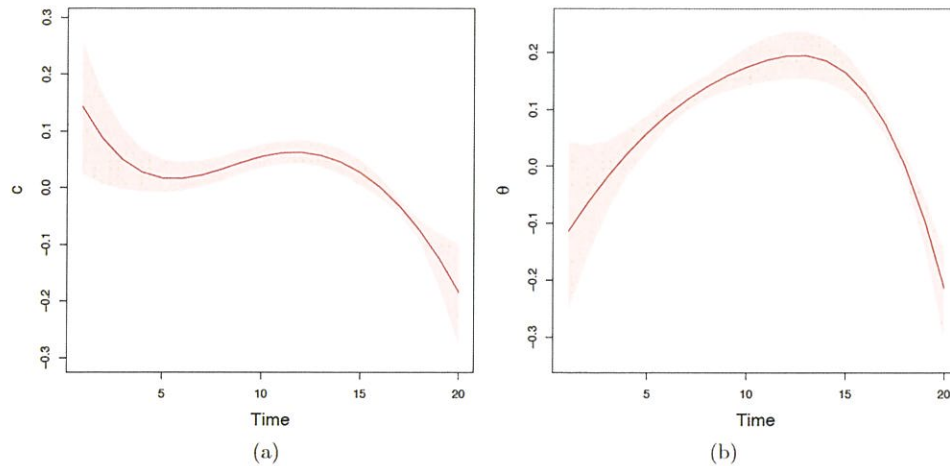


Figure 4. **a** Estimated posterior mean and point-wise 95% credible interval for the scaling parameter, c ; **b** estimated posterior mean and point-wise 95% credible interval for the rotation parameter, θ .

record linkage and capture-recapture models to accommodate important features of aerial imagery data. Our unified framework allows information exchange and uncertainty propagation between the estimation of linkage structure and population abundance, and our model is adequate for both inferential tasks.

Record linkage models are often sensitive to parameters that control linkage probability. In a sensitivity analysis for the graphical record linkage model, [Steorts \(2015\)](#) showed that linkage inference is only reliable when a very precise prior is used on the parameter for distortion probability. In the Bayesian alignment model, [Green and Mardia \(2005\)](#) advised that informative priors be used for parameters that dictate matching tendency. In our model, linkage of observed locations is motivated by their proximity in Euclidean distance to latent activity centers. Therefore, as expected, our model is sensitive to σ_u^2 , the parameter controlling movement. Reliable inference requires that animal movement between consecutive detections be small relative to distortion, otherwise the model would struggle to identify unique individuals using locations only. Fortunately, much is known about movement characteristics of many species and this information can be used to specify an informative prior for σ_u^2 . During aerial surveys in Glacier Bay, Alaska, the time lapse between consecutive images is so brief (1 second) that sea otter movement is significantly limited by their physical capability, thus we specified the prior for σ_u^2 such that movement distance between consecutive images was less than a meter ([Williams 1989](#)). We provide details for a sensitivity analysis of prior distributions on σ_u^2 in Supplementary Appendix B. In addition to limited individual movement, our method could potentially benefit from more overlapping regions and higher population intensities because they provide more instances for linkage. On the other hand, our method may be hindered by extensive distortions in the image footprints or highly clustered populations where distances between the true activity centers are closer than σ_u .

Although our method is designed to link observed individuals and estimate population size simultaneously, it can be useful even when the objective is only one of the two. The

X. LU ET AL.

output of a record linkage model provides insight about the number of unique individuals observed at least once, and abundance estimation requires only the additional subset of population that is not observed. Population models can be used to provide prior information about the total number of latent individuals in a graphical record linkage model (Tancredi et al. 2018), a parameter that has also proven to be influential for inference (Steorts 2015). Detection mechanisms can guide learning about the number of times an individual's record is observed: High detection probabilities indicate frequent observations of an individual, thereby promoting linkage; low detection probabilities indicate few observations of the individual, thereby proposing new latent identities. Our model assumptions can be generalized to account for more complicated monitoring situations. For example, hypergeometric models may be used in place of binomial models in capture-recapture studies when individual detections are correlated due to sampling without replacement from a finite population (Darroch 1958; Link et al. 2009; Tancredi and Liseo 2011). We may also model heterogeneity in p_0 to account for factors such as animal diving in response to aircraft disturbance and survey conditions that affect the backdrop (e.g., kelp, sun angle, sea state).

The use of observed locations in our model helped us better understand the spatial heterogeneity in population intensity. Under a uniform prior on s_m , the variation in population intensity is implicitly reflected through the estimated activity centers. A natural extension to our method is to model the spatial distribution of activity centers explicitly (Efford 2004, 2011; Brost et al. 2017, 2020). We could account for heterogeneity in the distribution of activity centers using a species distribution model (SDM; e.g., Hefley and Hooten, 2016). An SDM is often specified as a spatial point process model, which, in our case, could take the form

$$[s_m | \mathbf{x}(s_m)] = \frac{\exp(\mathbf{x}(s_m)' \boldsymbol{\beta})}{\int_{\mathcal{D}} \exp(\mathbf{x}(s)' \boldsymbol{\beta}) ds},$$

for $m = 1, \dots, M$, where $\mathbf{x}(s_m)$ denotes the vector of spatial covariates at s_m and $\boldsymbol{\beta}$ denotes the associated coefficients. Alternatively, we could attribute heterogeneity in the distribution of activity centers to the interaction among individuals which could be modeled mechanistically (e.g., Scharf et al., 2016).

Although our model was designed for aerial imagery data from sea otter population surveys in Glacier Bay, Alaska, our framework can be adapted for a variety of applications that involve intersecting fields of observation (Borchers et al. 2020). Our method is also useful for aligning unlabeled point patterns with consistent measurement error, such as reconstruction of a three-dimensional object from two-dimensional views (Ourselin et al. 2001; Rezende et al. 2016) and reconstruction of a movement trajectory using multiple snapshots (Ando 1991; Du et al. 2016).

ACKNOWLEDGEMENTS

This research was funded by NSF DMS 1614392 and NPS P16AC01524 and P19AC00063. Research and monitoring were conducted under US Fish & Wildlife Service Scientific Research Permit #MA14762C-0 and NPS Scientific Research Permit GLBA-2016-SCI-022. Any use of trade, firm, or product names is for descriptive

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

purposes only and does not imply endorsement by the US Government. We appreciate the assistance of Dennis Lozier and Louise Taylor with sea otter surveys and image processing.

[Received December 2020. Revised October 2021. Accepted December 2021.]

APPENDIX A: PRIOR DISTRIBUTIONS

$$\begin{aligned}
 p_0 &\sim \text{Beta}(3, 1), \\
 \psi &\sim \text{Beta}(0.001, 1), \\
 \sigma_u^2 &\sim \text{IG}(100, 25), \\
 s_m &\sim \text{Unif}(\mathcal{D}), \quad m = 1, \dots, M, \\
 \alpha &\sim \text{N}(\mathbf{0}, 0.001\mathbf{R} + 0.01\mathbf{I}), \\
 \beta &\sim \text{N}(\mathbf{0}, 0.001\mathbf{R} + 0.01\mathbf{I}),
 \end{aligned}$$

$$\text{where } \mathbf{R} = (\mathbf{D}_2^-)' \mathbf{D}_2 \text{ and } \mathbf{D}_2 = \begin{bmatrix} 1 & -2 & 1 & 0 & 0 \\ 0 & 1 & -2 & 1 & 0 \\ 0 & 0 & 1 & -2 & 1 \end{bmatrix}.$$

REFERENCES

- Anderson M, Fienberg SE (1999) Who counts? The politics of census-taking in contemporary America. Russell Sage Foundation
- Ando H (1991) Dynamic reconstruction of 3d structure and 3d motion. In: Proceedings of the IEEE workshop on visual motion, pp 101–102
- Barker RJ, Schofield MR, Link WA, Sauer JR (2018) On the reliability of N-mixture models for count data. *Biometrics* 74:369–377
- Betancourt B, Zanella G, Miller JW, Wallach H, Zaidi A, Steorts RC (2016) Flexible models for microclustering with application to entity resolution. In *Advances in neural information processing systems*, pp 1417–1425
- Borchers DL, Nightingale P, Stevenson BC, Fewster RM (2020) A latent capture history model for digital aerial surveys. *Biometrics*
- Brost BM, Hooten MB, Small RJ (2017) Leveraging constraints and biotelemetry data to pinpoint repetitively used spatial features. *Ecology* 98(1):12–20
- Brost BM, Hooten MB, Small RJ (2020) Model-based clustering reveals patterns in central place use of a marine top predator. *Ecosphere* 11:e03123
- Brown M, Lowe DG (2015) Automatic panoramic image stitching using invariant features. *Int J Comput Vision* 74:59–73
- Buckland ST, Burt ML, Rexstad EA, Mellor M, Williams AE, Woodward R (2012) Aerial surveys of seabirds: the advent of digital methods. *J Appl Ecol* 49:960–967
- Caughley G (1974) Bias in aerial survey. *J Wildl Manag* 38(4):921–933
- Christen P (2011) A survey of indexing techniques for scalable record linkage and deduplication. *IEEE Trans Knowl Data Eng* 24:1537–1555

X. LU ET AL.

- Copas J, Hilton F (1990) Record linkage: statistical models for matching computer records. *J R Stat Soc A Stat Soc* 153:287–312
- Darroch JN (1958) The multiple capture census i. Estimation of a closed population. *Biometrika* 45:343–358
- Dennis EB, Morgan BJT, Ridout MS (2015) Computational aspects of N-mixture models. *Biometrics* 71:237–246
- Dryden IL, Mardia KV (1998) *Statistical analysis of shape*. Wiley
- Du Y, Wong Y, Liu Y, Han F, Gui Y, Wang Z, Kankanhalli M, Geng W (2016) Marker-less 3d human motion capture with monocular image sequence and height-maps. In: *European conference on computer vision*. Springer, pp 20–36
- Efford M (2004) Density estimation in live-trapping studies. *Oikos* 106:598–610
- Efford MG (2011) Estimation of population density by spatially explicit capture-recapture analysis of data from area searches. *Ecology* 92:2202–2207
- Eisaguirre JM, Williams PJ, Lu X, Kissling ML, Beatty WS, Esslinger GG, Womble JN, Hooten MB (2021) Diffusion modeling reveals effects of multiple release sites and human activity on a recolonizing apex predator. *Mov Ecol* 9:34
- Esslinger GG, Esler D, Howlin S, Starcevic L (2015) Monitoring population status of sea otters (*Enhydra lutris*) in Glacier Bay National Park and Preserve, Alaska: options and considerations. US Department of the Interior, US Geological Survey
- Fellegi IP, Sunter AB (1969) A theory for record linkage. *J Am Stat Assoc* 64:1183–1210
- Fortini M, Liseo B, Nuccitelli A, Scanu M (2001) On Bayesian record linkage. *Res Official Stat* 4:185–198
- Green PJ, Mardia K (2005) Bayesian alignment using hierarchical models, with application in protein bioinformatics. *Biometrika* 93(2):235–254
- Gross JW, Heumann BW (2016) A statistical examination of image stitching software packages for use with unmanned aerial systems. *Photogr Eng Remote Sens* 82(6):419–425
- Hefley TJ, Broms KM, Brost BM, Buderman FE, Kay SL, Scharf HR, Tipton JR, Williams PJ, Hooten MB (2017) The basis function approach to modeling autocorrelation in ecological data. *Ecology* 98:632–646
- Hefley TJ, Hooten MB (2016) Hierarchical species distribution models. *Curr Lands Ecol Rep* 1:87–97
- Hooten MB, Johnson DS, Brost BM (2021) Making recursive Bayesian inference accessible. *Am Stat* 75:185–194
- Jain S, Neal RM (2004) A split-merge Markov chain Monte Carlo procedure for the Dirichlet process mixture model. *J Comput Graph Stat* 13:158–182
- Jameson RJ, Kenyon KW, Johnson AM, Wight HM (1982) History and status of translocated sea otter populations in North America. *Wildl Soc Bull* 10(2):100–107
- Jaro MA (1989) Advances in record-linkage methodology as applied to matching the 1985 census of Tampa, Florida. *J Am Stat Assoc* 84:414–420
- Kendall WL, Nichols JD, Hines JE (1997) Estimating temporary emigration using capture-recapture data with Pollock's robust design. *Ecology* 78:563–578
- Ketz AC, Johnson TL, Hooten MB, Hobbs NT (2019) A hierarchical Bayesian approach for handling missing classification data. *Ecol Evol* 9(6):3130–3140
- LaPorte RE, McCarty D, Bruno G, Tajima N, Baba S (1993) Counting diabetes in the next millennium: application of capture-recapture technology. *Diabetes Care* 16:528–534
- Larsen MD (2004) Record linkage using finite mixture models. An essential journey with donald Rubin's statistical family, applied Bayesian modeling and causal inference from incomplete-data perspectives, pp 309–318
- Larsen MD, Rubin DB (2001) Iterative automated record linkage using mixture models. *J Am Stat Assoc* 96:32–41
- Larson SE, Bodkin JL, VanBlaricom GR (2014) *Sea Otter conservation*. Academic Press
- Levin A, Zomet A, Peleg S, Weiss Y (2004) Seamless image stitching in the gradient domain. In: *European conference on computer vision*. Springer, pp 377–389
- Link WA (2013) A cautionary note on the discrete uniform prior for the binomial N. *Ecology* 94(10):2173–2179
- Link WA, Yoshizaki J, Bailey LL, Pollock KH (2009) Uncovering a latent multinomial: analysis of mark-recapture data with misidentification. *Biometrics* 66:178–185

IMPROVING WILDLIFE POPULATION INFERENCE USING AERIAL IMAGERY

- Liseo B, Tancredi A (2011) Bayesian estimation of population size via linkage of multivariate normal data sets. *J Official Stat* 27:491
- Lu X, Williams PJ, Hooten MB, Powell JA, Womble JN, Bower MR (2019) Nonlinear reaction-diffusion process models improve inference for population dynamics. *Environmetrics* 31(3):e2604
- Lum K, Price ME, Banks D (2013) Applications of multiple systems estimation in human rights research. *Am Stat* 67:191–200
- McGlinchy MH (2004) A Bayesian record linkage methodology for multiple imputation of missing links. In: *ASA proceedings of the joint statistical meetings*. American Statistical Association, Alexandria, VA, pp 4001–4008
- Ourselin S, Roche A, Subsol G, Pennec X, Ayache N (2001) Reconstructing a 3D structure from serial histological sections. *Image Vis Comput* 19:25–31
- R Core Team (2019) *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria
- Rezende DJ, Eslami SA, Mohamed S, Battaglia P, Jaderberg M, Heess N (2016) Unsupervised learning of 3d structure from images. In: *Advances in neural information processing systems*, pp 4996–5004
- Royle JA (2009) Analysis of capture-recapture models with individual covariates using data augmentation. *Biometrics* 65:267–274
- Royle JA, Dorazio R (2012) Parameter-expanded data augmentation for Bayesian analysis of capture-recapture models. *J Ornithol* 152:521–537
- Royle JA, Dorazio RM, Link WA (2007) Analysis of multinomial models with unknown index using data augmentation. *J Comput Graph Stat* 16:67–85
- Royle JA, Young KV (2008) A hierarchical model for spatial capture-recapture data. *Ecology* 89(8):2281–2289
- Sadinle M (2018) Bayesian propagation of record linkage uncertainty into population size estimation of human rights violations. *Ann Appl Stat* 12(2):1013–1038
- Scharf HR, Hooten MB, Fosdick BK, Johnson DS, London JM, Durban JW et al (2016) Dynamic social networks based on movement. *Ann Appl Stat* 10:2182–2202
- Steorts RC (2015) Entity resolution with empirically motivated priors. *Bayesian Anal* 10(4):849–875
- Steorts RC, Hall R, Fienberg SE (2015) A Bayesian approach to graphical record linkage and deduplication. *J Am Stat Assoc* 111:1660–1672
- Steorts RC, Ventura SL, Sadinle M, Fienberg SE (2014) A comparison of blocking methods for record linkage. *International conference on privacy in statistical databases*. Springer, Cham, pp 253–268
- Szeliski R (2006) Image alignment and stitching: a tutorial. *Found Trends® Comput Graph Vis* 2:1–104
- Tancredi A, Liseo B (2011) A hierarchical Bayesian approach to record linkage and population size problems. *Ann Appl Stat* 5(2B):1553–1585
- Tancredi A, Steorts R, Liseo B et al (2018) A unified framework for de-duplication and population size estimation. *Bayesian Anal* 15(2):633–682
- Ver Hoef JM (2014) *Aerial survey data*. Statistics Reference Online, Wiley StatsRef
- Wahba G (1978) Improper priors, spline smoothing and the problem of guarding against model errors in regression. *J Roy Stat Soc Ser B* 40(3):364–372
- Wallach H, Jensen S, Dicker L, Heller K (2010) An alternative prior process for nonparametric Bayesian clustering. In: *Proceedings of the thirteenth international conference on artificial intelligence and statistics*, pp 892–899
- Williams PJ, Hooten MB, Esslinger GG, Womble JN, Bodkin JL, Bower MR (2019) The rise of an apex predator following deglaciation. *Divers Distrib* 25:895–908
- Williams PJ, Hooten MB, Womble JN, Bower MR (2017) Estimating occupancy and abundance using aerial images with imperfect detection. *Methods Ecol Evol* 8:1679–1689
- Williams PJ, Schroeder C, Jackson P (2020) Estimating reproduction and survival of unmarked juveniles using aerial images and marked adults. *J Agric Biol Environ Stat* 25:133–147
- Williams TM (1989) Swimming by sea otters: adaptations for low energetic cost locomotion. *J Comp Physiol A* 164(6):815–824
- Winkler WE (1995) Matching and record linkage. *Bus Surv Methods* 1:355–384

X. LU ET AL.

- Winkler WE (2006) Overview of record linkage and current research directions. In: Bureau of the Census
- Womble J, Williams P, Johnson W, Taylor-Thomas L, Bower M (2018) Sea otter monitoring protocol for Glacier Bay National Park, Alaska: Version SO-2017.1. Natural Resource Report NPS/SEAN/NRR—2018/1762, National Park Service, Fort Collins, Colorado
- Wood SN, Pya N, Safken B (2016) Smoothing parameter and model selection for general smooth models. *J Am Stat Assoc* 111(516):1548–1563
- Wright JA, Baker RJ, Schofield MR, Frantz AC, Byrom AE, Gleeson DM (2009) Incorporating genotype uncertainty into mark-recapture-type models for estimating abundance using DNA samples. *Biometrics* 65:833–840

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

RESEARCH

Open Access

Diffusion modeling reveals effects of multiple release sites and human activity on a recolonizing apex predator



Joseph M. Eisaguirre^{1,2*} , Perry J. Williams¹, Xinyi Lu³, Michelle L. Kissling^{2,8}, William S. Beatty^{2,9}, George G. Esslinger⁴, Jamie N. Womble^{5,6} and Mevin B. Hooten^{3,7}

Abstract

Background: Reintroducing predators is a promising conservation tool to help remedy human-caused ecosystem changes. However, the growth and spread of a reintroduced population is a spatiotemporal process that is driven by a suite of factors, such as habitat change, human activity, and prey availability. Sea otters (*Enhydra lutris*) are apex predators of nearshore marine ecosystems that had declined nearly to extinction across much of their range by the early 20th century. In Southeast Alaska, which is comprised of a diverse matrix of nearshore habitat and managed areas, reintroduction of 413 individuals in the late 1960s initiated the growth and spread of a population that now exceeds 25,000.

Methods: Periodic aerial surveys in the region provide a time series of spatially-explicit data to investigate factors influencing this successful and ongoing recovery. We integrated an ecological diffusion model that accounted for spatially-variable motility and density-dependent population growth, as well as multiple population epicenters, into a Bayesian hierarchical framework to help understand the factors influencing the success of this recovery.

Results: Our results indicated that sea otters exhibited higher residence time as well as greater equilibrium abundance in Glacier Bay, a protected area, and in areas where there is limited or no commercial fishing. Asymptotic spread rates suggested sea otters colonized Southeast Alaska at rates of 1–8 km/yr with lower rates occurring in areas correlated with higher residence time, which primarily included areas near shore and closed to commercial fishing. Further, we found that the intrinsic growth rate of sea otters may be higher than previous estimates suggested.

Conclusions: This study shows how predator recolonization can occur from multiple population epicenters. Additionally, our results suggest spatial heterogeneity in the physical environment as well as human activity and management can influence recolonization processes, both in terms of movement (or motility) and density dependence.

Keywords: Bayesian, Biological invasion, Ecological diffusion, Partial differential equation, Reaction-diffusion, Reintroduction, Sea otter

*Correspondence: joseph_eisaguirre@fws.gov

¹Department of Natural Resources and Environmental Science, University of Nevada Reno, Reno, NV, USA

²United States Fish & Wildlife Service, Marine Mammals Management, Anchorage, AK, USA

Full list of author information is available at the end of the article



© The Author(s). 2021 **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Background

The global decline of apex predators has changed ecosystems [1–4]. These changes continue to have cascading effects across trophic levels, resulting in new ecosystem states of varying resilience [2]. When an apex predator is reintroduced, however, such a perturbation followed by continued growth and expansion of the population can change ecological communities and revert an ecosystem to a previous state [5]. Although often controversial, such shifts in ecosystem state can achieve conservation goals and afford ecological and economic benefits [6].

Predator reintroductions are sometimes proposed to recover ecosystem services or remedy human-caused declines, such as those due to overharvest [6, 7]. One of the most successful and celebrated efforts has been the reintroduction of wolves (*Canis lupus*) and subsequent recovery in the Greater Yellowstone Ecosystem. Wolves recolonized the area at a rate of about 10 km per year [8], and their renewed presence mediated over-browsing by elk (*Cervus canadensis*) and allowed the previous vegetation structure to return, subsequently driving additional recovery across the ecosystem [5]. Many reintroductions are unsuccessful, however [9, 10], because the distributions of resources, sources of mortality, and the physical environment—factors that influence recolonization—are highly variable through space and time [11–13]. Recolonization by apex predators is thus spatiotemporally dynamic, especially over large geographic areas that are characterized by finer-scale ecological variability [7]. Therefore, recolonization by a predator, as well as its abundance and persistence, will vary over space and through time.

Sea otters (*Enhydra lutris*), apex predators of nearshore marine systems, were harvested during the commercial fur trade up until the early 20th century, at which point they had declined nearly to extinction across most of their range [14]. For decades following, the nearshore marine ecosystems in many areas transitioned to, and persisted in, alternative states dominated by benthic herbivores that sea otters normally prey upon [15]. Legislation, beginning with the Fur Seal Treaty (1911), followed by the Marine Mammal Protection Act (MMPA; 1972) and the Endangered Species Act (1977), protected sea otters from harvest, with the exception of harvest by Alaska Natives for subsistence and handicraft, per the MMPA [14]. This protection facilitated sea otter population growth and expansion across parts of their range, which has been reverting the nearshore ecosystem in some of these areas to the historical predator-dominated state [6, 15–17].

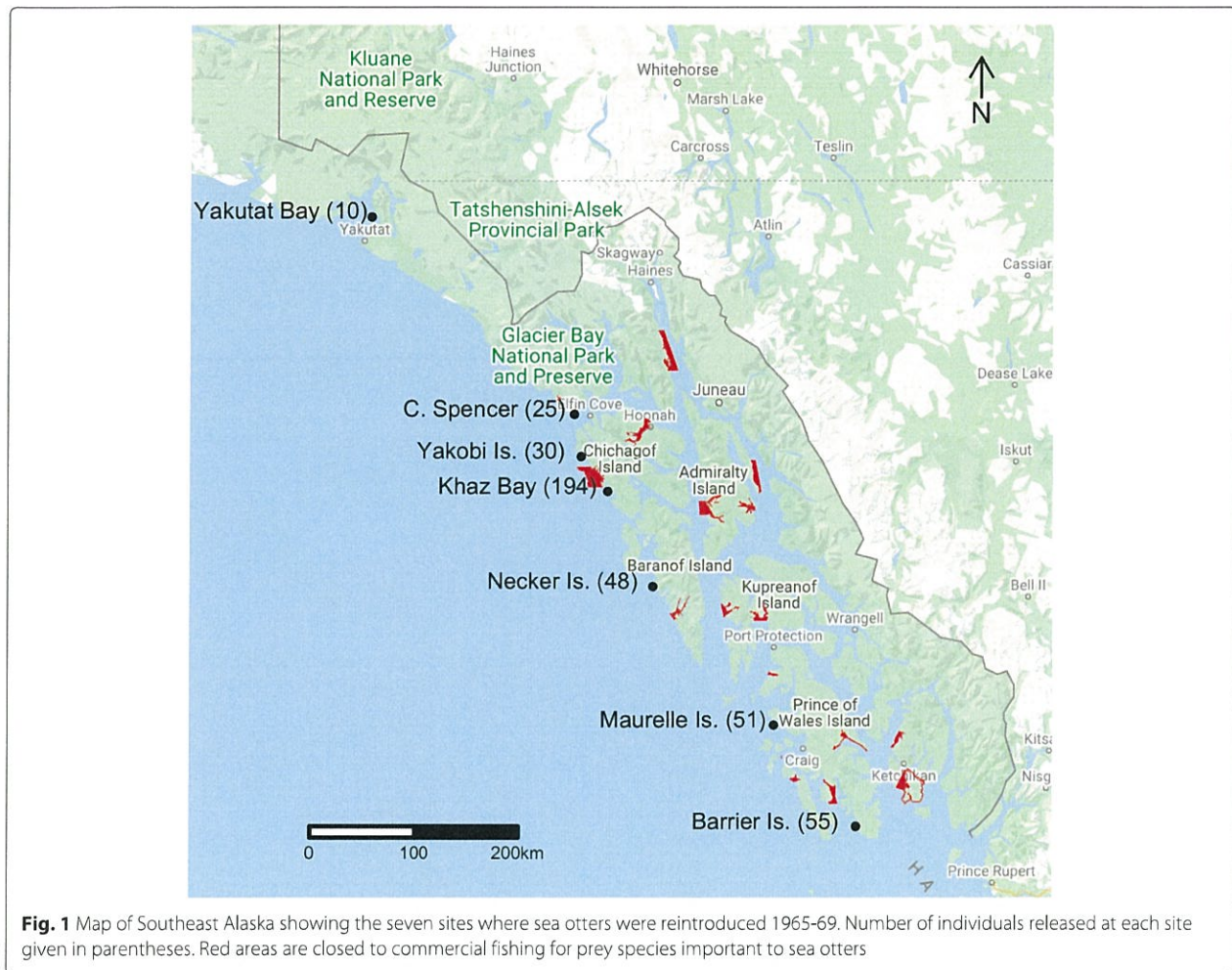
One of these areas is Southeast Alaska, where during the late 1960s, the then grazer-dominated nearshore system was perturbed by the translocation of 413 otters from stable remnant populations in Prince William Sound and around Amchitka Island, Alaska [18]. This reintroduction

followed previous failed attempts and was a four-year effort that translocated sea otters to seven sites across Southeast Alaska (Fig. 1). The number of individuals released at each site ranged from 10–194 [14, 18]. These individuals seeded a population that was recently estimated to exceed 25,000 [19].

The growing and expanding population colonized previously occupied areas, as well as newly available habitat that was historically glaciated (e.g., Glacier Bay; [20]). Across Southeast Alaska, the sea otter population is likely decades from reaching carrying capacity [19, 21]; even in Glacier Bay, the most densely populated area, evidence suggests carrying capacity may not be reached for 30 years [21].

Recent studies of the sea otter population in Southeast Alaska used integrated data models to investigate regional population trends and density-dependent effects [19] and influence of subsistence harvest [22]. While the approaches applied in these studies accounted for movements between discrete sub-regions within Southeast Alaska (i.e., immigration and emigration), they assumed a known intrinsic growth rate and did not explicitly incorporate a mechanistic model of population spread that would naturally capture movements of recolonizing individuals throughout this continuous geographic area. Spatiotemporal models, including those based on ecological diffusion, allow incorporating such dynamics and can provide novel insight beyond what conventional methods yield [23]. Therefore, several questions regarding the recolonization dynamics of this and other apex predators, as well as how they drive transitions from grazer- to predator-dominated ecosystem states, remain.

For example, while wolves and their resources were protected by a national park during the early stages of their recolonization of the Greater Yellowstone Region, sea otters in Southeast Alaska faced immediate competition with commercial fishing industries for some of their primary prey (e.g., urchins *Strongylocentrotus* spp. and bivalves *Panopea* spp.) as well as mortality from subsistence harvest [24, 25]. Indeed, sea otter population growth and spread was remarkable after individuals reached Glacier Bay National Park—the only area in Southeast Alaska where subsistence harvest of sea otters is not permitted—around the mid 1980s [20], yet Southeast Alaska encompasses a diverse matrix of marine areas with various types of resource management. This recolonization event affords the opportunity to assess how natural resource management can influence predator recolonization dynamics. Further, given the multi-site nature of the reintroduction, we also have an opportunity to investigate how population growth and spread can vary among population epicenters and how multi-site reintroductions may influence the success of recolonization.



We address some of the remaining questions about predator recolonization dynamics using a mechanistic spatiotemporal model of ecological diffusion that accounts for density dependent population growth and the spread of the population from multiple reintroduction sites. In particular, we examined the growth and spread of sea otters in Southeast Alaska to (1) investigate how colonizing individuals moved throughout the area from multiple reintroduction sites and (2) determine what factors contributed to the long term persistence of sea otters in particular locations, with a focus on the influence of managed areas (e.g., where limited or no commercial fisheries exist and/or where subsistence harvest of sea otters does not occur). Our approach involved integrating the mechanistic model of population growth and spread in a Bayesian hierarchical framework to estimate process parameters and uncertainty [26]. This approach has previously been applied on much smaller spatial scales to model sea otter recolonization

and population dynamics in Glacier Bay from a single epicenter [20, 21, 27]. Here, we applied it across seven population epicenters (or reintroduction sites) to learn about changes in distribution and abundance of sea otters in a region with spatially-variable management regimes.

Methods

Data collection

Various aerial survey methods have been used to collect data on the distribution and abundance of sea otters in Southeast Alaska. These include design-based, distribution, and model-based aerial photographic surveys.

Design-based surveys Design-based aerial surveys [28, 29] were implemented in Yakutat Bay in 1995 and 2005, Glacier Bay in 1999–2004, 2006, and 2012 [30], and across the remainder of Southeast Alaska in 2002, 2003, 2010, and 2011 [31]. These surveys involved observers counting

sea otters along 400-m wide linear transects flown with single-engine high-winged aircraft at a speed of 104 km/hr and altitude of 91 m. Transects were stratified based on depth and distance to shore, where areas with depths ≤ 40 m and closer to shore received greater sampling effort.

These design-based surveys also incorporated intensive search units (ISUs) to use in estimating detection probability; sea otters frequently dive beneath the surface to forage, during which time that are not available for detection [27]. During the survey, approximately every 15 minutes, an ISU was initiated based on the presence of a group of 1–20 sea otters. After being counted initially, the ISUs were re-counted while the pilot flew five concentric 400-m diameter circles so that a final count of each group could be obtained. In total, greater than 20,000 km of transects were flown across Southeast Alaska, and details of this effort were outlined recently by [19].

Distribution surveys We used data from distribution surveys only when design-based data were unavailable. This included Glacier Bay in 1993, 1996–1998, 2005, 2009, and 2010. Distribution surveys were conducted by fixed-wing aircraft with one or more observers and focused on favorable marine habitats (i.e., areas where depth was < 40 m; [20]). The locations and counts of all groups of sea otters encountered were recorded by the observer(s).

Aerial photographic surveys Aerial photographic surveys [32] were conducted in Glacier Bay in 2017, 2018, and 2019 [33]. Aerial photographic surveys were conducted from a single-engine high-winged aircraft with a high-resolution DSLR camera (Nikon D810, 36.6 megapixel) with an 85 mm focal length lens (Zeiss F/1.4 ZF.2) mounted in a porthole in the belly of the aircraft. Random and optimized (see [34]) linear transects were flown at a speed of 157–166 km/hr and altitude of 213–250 m with the camera capturing overlapping images. Each image covered ~ 60 m \times 90 m area of the water's surface. We used only non-overlapping images for analyses [21].

Hierarchical model of ecological diffusion

We modeled the growth and spread of sea otters across Southeast Alaska using an ecological diffusion model. Ecological diffusion of a population through space and time emerges from the movements of many individuals following random walks with spatially heterogeneous movement probabilities [35]. Over time, individuals congregate in favorable areas, where they exhibit longer residence time, giving rise to spatiotemporal variability in population distribution and abundance.

Model specification

We modeled sea otter abundance in Southeast Alaska at locations $i = 1, \dots, q$, where q is the total number of 400×400 m grid cells in the study area, during time $t = 1970, \dots, 2020$. Note that modeling on this 400 m spatial resolution matches the resolution of the design-based surveys. Due to the finer spatial resolution, the aerial photographic survey counts were aggregated to the 400 m scale, following [21]. Due to imperfect detection and availability of sea otters during surveys, we modeled the relationship between the latent true abundance of sea otters $N_{i,t}$ and observed relative abundance $y_{i,t}$ as

$$y_{i,t} \sim \text{Binomial}(N_{i,t}, p_t), \quad (1)$$

where p_t is the detection probability, defined here as the probability that an animal is on the surface and available to be counted. ISU data were collected during 12 years of the design-based surveys, allowing estimation of detection probability. Additionally, we used a moment-matched prior for three years for which aerial photo surveys were conducted; the moments were matched to the marginal posterior of the detection probability estimated by [34] (see Appendix 1).

We modeled true abundance with a negative binomial distribution conditioned on a dynamic mean $\lambda_{i,t}$ and dispersion parameter τ :

$$N_{i,t} \sim \text{NB}(\lambda_{i,t}, \tau). \quad (2)$$

The intensity parameter, $\lambda_{i,t}$ is the expected sea otter abundance in the i th grid cell during time t . Because diffusion is a continuous process, we obtain $\lambda_{i,t}$ by integration over a location S_i

$$\lambda_{i,t} = \int_{S_i} \lambda(\mathbf{s}, t) d\mathbf{s}, \quad (3)$$

where $\lambda(\mathbf{s}, t)$ is the population intensity at any location $\mathbf{s} \equiv (s_1, s_2)'$ in the continuous spatial domain.

We modeled the spatiotemporal dynamics to account for spread and density-dependent growth of the sea otter population with the following reaction-diffusion equation [21]:

$$\frac{\partial}{\partial t} \lambda(\mathbf{s}, t) = \left(\frac{\partial^2}{\partial s_1^2} + \frac{\partial^2}{\partial s_2^2} \right) \delta(\mathbf{s}) \lambda(\mathbf{s}, t) + \gamma \lambda(\mathbf{s}, t) \left(1 - \frac{\lambda(\mathbf{s}, t)}{K(\mathbf{s})} \right). \quad (4)$$

The diffusion coefficients $\delta(\mathbf{s})$ represent motility and are inversely proportional to residence time [35, 36]. The parameter γ is the intrinsic population growth rate, and $K(\mathbf{s})$ accounts for density-dependence that may vary over

space. While $\delta(\mathbf{s})$ controls how the population spreads, $K(\mathbf{s})$ controls how many individuals areas can sustain long term. Note that $K(\mathbf{s})$ corresponds to local density dependence, and the nominal carrying capacity of the region can be obtained by $\int_{\mathcal{S}} K(\mathbf{s}) d\mathbf{s}$ [21].

Equation (4) requires specifying an initial condition for $\lambda(\mathbf{s}, t_0)$. A scaled Gaussian kernel can represent a single epicenter from which a population spreads [37]. However, given that sea otters were reintroduced at seven sites throughout Southeast Alaska, we used a sum of $J = 7$ scaled Gaussian kernels, each centered on a reintroduction site (or epicenter) \mathbf{d}_j :

$$\lambda(\mathbf{s}, t = 1970) = \sum_{j=1}^J \frac{\theta_j \exp\left(\frac{-\|\mathbf{s}-\mathbf{d}_j\|^2}{\kappa_j^2}\right)}{\int_{\mathcal{S}} \exp\left(\frac{-\|\mathbf{s}-\mathbf{d}_j\|^2}{\kappa_j^2}\right) d\mathbf{s}}. \quad (5)$$

θ_j is a scale parameter controlling the initial density of individuals at \mathbf{d}_j , and κ_j is a dispersion parameter controlling the initial isotropic spread of those individuals around \mathbf{d}_j . To limit population spread based on sea otter biology, we used a reflective boundary, which does not allow population spread past the boundary, at locations adjacent to terrestrial environments as well as at locations at the offshore edge of the nearshore system, i.e., locations exposed to open ocean that are 5 km from shore or exhibit depths > 100 m, based on the distribution of survey observations.

To complete the specification of the hierarchical model, priors were specified for all model parameters. We used a combination of informative and weakly informative priors, based on previous results (e.g., from [20], [21], and [19]) as well as records of the translocations and historical observations [18]. We provide a complete list of priors in Appendix 1.

Environmental covariates

We expected that, over time, sea otters would congregate in areas with favorable habitat and resources. Thus, we modeled motility $\delta(\mathbf{s})$ as a log-linear function of covariates that have been found to be important drivers of sea otter space use and behavior [20, 21]. Based on previous studies, our covariates included depth, as a binary indicator (depth = 1 where < 40 m, and 0 otherwise), distance to shore, slope of the ocean floor, and shoreline complexity [20, 38–41]. Shoreline complexity was calculated for each location by summing the number of locations within a 1,000 m neighborhood that contained shoreline [20]. Given that subsistence harvest of sea otters [22] and human activities (e.g., disturbance from vessel traffic; [24]) influence sea otter population dynamics, we added a covariate of cumulative distance to the nearest incorporated city, town, or village. This was the sum of the shortest

swimmable paths from each city, town, or village, to any location \mathbf{s} .

As one of our goals was to investigate the varying levels of resource management across Southeast Alaska on the recolonization, we included Glacier Bay and fisheries closures as two indicator covariates, representing management categories. Sea otter population growth and recolonization dynamics are unique in Glacier Bay [19–21], which lies within a national park where various human activities (e.g., commercial fishing, subsistence harvest of sea otters, etc.) are limited. Some commercial fishing still occurs in Glacier Bay (i.e., for some finfish and Tanner crab *Chionoecetes bairdi*), but it is limited and being phased out. Red sea urchins (*Strongylocentrotus franciscanus*), sea cucumbers (*Parastichopus californicus*), and geoduck clams (*Panopea generosa*) are important prey for sea otters in Southeast Alaska [42–44], but they also support lucrative commercial fisheries [45]. Management of these state fisheries in Southeast Alaska involves a rotation of open and closed areas, in addition to areas that have remained closed long term due to federal jurisdiction, research, or being deemed not viable to support commercial harvest [45]; these areas closed long-term by regulation comprised what we termed ‘fisheries closures’ (Fig. 1). Dungeness crab (*Cancer magister*) are also important prey that are commercially harvested [46]; however, spatial data for this fishery were not available (but, we note that many of the Dungeness crab closures overlapped closures that we included). The log-linear function for motility was therefore

$$\begin{aligned} \log(\delta(\mathbf{s})) = & \beta_0 + \beta_1 \text{depth}(\mathbf{s}) + \beta_2 \text{dist}(\mathbf{s}) + \beta_3 (\text{slope}(\mathbf{s}) \\ & \times \text{depth}(\mathbf{s})) + \beta_4 \text{shore}(\mathbf{s}) + \beta_5 \text{town}(\mathbf{s}) \\ & + \beta_6 \text{glba}(\mathbf{s}) + \beta_7 \text{fish}(\mathbf{s}). \end{aligned} \quad (6)$$

While modeling $\delta(\mathbf{s})$ as a function of covariates allows for investigating how the population spreads to reach certain areas, modeling local density dependence $K(\mathbf{s})$ allows us to see if certain areas may influence long term population dynamics and densities. So, to further allow the process model to have sufficient flexibility to capture the unique colonization dynamics of Glacier Bay and to investigate the effects of resource management, including fisheries closures, on sea otter population dynamics within the ecological diffusion framework, we allowed density dependence to vary over space as a function of covariates. This took the form:

$$\log(K(\mathbf{s})) = \alpha_0 + \alpha_1 \text{glba}(\mathbf{s}) + \alpha_2 \text{fish}(\mathbf{s}). \quad (7)$$

While this formulation implies local density dependence (or local nominal carrying capacity) varies over the region

only according to these two indicator covariates, realized carrying capacity depends on motility and thus the covariates driving it as well [21].

All covariates, except for the binary indicators, were centered and scaled to mean zero and unit variance for estimation.

Estimation, derived parameters, and model validation

We sampled from the posterior distribution of the hierarchical model with Markov chain Monte Carlo (MCMC), implemented in R and C++ [47]. Ecological diffusion (Eq. 4) is continuous in space and time, so we used finite differencing for estimation over the discretized spatial and temporal domains [21, 27, 36]. Due to the resolution of the data, we set the spatial discretization to 400 m \times 400 m and the temporal discretization to $\Delta t = 1$ d. Additionally, we used homogenization for computational feasibility [21, 27, 36, 48], which was described in detail by [21] for the logistic ecological diffusion model. We followed [27] and [21] and chose $\epsilon = 1/10$, which corresponds to a homogenized scale of 4 km \times 4 km. Much of the computational demand of this and similar spatiotemporal models results from the high dimensional matrix operations required by the finite differencing procedure [27]. In contrast to previous work, we handled those as sparse matrix operations, which reduced the computational burden markedly.

To help understand how the colonization front of otters moved through space and time, we estimated the asymptotic spatially explicit spread (or colonization) rates. The asymptotic spread rate for the Malthusian (or exponential growth) model and the minimum spread rate for the logistic model is given by $2\sqrt{\delta}\gamma$, where δ is the homogenized diffusion coefficient [20, 49]. Asymptotic spread rates greater than the minimum are allowed in nonlinear (e.g., logistic) cases, and computing them requires knowing the shape of the wave front. From Eq. (5), the steepness of the front at $t = 1970$ is $1/\kappa_j^2$, and from theory of propagating waves, we know that the shape of the wave front is conserved [50]. Finally, if the front is steep, i.e., $1/\kappa_j^2 > \sqrt{\gamma/\delta}$, then the spread rate converges to $2\sqrt{\delta}\gamma$, whereas if the front is flat, i.e., $1/\kappa_j^2 < \sqrt{\gamma/\delta}$, asymptotic spread rate can be computed as $\frac{\delta}{\kappa_j^2} + \gamma\kappa_j^2$ for any time $t > 1970$ [50, 51].

We estimated total abundance $N(t) = \int_S N(\mathbf{s}, t) d\mathbf{s}$ by

$$N^{(k)}(t) = \sum_{i=1}^{n_{0,t}} N_{i,t} + \sum_{m=1}^{n_t - n_{0,t}} \hat{N}_{m,t}^{(k)} + \sum_{l=1}^{q - n_t} \tilde{N}_{l,t}^{(k)} \quad (8)$$

for the k th MCMC iteration. The term $N_{i,t}$ is an observation of true abundance, $\hat{N}_{m,t}^{(k)}$ is posterior draw of true abundance where relative abundance was observed,

$\tilde{N}_{l,t}^{(k)} \sim \text{NB}(\lambda_{l,t}^{(k)}, \tau^{(k)})$ where no data were collected, n_t is the number of locations where relative abundance or true abundance was observed, and $n_{0,t}$ is the number of locations where only true abundance was observed [21].

We used the posterior predictive distribution to assess model fit. A posterior predictive draw for an observation $y_{i,t}$ is given by $\tilde{y}_{i,t}^{(k)} \sim \text{Binomial}(\tilde{N}_{i,t}^{(k)}, p_t^{(k)})$. We compared these samples to the data point-wise by comparing the observed counts to the 95% credible intervals of the posterior predictive counts [52]. We assessed convergence to the posterior by visual inspection of the MCMC chains with traceplots. We summarized our parameter estimates using posterior means and 90% credible intervals [53, 54].

Results

It required approximately seven days using 15 independent chains run in parallel to obtain an MCMC sample of 15,000 iterations from the posterior. Only 23 of 42,553 observed counts fell outside of the 95% posterior predictive intervals, suggesting no lack of fit over the area that was surveyed.

We estimated an intrinsic growth rate of about 0.29 (0.28, 0.31; Table 1). Our estimates of total abundance (Fig. 2) were similar to other recent estimates [19] and those obtained with the design-based estimator [55]. Although not definitive, it appears the consistently high annual growth rate of the sea otter population across Southeast Alaska may have begun to slow in the last few years (Fig. 2).

We also found evidence that all covariates included in the model had an effect on the spatiotemporal process, both in terms of motility and density dependence (Table 1). Generally, sea otters across Southeast Alaska seemed to prefer areas with shallow depth (i.e., < 40 m), close to shore, steeper slopes (in areas with shallow depth), and straighter shorelines (Table 1). Additionally, sea otters tended to concentrate in Glacier Bay, areas with fisheries closures, and areas close to human communities, although the effect size was relatively large for areas with fisheries closures compared to Glacier Bay and human communities (Table 1). Further, population densities that begin to regulate growth were likely highest in Glacier Bay, followed by areas with fisheries closures, and lowest elsewhere in the region, although there was overlap in credible intervals between the effects of the protected status of Glacier Bay and areas with fisheries closures (Table 1).

The initial dispersal conditions suggested a steep wave front (i.e., satisfied $1/\kappa_j^2 > \sqrt{\gamma/\delta}$), so we estimated asymptotic spread rates with $2\sqrt{\delta}\gamma$ across all epicenters. Rates varied primarily from about 1–8 km/yr, with a median of 3.0 km/yr, but areas further from shore commonly exhibited more rapid spread rates (Fig. 3).

Table 1 Posterior means and 90% credible intervals for the parameters of the ecological diffusion model with logistic growth estimated for the sea otter population in Southeast Alaska 1970 to 2020. The subscripts on θ and κ are abbreviations of the translocation sites shown in Fig. 1. Estimates of detection probabilities are provided in Appendix 2: Table 2

Parameter	Lower bound	Mean	Upper bound
β_0 (intercept)	16.25	16.36	16.48
β_1 (depth)	-1.89	-1.77	-1.66
β_2 (distance to shore)	0.21	0.29	0.35
β_3 (slope \times depth)	0.14	0.22	0.29
β_4 (shoreline complexity)	0.14	0.17	0.21
β_5 (distance to towns)	0.37	0.45	0.55
β_6 (Glacier Bay)	-0.37	-0.24	-0.10
β_7 (fisheries closures)	-1.48	-1.34	-1.16
α_0 (intercept)	-1.77	-1.66	-1.55
α_1 (Glacier Bay)	2.78	3.16	3.58
α_2 (fisheries closures)	0.12	1.87	6.91
γ (intrinsic growth)	0.28	0.29	0.31
τ (overdispersion)	0.03	0.03	0.03
θ_{MI} (initial density)	119.65	147.53	175.46
θ_{BI}	8.06	9.75	11.40
θ_{NI}	8.33	9.96	11.63
θ_{KB}	65.41	98.90	132.59
θ_{YB}	8.36	10.01	11.69
θ_{YI}	63.74	96.18	128.84
θ_{CS}	68.19	98.82	130.55
κ_{MI} (initial dispersal)	25.41	28.78	32.20
κ_{BI}	1.37	2.54	3.80
κ_{NI}	4.42	9.11	13.90
κ_{KB}	0.51	0.63	0.78
κ_{YB}	0.80	2.23	3.79
κ_{YI}	4.17	8.49	12.40
κ_{CS}	4.59	9.23	13.91

Additionally, areas with fisheries closures generally exhibited slower spread rates (Fig. 3).

Discussion

To improve our understanding of the reintroduction biology of apex predators [13], we modeled the ongoing recolonization of Southeast Alaska by sea otters as a spatiotemporal process based on ecological diffusion, accounting for multiple population epicenters (i.e., reintroduction sites), preferential dispersion, and spatially-variable density dependence (Fig. 4). In addition to the novelty of spatially-varying density dependence, to our knowledge, this is the largest spatial extent and finest spatial reso-

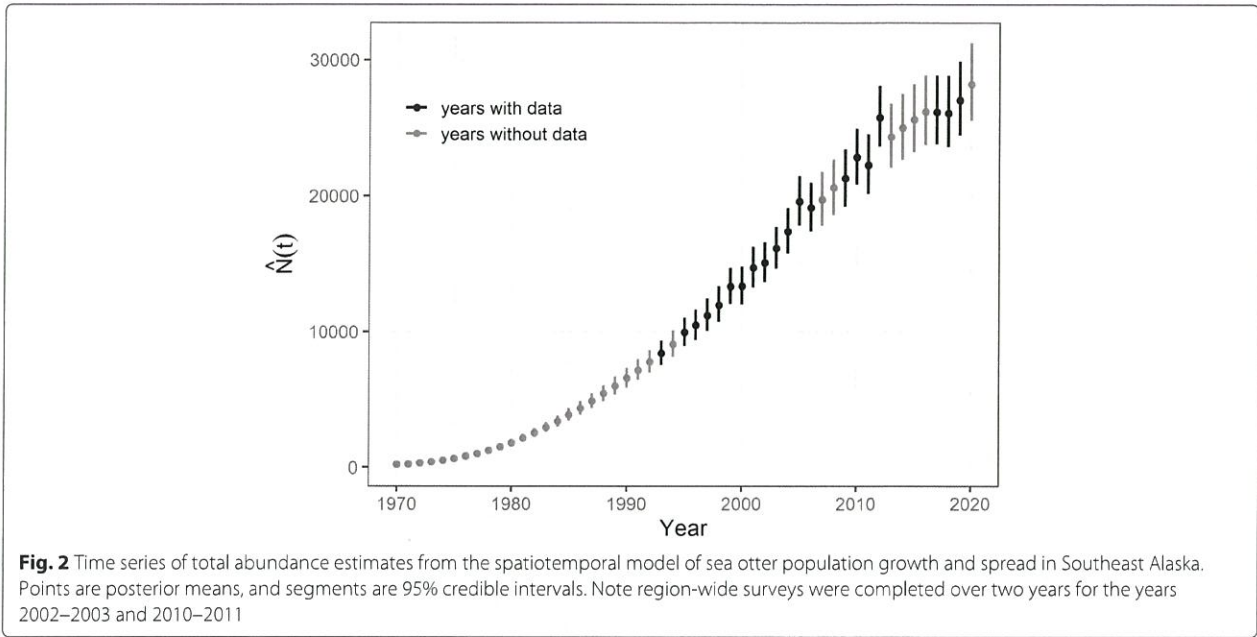
lution over which such a model has been implemented. Homogenization offers substantial computational gains [36, 48], but we also used sparse matrix operations, which made implementing the model on the scale of Southeast Alaska much more computationally tractable.

Ecological diffusion is well established in mathematical and ecological theory pertaining to the spread of organisms [35]; however, other process models could certainly be used to model recolonizing populations. For example, [56] implemented a dynamic occupancy model where colonization proceeds following gradients of favorable habitat. While an extension to modeling abundance in their framework is certainly possible, ecological diffusion naturally models abundance as well as movement toward and concentration in favorable habitat. [19] and [38] modeled sea otter recolonization (of Southeast Alaska and the central coast of California, respectively) by parsing the study areas into distinct units and specifying immigration and emigration among them. While doing so offers computational advantages, inferences are restricted to those defined units. In contrast, with a continuous spatiotemporal model, such as ecological diffusion, inferences can be made about any areas of interest within the modeled domain—defined a priori or a posteriori—based on straightforward *post hoc* calculations (e.g., time series of abundance within different areas).

Our results from applying the ecological diffusion model to Southeast Alaska indicate that sea otters generally concentrate in areas presumed to be favorable for foraging as well as areas closer to human communities, but sea otter densities that begin to regulate population growth are higher in areas with limited or no commercial fishing and other human activities. We were also able to obtain greater precision in our estimates of total abundance than design-based estimators and recent modeling efforts (Fig. 2; [19]). Furthermore, we found that the rates of colonization averaged about 3 km/yr throughout the region, with higher rates being in areas with higher motility. These factors all contributed to the ongoing success of the recolonization that continues to drive ecosystem change in the region [15, 42].

Spatial variability in abundance

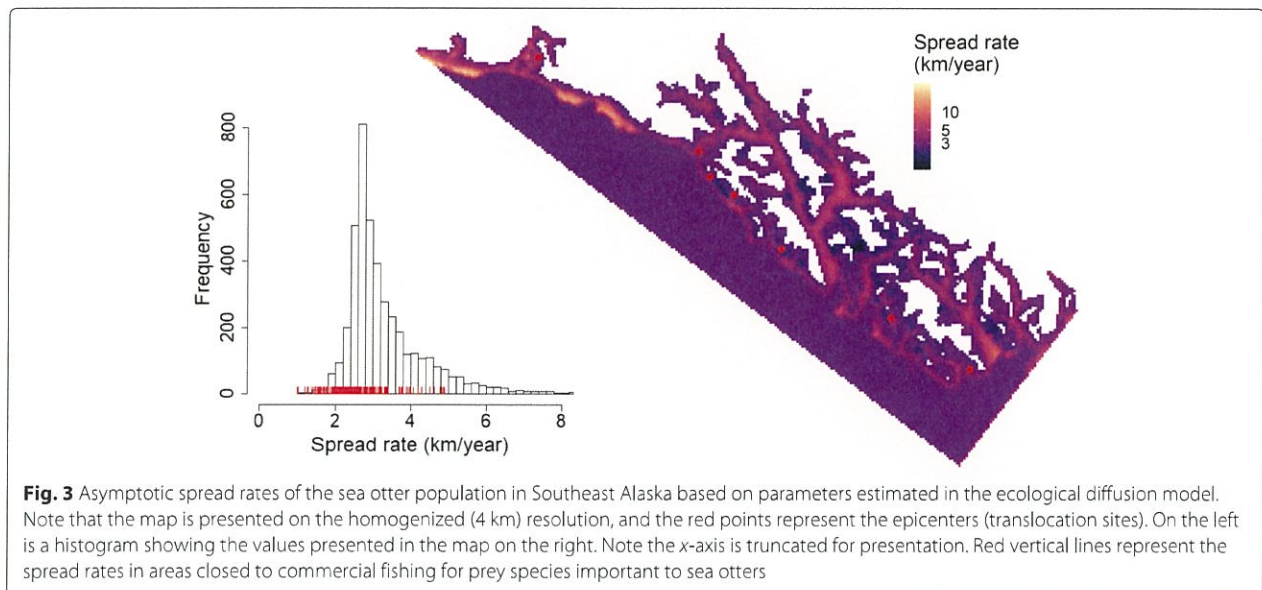
Another effort to model the growth and expansion of the sea otter population in Southeast Alaska found that abundance and carrying capacity varied between large, discrete sub-regions [19]. However, we also accounted for how spatial covariates drive variation in abundance and movement of sea otters throughout the region (Figs. 3 & 4). We found that shallow depth, which defines foraging habitat [39, 40], was positively correlated with sea otter residence time. We also found that sea otters additionally concentrate in areas where commercial fisheries are closed, as well as in protected areas, where subsistence harvest of

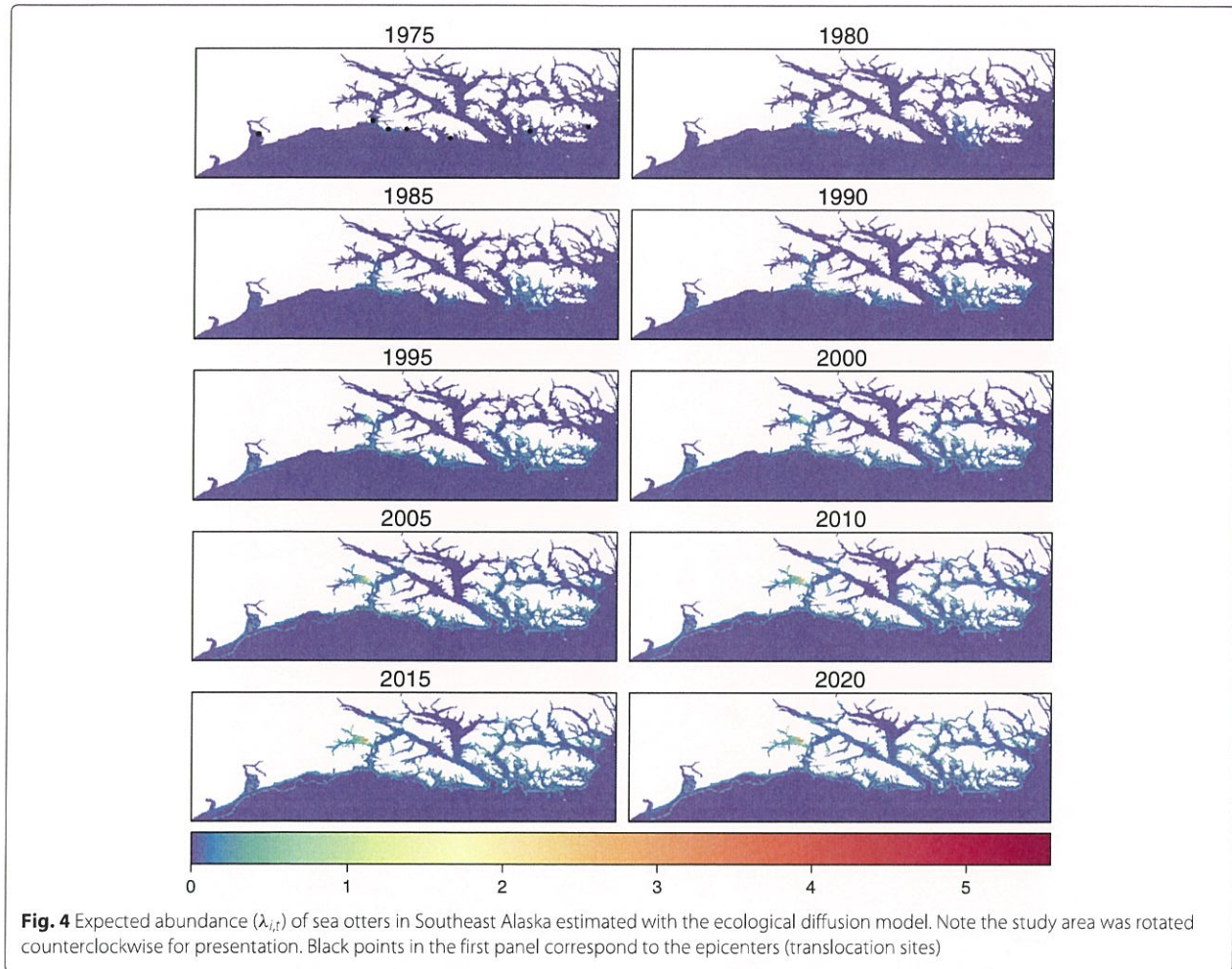


sea otters is not permitted (i.e., Glacier Bay; Table 1), which suggests greater prey availability, foraging habitat, and mortality risk are strong drivers of sea otter distribution and abundance. Our finding that sea otters exhibit higher residence time closer to human communities is seemingly inconsistent with previous findings of exposure to subsistence hunting influencing sea otter movement [44] and population growth [22]. However, the diffusion model is likely capturing what happens during the initial

colonization of areas closer to communities, and, in the longer-term, areas closer to communities where harvest is common may act as population sinks [22].

Sea otter colonization and foraging habits have marked effects on assemblages of benthic invertebrates, including many commercially-harvested shellfish [42, 44, 57]. While some areas are closed to commercial fishing in Southeast Alaska due to seemingly unsupportable abundances of harvested species (for commercial purposes), sea otters





are adept at capturing these species even in closed areas. [42] found that sea cucumber abundance negatively correlates with sea otter occupancy but also observed sea cucumbers in sea otter diets in areas where surveys suggested a 100% decline in sea cucumbers. This finding suggests that sea otters can find prey even when it is undetected by targeted surveys. So, even in areas that may not be able to support commercial harvest by humans, an abundance of prey may be available to sea otters, including sea cucumbers but likely other species as well that may have become abundant as the ecosystem transitioned to the predator-dominated state [58].

In addition to influencing residence time of sea otters, these areas with reduced commercial activity may offer sea otters some relief from competition for food resources, thereby supporting the higher nominal carrying capacities suggested by our results (Table 1). Furthermore, extensive glacial retreat over the last 350 years and subsequent ecological succession in the marine

environment has led to a highly diverse and abundant benthic prey community in Glacier Bay since sea otters previously inhabited the region [20, 57]. In addition to the reduced human activity in the protected area of Glacier Bay, the new habitat likely further contributed to the higher nominal carrying capacity there (Table 1; [19, 21]). As the population expands into other previously-glaciated fjords with shallow habitat, we might expect such areas to similarly support higher carrying capacities, and we may be presented with an opportunity to investigate how novel niche space might interact with management strategy to drive spatially-variable carrying capacities.

In contrast to the relatively rapid recolonization of Southeast Alaska, sea otter populations have been slower to recover in the southern parts of their range, such as the coastal habitat of California. Parts of Southeast Alaska, such as the outer coast, are dominated by rocky benthos that can support healthy kelp forests. So, the top-down

effects on grazers by sea otters would quickly release kelp from control [16], in turn providing otters with protective habitat. The California coast, on the other hand, is a matrix of disjunct rocky benthos and stretches of softer substrate—poor for persistent kelp forest establishment—that may limit the recovery of sea otter populations via limiting female dispersal and survival [59, 60]. Further, much more of the nearshore marine environment in California is exposed to open ocean compared to the more sheltered bays and passages of Southeast Alaska. Particularly exposed areas of the California coast (e.g., Point Conception) are thought to be barriers to sea otter population spread [60], and new evidence suggests sea otters may have utilized protected estuaries historically [61]. Predation by white sharks (*Carcharodon carcharias*) may also limit sea otter range expansion along the California coast [62]. These regional differences in recolonization dynamics highlight the need to carefully consider strategies to improve the likelihood of long-term success of predator reintroduction efforts.

Other studies have included multiple fine scale habitat covariates in population models to explain carrying capacity of sea otters [38]. As more spatial data become available for Southeast Alaska, similar covariates could be included in the diffusion model. However, homogenization of the logistic diffusion model implies that realized carrying capacity is, in part, a function of motility [21]. We included two indicator covariates in our formulation of $K(\mathbf{s})$, representing areas with different management regimes, but variation in motility over the region also explains spatial variation in carrying capacity in the model. Other covariates, such as kelp canopy cover and benthic substrate composition, which have been shown to be important drivers of sea otter carrying capacity elsewhere [38], could be included in future models (i.e., as covariates affecting density dependence and/or motility).

Colonization rates and multi-site reintroductions

While we estimated a median spread rate of 3.0 km/yr in Southeast Alaska, we also found that asymptotic spread rates of sea otters can vary greatly over such a vast region (Fig. 3). Asymptotic spread rates of recolonizing sea otters in California were first estimated to range from about 1.7 to 3.5 km/yr [63], and [60] estimated about 4.7 km/yr for the southern edge of the California range and about 2 km/yr for the northern edge. Similarly, [20] estimated rates of 1.5 to 4.5 km/yr in Glacier Bay. Recalling that these spread rates are estimated as $2\sqrt{\delta\gamma}$ [20, 49, 63], the greater range that we estimated is due to (1) a higher intrinsic growth rate (discussed below; Table 1), as well as (2) the extensive spatial variability in motility harbored by a region of such size.

While we did not find evidence that any of the initial dispersal conditions (i.e., κ_j) for sea otters in Southeast Alaska affected the theoretical asymptotic spread rates (Table 1), and thus the spatial variation of those rates did not vary among epicenters (Fig. 3), specific translocation strategies could improve colonization rates. For example, if individuals were released at a site such that they were spread out sufficiently to create a flat propagating front (i.e., satisfying the condition $1/\kappa_j^2 < \sqrt{\gamma/\delta}$), theory suggests the population could spread at rates greater than the minimum spread rate (i.e., $\frac{\delta}{\kappa_j^2} + \gamma\kappa_j^2$; [50, 51]). Somewhat counter-intuitively, this suggests that higher colonization rates could be achieved by reintroducing individuals over wide areas where the species is expected to have higher motility and thus lower residence time (i.e., less favorable habitat). While it is important to note that failed reintroductions are commonly attributed to translocations of low initial densities (resulting in elevated effects of demographic stochasticity and/or Allee effects) and to unsuitable habitat (causing high mortality; [13]), individuals released in areas correlating with low residence time should spread rapidly to several locations with more favorable habitat and begin to concentrate in those areas. In fact, our results provided evidence of this: The sea otter population spread quickly over areas with high motility, then settled at high abundance in areas with low motility, which included areas with limited or no commercial fishing (Figs. 3 & 4). Given the relationship between motility in the ecological diffusion model, population spread rates, and specific forms of resource selection functions [64], it is possible that preliminary investigations of individual animal movement—either in the reintroduction area or a similar area—could be used to optimize a reintroduction strategy in terms of the initial locations and densities of released individuals. Nonetheless, these inferences regarding improved translocation strategies are largely based on mathematical theory underlying diffusion models, so further study is needed to determine how they may apply to translocation and reintroduction efforts in practice.

While sea otter reintroductions along the North American coast were an early example of a multi-site effort [18], there is a recent and ongoing multi-site reintroduction of a terrestrial predator, fisher (*Pekania pennanti*), in the northwestern U.S. [65]. Similar to sea otters, fishers declined due to over-harvest and lack of management, yet reintroduction attempts have been showing promise in restoring this predator across its historical range [10]. The simulation modeling by [10] suggested that multiple reintroduction sites can improve the success of predator recolonization. Our work adds to this body of knowledge by documenting, with a mechanistic model fit to data, how

such a process occurs over a region where colonizing individuals face variability in motility and density dependence. Indeed, our application was to a marine system, although a parallel application to the expanding fisher populations or similar terrestrial predator could reveal how such a process might vary between marine and terrestrial systems, over which animals have inherent differences in motility. Nonetheless, we found the spread rates of sea otters in Southeast Alaska were generally less than the 9.78 km/yr documented for wolves—highly mobile terrestrial predators [8]. Although, in certain areas, sea otter populations may be able to exceed that rate (Fig. 3).

Intrinsic growth

A maximum growth rate of about 20–25% has been generally accepted for sea otter populations for some time [19, 66]. However, modeling the growth and spread of sea otters across the entire region of Southeast Alaska as a continuous spatiotemporal process suggested intrinsic growth for at least this population is higher (Table 1). The evidence was quite strong: We used an informative prior for γ centered on 0.25, based on previous studies, yet the data easily pulled the marginal posterior upward (Table 1; Appendix 1).

While the previous estimates were generally accepted, it had been suggested they were likely biased low due to underestimated natality [67]. Assuming female sea otters in the area have the ability to average about one female pup every other year, our estimated intrinsic growth of about 0.29 is reasonable and aligns with the requisite theoretical maximum population growth rate [66, 68]. It is therefore possible that sea otter populations have the potential to grow more rapidly when unhindered by density-dependent factors than previous evidence suggested. Indeed, our estimate of intrinsic growth is high among marine mammals [66, 69, 70] but is reasonable, especially because the relatively mild winter conditions and productivity of Southeast Alaska are likely conducive to sea otters averaging one pup per year.

Application of a diffusion model similar to the one we implemented revealed the intrinsic growth rate of wolves colonizing parts of France varied between about 0.3 and 0.7, depending on the amount of forest cover [71]. However, modeling intrinsic growth—the theoretical maximum rate of increase of the population—as a function of covariates, as [71] did, implicitly assumes that those covariates have a density-independent effect on population growth. In contrast, we chose to model the density dependence parameter $K(\mathbf{s})$ as a function of spatial covariates because we hypothesized those covariates would affect how density moderates population growth (e.g., through reduced prey availability at higher population densities), rather than be density-independent.

Continued population growth and spread

While it appears the annual rate of increase of the sea otter population in Southeast Alaska may be slowing (Fig. 2), it is likely still decades from reaching total carrying capacity [19, 21]. As the recolonization process continues, the population will reach new habitat, in addition to Glacier Bay, that will similarly afford greater local equilibrium abundances. Sea otters in the region also face growing conflicts with human interests and activities due to their effects on commercially-valuable and subsistence species [25]. However, the return of the historical state of the nearshore marine ecosystem is gaining support among many stakeholders because there is great value in the ecosystem services that the predator-dominated system can render, such as improved carbon sequestration, nursery habitat for fish, and greater fish biomass [6, 72].

As we continue to monitor this growing and expanding population, as well as the requisite ecosystem change, we can adapt our modeling approach to gain additional insight into total equilibrium abundance, the spatial variability of equilibrium abundance, the effects of subsistence harvest of sea otters and commercial fisheries, and how climate change may continue to influence the process. Key to this ongoing effort will be using the mechanistic diffusion model to forecast population growth and spread to dynamically optimize the monitoring framework (*sensu* [34]).

Conclusions

As predator reintroductions continue to be proposed (e.g., 2020 Colorado Proposition 114), there is an increasing need to understand recolonization processes across modern land- and seascapes with varying levels of management and human activity. Fundamental to our understanding of how keystone predator reintroductions can drive ecosystem change is understanding how a predator population grows and expands its range. We provide new insight into how colonization and growth can occur from multiple reintroduction sites and with spatial heterogeneity in both the physical environment as well as human activity and management.

Appendix 1: Priors

$$\gamma \sim \text{Normal}(0.25, 0.01^2)$$

$$\boldsymbol{\beta} \sim \text{Normal}(\mathbf{0}, 10^2 \mathbf{I})$$

$$\theta_j \sim \text{Normal}^+(\mu_{\theta,j}, \sigma_{\theta,j}^2), \text{ where } \boldsymbol{\mu}_{\theta} = (100, 10, 10, 100, 10, 100, 100)' \text{ and } \boldsymbol{\sigma}_{\theta}^2 = (20^2, 1^2, 1^2, 20^2, 1^2, 20^2, 20^2)'$$

$$\kappa_j \sim \text{Normal}^+(\mu_{\kappa,j}, \sigma_{\kappa,j}^2), \text{ where } \boldsymbol{\mu}_{\kappa} = (10, 2, 10, 10, 2, 10, 10)' \text{ and } \boldsymbol{\sigma}_{\kappa}^2 = (3^2, 1^2, 3^2, 3^2, 1^2, 3^2, 3^2)'$$

$$\tau \sim \text{Uniform}(0, 1)$$

$$\boldsymbol{\alpha} \sim \text{Normal}(\mathbf{0}, 10^2 \mathbf{I})$$

$$p_t \sim \text{Beta}(1, 1) \text{ for } t \neq 2017, 2018, 2019$$

$$p_t \sim \text{Beta}(44.04937, 13.40566) \text{ for } t = 2017, 2018, 2019$$

Appendix 2

Table 2 Full version of table 1 from the main text that includes detection probabilities

Parameter	Lower bound	Mean	Upper bound
β_0	16.25	16.36	16.48
β_1	-1.89	-1.77	-1.66
β_2	0.21	0.29	0.35
β_3	0.14	0.22	0.29
β_4	0.14	0.17	0.21
β_5	0.37	0.45	0.55
β_6	-0.37	-0.24	-0.10
β_7	-1.48	-1.34	-1.16
α_0	-1.77	-1.66	-1.55
α_1	2.78	3.16	3.58
α_2	0.12	1.87	6.91
γ	0.28	0.29	0.31
τ	0.03	0.03	0.03
θ_{MI}	119.65	147.53	175.46
θ_{BI}	8.06	9.75	11.40
θ_{NI}	8.33	9.96	11.63
θ_{KB}	65.41	98.90	132.59
θ_{YB}	8.36	10.01	11.69
θ_{YI}	63.74	96.18	128.84
θ_{CS}	68.19	98.82	130.55
κ_{MI}	25.41	28.78	32.20
κ_{BI}	1.37	2.54	3.80
κ_{NI}	4.42	9.11	13.90
κ_{KB}	0.51	0.63	0.78
κ_{YB}	0.80	2.23	3.79
κ_{YI}	4.17	8.49	12.40
κ_{CS}	4.59	9.23	13.91
ρ_{1999}	0.74	0.80	0.85
ρ_{2000}	0.70	0.75	0.80
ρ_{2001}	0.82	0.86	0.89
ρ_{2002}	0.86	0.89	0.91
ρ_{2003}	0.77	0.79	0.82
ρ_{2004}	0.73	0.77	0.81
ρ_{2005}	0.53	0.58	0.63
ρ_{2006}	0.71	0.75	0.78
ρ_{2010}	0.87	0.90	0.92
ρ_{2012}	0.54	0.58	0.63
ρ_{2017}	0.67	0.77	0.85
ρ_{2018}	0.67	0.77	0.85
ρ_{2019}	0.67	0.77	0.85

Acknowledgements

Numerous people contributed to data collection and provided logistical support. These include Jim Bodkin, Mark Udevitz, Dan Monson, Ben Weitzman, Verena Gill, Angela Doroff, Patrick Kearney, Chuck Schroth, Mike Sharp, Steve Wilson, Dennis Lozier, Louise Taylor, Janet Neilson, Doug Burn, Jim deLaBruere, and Andy Harcombe. Additionally, we thank Thomas Diltz for help with the bathymetry data, Kathy Smikrud for help compiling the spatial data for fisheries closures, Kyle Herbert for help during project conception, and Paul Schuette for helpful conversations during the development of this manuscript. Finally, we thank George Durner, Eliezer Gurarie, Christen Fleming, and an anonymous reviewer for helpful comments that improved the manuscript, as well as the U.S. Geological Survey Advanced Research Computing team for use of the Yeti Supercomputer (<https://doi.org/10.5066/F7D798MJ>).

Authors' contributions

All authors contributed to the design of the research. MLK, WSB, GGE, and JNW collected and organized the data. JME, PJW, XL, and MBH designed the analytical methods. JME led the analysis and manuscript. All authors contributed to drafts of the manuscript. All authors read and approved the final manuscript.

Funding

This work was supported by the U.S. Fish and Wildlife Service, National Park Service, and U.S. Geological Survey.

Availability of data and material

Data are available from [30, 31], and [33].

Declarations

Ethics approval and Consent to participate

Aerial surveys were conducted under U.S. Fish and Wildlife Service Scientific Research Permit #MA14762C-0 and National Park Service Scientific Research Permit GLBA-2016-SCI-022.

Consent for publication

All authors consent to publication. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government. The findings and conclusions of the U.S. Fish and Wildlife Service authors are their own and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Department of Natural Resources and Environmental Science, University of Nevada Reno, Reno, NV, USA. ²United States Fish & Wildlife Service, Marine Mammals Management, Anchorage, AK, USA. ³Department of Statistics, Colorado State University, Fort Collins, CO, USA. ⁴U.S. Geological Survey, Alaska Science Center, Anchorage, AK, USA. ⁵Southeast Alaska Inventory and Monitoring Network, National Park Service, Juneau, AK, USA. ⁶Glacier Bay Field Station, National Park Service, Juneau, AK, USA. ⁷Colorado Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO, USA. ⁸Present address: Wildlife Biology Program, Department of Ecosystem and Conservation Sciences, W.A. Franke College of Forestry and Conservation, University of Montana, Missoula, MT, USA. ⁹Present address: U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI, USA.

Received: 17 March 2021 Accepted: 1 June 2021

Published online: 30 June 2021

References

- Ripple WJ, Estes JA, Beschta RL, Wilmers CC, Ritchie EG, Hebblewhite M, Berger J, Elmhagen B, Letnic M, Nelson MP, Schmitz OJ, Smith DW, Wallach AD, Wirsing AJ. Status and ecological effects of the world's largest carnivores. *Science*. 2014;343(6167). <https://doi.org/10.1126/science.1241484>.

2. Estes JA, Terborgh J, Brashares JS, Power ME, Berger J, Bond WJ, Carpenter SR, Essington TE, Holt RD, Jackson JBC, Marquis RJ, Oksanen L, Oksanen T, Paine RT, Pikitch EK, Ripple WJ, Sandin SA, Scheffer M, Schoener TW, Shurin JB, Sinclair ARE, Soulé ME, Virtanen R, Wardle DA. Trophic downgrading of planet Earth. *Science*. 2011;333(6040):301–6. <https://doi.org/10.1126/science.1205106>.
3. Prugh LR, Stoner CJ, Epps CW, Bean WT, Ripple WJ, Laliberte AS, Brashares JS. The rise of the mesopredator. *BioScience*. 2009;59(9):779–91. <https://doi.org/10.1525/bio.2009.59.9.9>.
4. Wallach AD, Johnson CN, Ritchie EG, O'Neill AJ. Predator control promotes invasive dominated ecological states. *Ecol Lett*. 2010;13(8):1008–18. <https://doi.org/10.1111/j.1461-0248.2010.01492.x>.
5. Ripple WJ, Beschta RL. Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction. *Biol Conserv*. 2012;145(1):205–13. <https://doi.org/10.1016/j.bioccon.2011.11.005>.
6. Gregr EJ, Christensen V, Nichol L, Martone RG, Markel RW, Watson JC, Harley CDG, Pakhomov EA, Shurin JB, Chan KMA. Cascading social-ecological costs and benefits triggered by a recovering keystone predator. *Science*. 2020;368(6496):1243–7. <https://doi.org/10.1126/science.aay5342>.
7. Ritchie EG, Elmhagen B, Glen AS, Letnic M, Ludwig G, McDonald RA. Ecosystem restoration with teeth: What role for predators? *Trends Ecol Evol*. 2012;27(5):265–71. <https://doi.org/10.1016/j.tree.2012.01.001>.
8. Hurford A, Hebblewhite M, Lewis MA. A spatially explicit model for an Allee effect: Why wolves recolonize so slowly in Greater Yellowstone. *Theor Popul Biol*. 2006;70(3):244–54. <https://doi.org/10.1016/j.tpb.2006.06.009>.
9. Fischer J, Lindenmayer DB. An assessment of the published results of animal relocations. *Biol Conserv*. 2000;96(1):1–11. [https://doi.org/10.1016/S0006-3207\(00\)00048-3](https://doi.org/10.1016/S0006-3207(00)00048-3).
10. Lewis JC, Powell RA, Zielinski WJ. Carnivore translocations and conservation: Insights from population models and field data for fishers (*Martes pennanti*). *PLoS ONE*. 2012;7(3):32726. <https://doi.org/10.1371/journal.pone.0032726>.
11. Ovenden TS, Palmer SCF, Travis JMJ, Healey JR. Improving reintroduction success in large carnivores through individual-based modelling: How to reintroduce Eurasian lynx (*Lynx lynx*) to Scotland. *Biol Conserv*. 2019;234(March):140–53. <https://doi.org/10.1016/j.bioccon.2019.03.035>.
12. Seddon PJ, Griffiths CJ, Soorae PS, Armstrong DP. Reversing defaunation: Restoring species in a changing world. *Science*. 2014;345(6195):406–12.
13. Armstrong DP, Seddon PJ. Directions in reintroduction biology. *Trends Ecol Evol*. 2008;23(1):20–5. <https://doi.org/10.1016/j.tree.2007.10.003>.
14. Bodkin JL. Historic and Contemporary Status of Sea Otters in the North Pacific. In: Larson SE, Bodkin JL, VanBlaricom GR, editors. *Sea Otter Conservation*. Cambridge: Academic Press; 2015. p. 43–61. <https://doi.org/10.1016/B978-0-12-801402-8.00003-2>.
15. Estes JA, Duggins DO. Sea otters and kelp forests in Alaska: generality and variation in a community ecological paradigm. *Ecol Monogr*. 1995;65(1):75–100. <https://doi.org/10.2307/2937159>.
16. Estes JA, Palmisano JF. Sea Otters: Their role in structuring nearshore communities. *Science*. 1974;185(4156):1058–60.
17. Estes JA, Tinker MT, Bodkin JL. Using ecological function to develop recovery criteria for depleted species: sea otters and kelp forests in the Aleutian Archipelago. *Conserv Biol*. 2010;24(3):852–60. <https://doi.org/10.1111/j.1523-1739.2009.01428.x>.
18. Jameson RJ, Kenyon KW, Johnson AM, Wight HM. History and status of translocated sea otter populations in North America. *Wildl Soc Bull*. 1982;10(2):100–7.
19. Tinker MT, Gill VA, Esslinger GG, Bodkin J, Monk M, Mangel M, Monson DH, Raymond WW, Kissling ML. Trends and carrying capacity of sea otters in southeast Alaska. *J Wildl Manag*. 2019;83(5):1073–89. <https://doi.org/10.1002/jwmg.21685>.
20. Williams PJ, Hooten MB, Esslinger GG, Womble JN, Bodkin JL, Bower MR. The rise of an apex predator following deglaciation. *Divers Distrib*. 2019;25(6):895–908. <https://doi.org/10.1111/ddi.12908>.
21. Lu X, Williams PJ, Hooten MB, Powell JA, Womble JN, Bower MR. Nonlinear reaction–diffusion process models improve inference for population dynamics. *Environmetrics*. 2020;31(3):2604. <https://doi.org/10.1002/env.2604>.
22. Raymond WW, Tinker MT, Benter B, Kissling M, Gill VA, Eckert GL. Location-specific factors influence patterns and effects of subsistence sea otter harvest in Southeast Alaska. *Ecosphere*. 2019;10(September):e02874.
23. Hefley TJ, Hooten MB, Russell RE, Walsh DP, Powell JA. When mechanism matters: Bayesian forecasting using models of ecological diffusion. *Ecol Lett*. 2017;20(5):640–50. <https://doi.org/10.1111/ele.12763>.
24. Ballachey BE, Bodkin JL. Challenges to Sea Otter Recovery and Conservation. In: Larson SE, Bodkin JL, VanBlaricom GR, editors. *Sea Otter Conservation*. Cambridge: Academic Press; 2015. p. 63–96. <https://doi.org/10.1016/B978-0-12-801402-8.00004-4>.
25. Carswell LP, Speckman SG, Gill VA. Shellfish fishery conflicts and perceptions of sea otters in California and Alaska. *Sea Otter Conserv*. 2015;2015:333–68. <https://doi.org/10.1016/B978-0-12-801402-8.00012-3>.
26. Wikle CK, Hooten MB. A general science-based framework for dynamical spatio-temporal models. *Test*. 2010;19:417–51. <https://doi.org/10.1007/s11749-010-0209-z>.
27. Williams PJ, Hooten MB, Womble JN, Esslinger GG, Bower MR, Hefley TJ. An integrated data model to estimate spatiotemporal occupancy, abundance, and colonization dynamics. *Ecology*. 2017;98(2):328–36. <https://doi.org/10.1002/ecy.1643>.
28. Bodkin JL, Udevitz MS. An aerial survey method to estimate sea otter abundance. In: Garner G, Armstrup S, Laake J, Manly B, McDonald L, Robertson D, editors. *Marine Mammal Survey and Assessment Methods*. Leiden: A. A. Balkema; 1999. p. 13–26.
29. Esslinger GG, Esler D, Howlin S, Starcevic LA. Monitoring population status of sea otters (*Enhydra lutris*) in Glacier Bay National Park and Preserve, Alaska—Options and Considerations. 201542. <https://doi.org/10.3133/ofr20151119>.
30. Esslinger GG. Sea Otter aerial survey data from Glacier Bay National Park and Preserve, 1999-2012: U.S. Geological Survey data release. 2019. <https://doi.org/10.5066/P9SBAFF6>.
31. Esslinger GG. Sea Otter aerial survey data from southeast Alaska, 2002-2003: U.S. Geological Survey data release. 2020. <https://doi.org/10.5066/P9PYG92B>.
32. Womble JN, Williams PJ, Johnson WF, Taylor-Thomas LF, Bower MR. Sea Otter Monitoring Protocol for Glacier Bay National Park, Alaska: Version SO-2017.1. Natural Resource Report NPS/SEAN/NRR-2018/1762. National Park Service, Fort Collins, Colorado; 2018.
33. Womble JN, Taylor LF. Glacier Bay sea otter count data from images (SO_D). Juneau: NPS SEAN; 2020. <https://irma.nps.gov/DataStore/Reference/Profile/2>.
34. Williams PJ, Hooten MB, Womble JN, Esslinger GG, Bower MR. Monitoring dynamic spatio-temporal ecological processes optimally. *Ecology*. 2018;99(3):524–35. <https://doi.org/10.1002/ecy.2120>.
35. Turchin P. Quantitative Analysis of Movement: Measuring and Modeling Population Redistribution in Animals and Plants. Sunderland: Sinauer Associates; 1998.
36. Hooten MB, Garlick MJ, Powell JA. Computationally efficient statistical differential equation modeling using homogenization. *J Agric Biol Environ Stat*. 2013;18(3):405–28. <https://doi.org/10.1007/s13253-013-0147-9>.
37. Williams PJ, Hooten MB, Womble JN, Bower MR. Estimating occupancy and abundance using aerial images with imperfect detection. *Methods Ecol Evol*. 2017;8(12):1679–89. <https://doi.org/10.1111/2041-210X.12815>.
38. Tinker MT, Yee JL, Laidre KL, Hatfield BB, Harris MD, Tomoleoni JA, Bell TW, Saarnan E, Carswell LP, Miles AK. Habitat features predict carrying capacity of a recovering marine carnivore. *J Wildl Manag*. 2021;85(1):303–23. <https://doi.org/10.1002/jwmg.21985>.
39. Bodkin JL, Esslinger GG, Monson DH. Foraging depths of sea otters and implications to coastal marine communities. *Mar Mammal Sci*. 2004;20(2):305–21. <https://doi.org/10.1111/j.1748-7692.2004.tb01159.x>.
40. Johnson CK, Tinker MT, Estes JA, Conrad PA, Staedler M, Miller MA, Jessup DA, Mazet JAK. Prey choice and habitat use drive sea otter pathogen exposure in a resource-limited coastal system. *Proc Natl Acad Sci U S A*. 2009;106(7):2242–7. <https://doi.org/10.1073/pnas.0806449106>.
41. Gregr EJ, Nichol LM, Watson JC, Ford JKB, Ellis GM. Estimating carrying capacity for sea otters in British Columbia. *J Wildl Manag*. 2008;72(2):382–8. <https://doi.org/10.2193/2006-518>.
42. Larson SD, Hoyt ZN, Eckert GL, Gill VA. Impacts of sea otter (*Enhydra lutris*) predation on commercially important sea cucumbers (*Parastichopus californicus*) in southeast Alaska. *Can J Fish Aquat Sci*. 2013;70(August):1498–507.
43. Estes JA. Natural history, ecology, and the conservation and management of sea otters. *Sea Otter Conserv*. 201519–41. <https://doi.org/10.1016/B978-0-12-801402-8.00002-0>.

44. Hoyt Z. Resource Competition, Space Use and Forage Ecology of Sea Otters in Southern Southeast Alaska. Phd, University of Alaska Fairbanks. 2015. <https://doi.org/10.1017/CBO9781107415324.004>.
45. Rumble J, Hebert K. Report to the board of fisheries, miscellaneous dive fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Management Report 11-59. Technical report. 2011. <http://www.adfg.alaska.gov/FedAidPDFs/FMR14-46.pdf>.
46. Shirley TC, Bishop G, O'Clair CE, Taggart SJ, Bodkin JL. Sea otter predation on dungeness crab in Glacier Bay, Alaska. In: High Latitude Crabs: Biology, Management and Economics. Fairbanks: Alaska Sea Grant College Program, University of Alaska; 1996. p. 96–02563576.
47. R Core Team, R Foundation for Statistical Computing. R: A language and environment for statistical computing. 2019. <https://www.r-project.org/>.
48. Garlick MJ, Powell JA, Hooten MB, McFarlane LR. Homogenization of large-scale movement models in ecology. *Bull Math Biol.* 2011;73(9): 2088–108. <https://doi.org/10.1007/s11538-010-9612-6>.
49. Okubo A. Diffusion and Ecological Problems: Mathematical Models. New York: Springer; 1980.
50. Cencini M, Lopez C, Vergni D. Reaction-diffusion systems: front propagation and spatial structures. *Lect Notes Phys.* 2003;636:187–210. https://doi.org/10.1007/978-3-540-39668-0_9.
51. Ebert U, Van Saarloos W. Front propagation into unstable states: Universal algebraic convergence towards uniformly translating pulled fronts. *Phys D Nonlinear Phenom.* 2000;146(1-4):1–99. [https://doi.org/10.1016/S0167-2789\(00\)00068-3](https://doi.org/10.1016/S0167-2789(00)00068-3).
52. Conn PB, Johnson DS, Williams PJ, Melin SR, Hooten MB. A guide to Bayesian model checking for ecologists. *Ecol Monogr.* 2018;88(4):526–42. <https://doi.org/10.1002/ecm.1314>.
53. Kruschke J. Doing Bayesian Data Analysis: A Tutorial with R, JAGS, and Stan, 2nd ed. New York: Academic Press; 2015.
54. Gelman A, Carlin J. Beyond power calculations: Assessing type S (sign) and type M (magnitude) errors. *Perspect Psychol Sci.* 2014;9(6):641–51. <https://doi.org/10.1177/1745691614551642>.
55. U.S. Fish and Wildlife Service. NORTHERN SEA OTTER (*Enhydra lutris kenyoni*): Southeast Alaska Stock. Technical report. 2014.
56. Broms KM, Hooten MB, Johnson DS, Altwegg R, Conquest LL. Dynamic occupancy models for explicit colonization processes. *Ecology.* 2016;97(1):194–204. <https://doi.org/10.1890/15-0416.1>.
57. Weitzman BP. Effects of sea otter colonization on soft-sediment intertidal prey assemblages in Galcier Bay, Alaska. Master of arts, University of California Santa Cruz. 2013.
58. Estes JA, Jameson RJ, Rhode EB. Activity and prey election in the sea otter: Influence of population status on community structure. *Am Nat.* 1982;120(2):242–58.
59. Nicholson TE, Mayer KA, Staedler MM, Fujii JA, Murray MJ, Johnson AB, Tinker MT, Van Houtan KS. Gaps in kelp cover may threaten the recovery of California sea otters. *Ecography.* 2018;41(11):1751–62. <https://doi.org/10.1111/ecog.03561>.
60. Tinker MT, Doak DF, Estes JA. Using demography and movement behavior to predict range expansion of the Southern Sea Otter. *Ecol Appl.* 2008;18(7):1781–94. <https://doi.org/10.1890/07-0735.1>.
61. Hughes BB, Wasson K, Tim Tinker M, Williams SL, Carswell LP, Boyer KE, Beck MW, Eby R, Scoles R, Staedler M, Espinosa S, Hessing-Lewis M, Foster EU, Beheshti KM, Grimes TM, Becker BH, Needles L, Tomoleoni JA, Rudebusch J, Hines E, Silliman BR. Species recovery and recolonization of past habitats: Lessons for science and conservation from sea otters in estuaries. *PeerJ.* 2019;2019(12):1–30. <https://doi.org/10.7717/peerj.8100>.
62. Tinker MT, Hatfield BB, Harris MD, Ames JA. Dramatic increase in sea otter mortality from white sharks in California. *Mar Mamm Sci.* 2016;32(1): 309–26. <https://doi.org/10.1111/mms.12261>.
63. Lubina JA, Levin SA. The Spread of a Reinvading Species: Range Expansion in the California Sea Otter. *Am Nat.* 1988;131(4):526–43. <https://doi.org/10.1086/284804>.
64. Hooten MB, Lu X, Garlick MJ, Powell JA. Animal movement models with mechanistic selection functions. *Spat Stat.* 2020;37:100406. <https://doi.org/10.1016/j.spasta.2019.100406>.
65. Lewis JC, Chestnut T, Ransom JL, Werntz DO. Cascades fisher reintroduction project: Progress report for December 2015 to March 2017. Natural Resource Report NPS/PWR/NRR–2017/1486. 2017.
66. Estes JA. Growth and equilibrium in sea otter populations. *J Anim Ecol.* 1990;59(2):385–401. <https://doi.org/10.2307/4870>.
67. Riedman ML, Estes JA, Staedler MM, Giles AA, Carlson DR. Breeding patterns and reproductive success of California sea otters. *J Wildl Manag.* 1994;58(3):391. <https://doi.org/10.2307/3809308>.
68. Cole L. The population consequences of life history phenomena. *Q Rev Biol.* 1954;29(2):103–37.
69. Schmitz OJ, Lavigne DM. Intrinsic rate of increase, body size, and specific metabolic rate in marine mammals. *Oecologia.* 1984;62:305–9. <https://doi.org/10.1007/BF00384261>.
70. Bowen WD, McMillan J, Mohn R. Sustained exponential population growth of grey seals at Sable Island, Nova Scotia. *ICES J Mar Sci.* 2003;60(6):1265–74. [https://doi.org/10.1016/S1054-3139\(03\)00147-4](https://doi.org/10.1016/S1054-3139(03)00147-4).
71. Louvrier J, Papaix J, Duchamp C, Gimenez O. A mechanistic-statistical species distribution model to explain and forecast wolf (*Canis lupus*) colonization in South-Eastern France. *Spat Stat.* 2020;36:100428. <https://doi.org/10.1016/j.wavemoti.2020.102529>.
72. Wilmers CC, Estes JA, Edwards M, Laidre KL, Konar B. Do trophic cascades affect the storage and flux of atmospheric carbon? An analysis of sea otters and kelp forests. *Front Ecol Environ.* 2012;10(8):409–15. <https://doi.org/10.1890/110176>.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

