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## UAF student using recorders to study man-made, natural sounds around Kenai wildlife refuge

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KENAI, Alaska — By listening, Tim Mullet is learning more than he expected.

The 34-year-old Ohio native and University of Alaska Fairbanks doctoral student has been putting his ear to the sounds echoing through the Kenai National Wildlife Refuge.

And, with the help of 13 audio recorders, he's been able to record more than 85,000 sound files from locations throughout the refuge documenting the biological, anthropogenic and geophysical sounds emanating across the landscape.

The massive recording project is part of the research Mullet needs to finish his dissertation and get his Ph.D., but it also serves a greater purpose.

"We're just trying to build a better knowledge of how sound is distributed throughout the refuge," he said Friday in the basement lab of the Refuge headquarters. "It's not going to drive any management, it just gives us some idea — knowledge for knowledge's sake at this point. So the future of it can drive more studies into specific areas."

One of the large parts of gathering the sound files is studying the anthropogenic — or mechanical or man-made — noises penetrating the wilderness.

Of the 2 million acres of land contained in the refuge's borders, 1.3 million acres are Congressionally designated to be wilderness, Mullet said.

"That wilderness has specific mandates to manage for naturally occurring processes and ecosystems and to provide recreationists with outstanding opportunities for solitude," he said.

The refuge is one of the most visited areas on the Peninsula, he

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said, making it an area ripe with anthropogenic sounds. The high amount of anthrophony sometimes masks the natural sounds of the refuge, especially in the northwestern portion due to its proximity to developments.

That increased anthrophony degrades the quality of wilderness, Mullet contends. Along with vehicle noise, airplanes, and others, one part of the soundscape on Mullet's mind are the snow machines that allow residents access to remote parts of the wilderness during the winter.

"There is an increase number of snow machines into the refuge over the last several years and they can reach a lot more remote locations, so essentially these mechanical noises are intruding into more remote areas of wilderness," he said.

"Snowmachines are allowed to go into the wilderness areas and to experience solitude in the presence of snowmachines — it's kind of an oxymoron," he said referring to the requirement of Congressionally designated wilderness. "You can't do it."

Mullet uses the 13 recorders — seven of which are in permanent locations — to monitor the sounds throughout the refuge. The recorders are set to capture 20 seconds of audio every 15 minutes.

From there, the data is put into a remote environmental assessment laboratory system that analyzes the frequencies and spits out index numbers of the amount of anthrophony or biophony — natural sounds — occurring at each sound station.

"Then it gets kind of interesting," he said.

From there, Mullet dumps the frequency values along with longitude and latitude information into a predictive modeling software that lets him predict anthrophony throughout the entire refuge.

Mullet can then pull that data into a GIS system and create a map of exactly where the sounds are occurring in the refuge. Areas marked in red contain high levels of unnatural or mechanical sounds and often coordinate with proximity to development or road systems.

That resulting data — the majority of which was compiled from December to April — will be one of several models that he'll create to get the best interpretation of the refuge's soundscape and anthrophony, including the snow machines.

This winter, he hopes to expand to 23 sound stations and try moving to different locations every two weeks.

"The area I can sample and the amount of sound that I can sample throughout the refuge is exponential at that point," he said. "So, we are really going to expand our efforts this winter."

One of the parts of the project is to see how levels of the anthrophony affect wildlife and moose in particular.

"Basically asking the question, 'Do moose have higher stress levels in areas of higher anthrophony?'" he said.

Raised stress might have a physiological effect on the moose, Mullet said. But that's where the project gets a little controversial, he said.

"I presented my proposal to two snowmachine club meetings and the state Fish and Game and those were intense," he said with a laugh.

"Basically I presented my proposal for about 45 minutes and then was asked questions for about two hours."

It's a touchy subject, "and rightfully so," he said.

"The snowmachiners are scared the refuge wants to close the refuge to the snow machines and that's not true," Mullet said.

He added the results of his research might be considered in future management, but "it is not going to drive management."

Mullet will continue his work in the refuge for at least another year before he heads up to Fairbanks to analyze the gathered data. He hopes to be able to defend his dissertation to his committee — including John Morton with Kenai National Wildlife Refuge, Falk Huettmann with UAF and Stuart Gage with Michigan State

University — sometime in 2014.

But, Mullet said he is just enjoying his time in what he considers one of world's most beautiful areas.

In fact, doing work with the snowmachines has forced Mullet to get in touch with the recreational aspect of the refuge and discover why scores of residents enjoy activities like snow machining.

"Snowmachining is a fun activity and it does get you out to some amazing locations so I can understand completely why people do it," he said.

The project has given him a better perspective on both sides of the issue.

"I've seen some awesome areas throughout the refuge — some areas that nobody else has been through, some areas that you can only access through helicopter or float plane," he said.

He said he has begun to develop a connection with the land and all of its sounds.

"To study human disturbance in the Last Frontier is kind of interesting because we'd like to keep it that way," he said.

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