Researchers with the Tanana Chiefs Conference, the regional non-profit organization representing 42 Alaska Native tribes scattered across the Interior, are collaborating with the EPSCoR Boreal Fires team on two projects studying wildfire-related impacts using small unmanned aircraft systems (sUAS) or drones. One study is examining vegetation regeneration in village fuelbreaks, and the other is looking at how fires along rivers could influence salmon habitat and growth rates.

“They’ve got a better handle on what’s important to their communities than we do,” Boreal Fires researcher Todd Brinkman said of TCC. “I want us to co-produce research that helps TCC advocate for the interests of their communities and helps them make smart, timely, and adaptive decisions with regards to wildfire and to resilience to wildfire.”

Firebreaks

In May 2020, TCC Forester Fabian Keirn said his team was studying the fires of a fuelbreak in the village of Tanacross, May 3 to 5, 2020. Right: Tanana Chiefs Conference Natural Cultural Resources Specialist Debra Lynne gathers sUAS imagery of a fuelbreak in the village of Tanacross, May 3 to 5, 2020. Left: Tanana Chiefs Conference Fire Program Specialist Fabian Keirn gathers sUAS footage of a fuelbreak in the village of Tanacross, May 3 to 5, 2020. (Photo by Seth Adams/Seth Adams Photography)

“A lot of our research was based on the fact that they had had preventative firebreaks put in,” said Keirn. “Because we want to better understand how climate change is impacting wild food resources, so we can better manage them.”

Keirn’s job was to gather remotely sensed photos of the firebreaks using sUAS, working at dusk or dawn to minimize shadows—which can create artifacts in the imagery that interfere with analysis. He ground-truthed the data by measuring the size and number of trees, as well as the percent cover of grasses, at a set of small circular plots of the firebreaks stationed roughly 200 feet apart. He then shipped the data to UAF, where Brinkman, fellow Boreal Fires researcher Michelle Quillin, and undergrad Irina Sweedler had been studying the imagery to see how successfully it could be used to correctly classify vegetation types.

Keirn said the data could enable researchers to examine whether firebreaks have given back the ground to which they may no longer serve their purpose, and also to look at how effective these types of fuel breaks are in the first place. “I don’t think too many people have done too many studies on these shaded fuelbreaks,” he noted. “Whether or not that strategy has worked hasn’t really been followed up on.”

Brinkman said the project is also a proof-of-concept of the sUAS technique, which could provide organizations with a rapid, simple tool for the currently time-consuming process of evaluating firebreaks. He said the UAF researchers are concluding their evaluation of the technique and they’ve been generally pleased with the results, and that the next step is to share their findings with TCC and decide whether to further pursue the study.

“I’d love to put together some sort of training workshop for rural communities where they can assess their fuelbreaks themselves,” Brinkman noted. “This is something that they could probably do from start to finish without us. It would be great.”

Berlin fires could affect salmon in a number of ways: for example, they can result in lower water temperatures, which may increase growth rates; they may increase the amount of fine-scale debris in the river, which can inhibit feeding and growth rates. Schoen said fires could affect salmon in a number of ways: for example, they can result in lower water temperatures, which may increase growth rates; they may increase the amount of fine-scale debris in the river, which can inhibit feeding and growth rates. Schoen said fires could affect salmon in a number of ways: for example, they can result in lower water temperatures, which may increase growth rates; they may increase the amount of fine-scale debris in the river, which can inhibit feeding and growth rates. Schoen said fires could affect salmon in a number of ways: for example, they can result in lower water temperatures, which may increase growth rates; they may increase the amount of fine-scale debris in the river, which can inhibit feeding and growth rates.

Another significant way that fires may impact juvenile salmon is by flushing more sediment into the water and thus increasing river turbidity, which may inhibit feeding and growth. To study turbidity, TCC Natural Cultural Resources Specialist Debra Lynne used a sUAS equipped with a multispectral sensor to gather both visual and multispectral imagery of the stretches of the Chena River where sampling was taking place. The multispectral imagery was then sent to UAF researcher Michelle Quillin, who had been processing equipment and expertise, while TCC’s imagery analysis access was available only during the early days of the COVID pandemic. And the salmon, Keirn said, are well able to adjust to UAF’s and TCC’s research in order to gain knowledge about potential impacts to a natural resource.

“Chinook salmon are an important source of food for the residents of the TCC region in the Yukon and Kuskokwim rivers, and also provide an important cultural role in fish camps,” noted McKeen. “We were excited about the projects because we want to further understand how climate change is impacting wild food resources, so we can better manage these resources.”

The sUAS imagery collected by TCC also would be great.”

“Getting a handle on where those patterns are is fairly easy,” he noted. “These water index algorithms work well to pixelate in-river turbidity measure — the NDWI values from the index maps,” he explained. “We’re trying to build a relationship between those two.”

“Like the firebreak project, McKenna said a major goal of the research is to test the effectiveness of the sUAS as a real deployment tool, especially in remote environments. “If there’s a forest fire, a common stream drainage path is right to deploy a drone and collect some rapid assessment imagery and look at some of the features that is going to be beneficial or harmful or maybe neutral to the spawning Chinook populations.”

“While we’ve got a long way to go in terms of proofing and validating the models, they have been generally pleased with the results, and that the next step is to share their findings with TCC and decide whether to further pursue the study. “I would love to put together some sort of training workshop for rural communities where they can assess their fuelbreaks themselves,” Brinkman noted. “This is something that they could probably do from start to finish without us. It would be great.”

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Aquatic Specialist Michael Quillin examines a juvenile Chinook salmon sampled from the Chena River, August 21, 2020. (Photo by Seth Adams/Seth Adams Photography)