BIOFUELS
Alaska’s new power plants?
Chris Garber-Slaght let out a slight groan as he hoisted a five-gallon jug of syrupy brown liquid and emptied it into a large, filter-lined funnel near eye level.

“This stuff’s pretty disgusting,” he said, turning his nose away from the source. “But it’s free.”

Garber-Slaght was in the midst of a twice-weekly stop at the filling station where he gets fuel for the 400-mile-a-week commute from his Fairbanks home to Eielson Air Force Base, where he teaches high school English. This particular “filling station” is in a south Fairbanks warehouse donated by ABS Alaska, and the “free” fuel he was filtering is waste vegetable oil, known as WVO, from a local restaurant.

The group has equipment that can produce both biodiesel and straight vegetable oil (SVO) from the same waste material, but biodiesel takes more time and money to produce and can only be used in the summer since it gels at low temperatures. (Biodiesel also requires an alcohol additive, most commonly methanol, which is expensive to buy and ship to Alaska, and the process produces a byproduct — glycerine — which can be a problem to dispose of.) Since Garber-Slaght is the only person in Fairbanks who uses SVO during the winter, he gets pretty much all the fuel he can use once the snow flies.

To get his Ford F-250 heavy-duty diesel pickup truck to run on SVO, Garber-Slaght spent about $1,000 on a kit that he attached underneath the truck’s bed. Since SVO has a higher freezing point than regular diesel, the alternative fuel has to be heated in a separate tank to keep it from gelling. The kit filters and preheats the oil on its way from the tank to the engine. Garber-Slaght said it takes about five minutes driving on traditional diesel before the recycled oil has warmed up enough to burn, but other than that he said it’s been smooth sailing.

“I converted to veggie oil back in early summer,” Garber-Slaght said. “So far I’ve driven about 7,000 miles and made trips to Anchorage, to Chitina and daily trips to Eielson without a single problem. Even at temperatures down to minus 10 degrees it’s been trouble-free. We’re good to go.”
What’s good for the Garber-Slaghts might soon be good for others in the area as well. Reports estimate as many as 10,000 gallons of WVO are generated by commercial kitchens around Fairbanks every month. Since WVO is considered a toxic waste, vendors are prohibited from using drains or the landfill to dispose of their leftover oil. The borough maintains a collection site where businesses can dump their waste veggie oil at a cost of around $15 per gallon, but a fledgling industry has sprouted to collect waste oil from local businesses and turn it into biofuel.

Francis Collins is a local landlord who got the idea a couple years ago to collect waste oil and use it to heat her apartment buildings. She started Arctic Biofuels, a two-person business that collects waste oil from local restaurants for free, processes the waste into both biodiesel and SVO, and uses it to heat apartment buildings. She's generating enough biofuel to supply a few clients with oil for their home-heating needs at prices well below commercial heating oil. “I want it [waste oil] and the restaurants don’t, so it works out well for both of us,” Collins said. “And it keeps it out of the landfill.”

Barley — not just for beer anymore

Barley is another source of locally grown biofuel making an impact this winter in the Interior. Gary Sonnichsen, a farmer in Delta Junction, has been growing barley for the past 12 years. He’s one of dozens of area farmers looking for a market for their grain now that the state-supported dairy industry has just about dried up. He thinks he may have found a market in the energy-hungry homes of Fairbanks.

“At’s hard to predict precisely, but I expect to sell about 250 tons of barley for fuel this year,” Sonnichsen said in November. “That’s up from zero tons last year.”

At a price of about $200 a ton, which delivers the BTU equivalent of 125 gallons of home-heating oil, Sonnichsen says he can grow and sell enough barley to make a profit. He’s excited about the prospects for future growth.

“I absolutely think it’s feasible for Delta-area farmers to grow barley to sell for home-heating fuel. We’ve been growing barley here for 50 years, through all kinds of weather and tough conditions. We’ve pretty much got the economics of it figured out.”

Sonnichsen is partnering with Don Trometter of North Pole Pipe and Supply, who’s acting as a local supplier for the North Pole/Fairbanks area. Trometter makes the drive to Delta each week, bringing back 12 to 15 tons of the dried, easily combustible grain that burns in specific models of stoves and furnaces (see sidebar on page 11). He sells the grain to area homeowners in bags of 50 or 1,500 pounds.

Ten thousand gallons of waste vegetable oil (WVO) are generated by commercial kitchens around Fairbanks every month.

Firewood — the original biofuel

The cost of energy in the Fairbanks area was termed a “crisis of generational proportions” by Fairbanks North Star Borough Mayor Jim Whitaker in May 2008, when rising fuel costs around the globe showed no signs of stabilizing. High energy costs spurred Alaska Gov. Sarah Palin and state lawmakers to pass emergency legislation for a $1,200 “energy rebate” added to every resident’s 2008 permanent fund dividend to help Alaskans deal with unprecedented fuel costs.

The spiraling cost of conventional heating sources and an influx of cash into residents’ pockets has led to a surge in the use of the most traditional biofuel — wood. Reports indicate almost 2,000 wood heat appliances were sold in the Fairbanks area in summer 2008. The rush on wood stoves and wood furnaces has resulted in a shortage of dry firewood, which is crucial to reducing the amount of pollution.

Experts who monitor air quality warned that the added smoke from hundreds of new wood-burning stoves and outdoor furnaces — some burning green fuel — would cause a serious spike in Fairbanks’ air pollution problem during the winter.

Mark Wiebold sells wood and pellet stoves at The Woodway in Fairbanks. He fears the rush on wood energy could carry a serious unintended consequence.

“I’m afraid what we have now is a bunch of people who are all of a sudden burning wood as an alternative to more-expensive fossil fuels. Even though we’re selling state-of-the-art wood stoves that exceed [Environmental Protection Agency] standards when used properly, it’s up to the individual to make a personal commitment to learn how to use it and maintain an adequate supply of dry firewood. The air quality in Fairbanks is a real issue and I’m not sure how it’ll be addressed.”
According to Wiebold at The Woodway, local barley is a clean-burning, affordable, easy-to-handle alternative to wood pellets, and he likes the idea of buying fuel from a local supplier.

“When you spend a hundred bucks on fuel from a local source, that money turns right around and gets spent in other local businesses,” Wiebold said. “I kind of like the idea of my energy dollar staying in the local economy.”

Sonnichsen sees a future in developing barley to be used specifically for fuel.

“What we’ve been growing here for decades is aimed as a livestock feed. If we get a variety better suited for fuel it would make barley an even more viable long-term energy solution.”

Rich Seifert is one local expert who disagrees with that assessment. Seifert, an energy specialist with UAF’s Cooperative Extension Service, is convinced that the idea of burning grain as fuel makes no sense.

“I think that’s just a bad path for us to take,” Seifert said. “The amount of fossil fuel needed to produce a crop through modern agricultural techniques throws the whole idea of using grain as a fuel out of balance. Why would you use fossil fuels to run the tractors and combines and trucks to get the grain to market, when you could be growing native species of trees instead, and then burning the trees for heat? The farmers may be able to make a profit in the short term, but sooner or later a market correction will have to occur and the idea will have to fizzle out.”

It’s the same problem with growing corn for ethanol Outside, Seifert said. “You can’t violate the physics of it. It’s the basic law of thermodynamics.”

Alaska grasses and grains may hold the key to rural fuel woes

Seifert isn’t alone in his contention that burning fossil fuel to transport biofuel can be both economically and environmentally unfriendly. UAF’s Professor Stephen Sparrow and his colleague, Associate Professor Mingchu Zhang, are studying a variety of local grasses and grains to determine if there’s an untapped energy source that’s readily available in many parts of Alaska.

“The energy content in these biofuels is simply not comparable to coal or oil, so it makes no sense to try to transport it long distances,” Sparrow said. “We’re looking primarily at local usage as a supplement to existing sources, rather than a sole energy source. But in rural Alaska if we could substitute, say, 30 percent biofuel for diesel, that would be fantastic.”

“There’s a lot of interest in utilizing biofuels in Western Alaska, near Bethel and on the Seward Peninsula,” Sparrow said. “They’re particularly interested in willows and native grasses that are well

Bob Vanveldhuizen, a research technician with UAF’s School of Natural Resources and Agricultural Sciences, harvests canola as part of a research study to determine the viability of biofuels.
adapted and easy to grow in that environment. We’re just trying to get a handle on whether these plants can produce enough energy to be worth carrying out some more detailed studies at the next stage.”

Zhang’s work includes studies of canola, or rapeseed, which has one of the highest oil contents of any domestic crop. Growing canola in Interior Alaska has been tried before without much success, primarily because of a short growing season that doesn’t give seeds enough time to mature, resulting in an unappealing green oil. But Zhang says biodiesel may be a viable alternative market for Alaska canola. “If it’s going into a fuel tank, it doesn’t matter what it looks like.”

Zhang said another benefit of growing canola in the Interior is that it provides a valuable rotational crop for local farmers.

“Most of the farmers in Delta have only been growing barley, but it would be good for the soil to rotate their fields with another marketable grain.”

And Zhang said he’s not ready to give up on canola as a source of commercial-grade food oil.

“Canola oil from central Canada sells for about $15 dollars a gallon in local grocery stores. I think the opportunity exists to be able to compete with that and create a market for locally produced, ‘Made in Alaska’ canola oil.”

**Biomass may be the only alternative to petroleum**

Meanwhile, at UAF’s Agricultural and Forestry Experiment Station in Palmer, research Assistant Professor Andy Soria is breaking new ground with his work in biofuels. Soria came to UAF’s Department of Forest Sciences after working in the alternative energy field in several corners of the world.

Soria’s research in Palmer involves breaking down the chemical components of various species of Alaska wood to create not only energy but other resources as well. Petroleum isn’t just what makes your car run — it’s also in the car’s steering wheel, seat cushion and floor mat. Energy can be derived from wind, sun and water, but products like plastic can’t, so Soria is investigating the possibilities of replacing hydrocarbons — the petroleum-based building blocks of products ranging from plastics to ingredients for lipstick — with plant-based materials.

“Nobody’s really looking at a tree or a plant from that particular perspective,” Soria said. “Once we understand what its makeup is, we can truly zoom in and figure out what products we can get out of it.”

Even though biomass has potential as both a sustainable energy source and hydrocarbon replacement, Soria said convincing decision makers is one of his biggest challenges.

“We’re so intertwined with a petroleum-based economy it’s really difficult,” he said. “We’re dealing with a complete multitrillion dollar infrastructure and we’re suddenly starting to develop something completely from scratch.”

For some, the switch to plants, trees and grasses for a range of uses is inevitable. The question for Alaskans is just how homegrown the new economy will be.

“The only source of energy that competes in real terms — based on the potential products — is biomass. It’s the only long-term solution for everything we use petroleum for — that’s it, plain and simple. There’s no other alternative.”

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**Glossary of Terms**

**Alternative fuels**
Fuel sources that appeal to unconventional or nontraditional interests, such as nuclear energy, biofuels, etc. (as opposed to fossil fuels, the traditional source of most fuel).

**Biofuel**
Any fuel derived from renewable biological sources, as plants or animal waste; esp., a liquid fuel for automotive engines made from corn or soybean oil.

**Biomass**
1. the amount of living matter (as in a unit area or volume of habitat) 2. plant materials and animal waste used especially as a source of fuel.

**Renewable energy**
Energy that can be replenished naturally, as solar, wind or water power.

**Sustainable**
Designating, of, or characterized by a practice that sustains a given condition, as economic growth or a human population, without destroying or depleting natural resources, polluting the environment, etc.

— per *Webster’s New World College Dictionary* and *Merriam-Webster Online*.

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Todd Paris, ’83, is a freelance writer, professional photographer and photo manager at UAF Marketing and Communications. He recently installed a pellet wood stove in his home.

Watch the making of canola oil and other biofuel processes at [www.uaf.edu/aurora/](http://www.uaf.edu/aurora/).
Pellets
little, lumpy and hot

By Tori Tragis

Fuel oil is normally a viscous, slow-moving material, more syrup than quicksilver, but the price of it sure has a way of defying gravity. In the past year, its budget-busting ascents into the atmosphere have sent hundreds of households in Interior Alaska scrambling for other, cheaper ways to heat their homes and businesses.

Electricity's out — it's inefficient and expensive, and those little portable heaters can be fire hazards. Wood stoves are popular, but getting the wood can be costly if you don't cut it yourself, and labor-intensive if you do. (Though there is that old, ahem, saw about cutting your own wood and heating yourself twice.) Wood stoves have widely varying degrees of efficiency, and can contribute to dangerously poor air quality.

Which brings us to pellets. Fairbanks-area merchants are doing a roaring business with pellet stoves and pellet boilers, which heat water for baseboard pipes as well as household use. Pellet stoves are the most popular, and can be found at smaller Fairbanks businesses like Ferguson Enterprises and The Woodway, and at box stores like Home Depot and Lowe's. North Pole Pipe and Supply sells barley-fueled boilers as quickly as they come in (the barley comes from Delta Junction farms), and they're considering adding a wood-pellet stove to their line-up.

Common among retailers is their forecast for continued demand for pellet stoves and boilers, and a corresponding need for a steady, plentiful and reliable supply of wood pellets.

Wood pellets are ground-up material compressed into uniform lumps that resemble beefed-up bran cereal; sometimes the wood is mixed with an adhesive material. Pellets' efficiency and heating value vary depending on the kind and quality of material used, and how it's made and burned, but in general, pellets can and should be considered a legitimate alternative to heating oil, especially in cold climates like Alaska where staying warm is tantamount to staying alive, and where the cost of fuel is creating ever-greater economic hardships.

Finding local solutions is crucial, notes Ron Brown, a wood-energy expert with the Alaska Energy Authority. Rural villages are desperate for relief from high fuel-oil costs. Freighting in pellets is a problem in the Bush because of a lack of adequate storage, which should be warm and dry. Even small homes need a few tons of pellets for a year, and large buildings like schools and community centers need much more. Finding space for all that isn't easy, but local production would mitigate some of the problem — and add to the local economy at the same time.

Steve Sparrow's work on local pellet production is still putting down roots, literally, in willow research plots around Alaska. Sparrow, of UAF's School of Natural Resources and Agricultural Sciences, and the Alaska Plant Materials Center are growing and testing six different willow species to see if they'd make a viable industry for growing and pelletizing in rural Alaska. The first harvest isn't until 2011 — a long time for financially strapped villages — but it's progress.

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