

EPA-RGI Regional Grass-Roots Biodiesel Works Proposal

**I. BASIC INFORMATION (5 Points)**

**DESCRIPTION**

Descriptive Project Title (8 words or less): **Grass-Roots Biodiesel Works**

Project Abstract (50 words or less): Small-scale biodiesel plants will be built, and with training, placed on farms, tribal lands, biodiesel cooperatives, and fleet operations. Biodiesel will be produced, displacing diesel fuel use and thereby reducing air, water and soil pollution. To ensure replication operators will reimburse costs allowing other sites to receive plants and training.

Location(s) of Project: Western Washington State

Physical description: Farms, Tribal lands, Local Biodiesel Cooperatives, Fleet operations.

City(ies): Bellingham, Carnation, Poulsbo, Seattle, San Juan Island Solid Waste, Lummi Nation, Squamish Tribe.

County(ies): Whatcom, King, Kitsap, San Juan, and Thurston Counties

State: WA Zip Code(s): 98225, 98110, 98104, 98250,

Watershed Name(s): South, Central and Northern Puget Sound

HUC 8 Digit USGS Hydrologic Code(s)

Congressional District(s):

<u>Watershed Name</u>	<u>USGS Code</u>	<u>County Name</u>	<u>Congressional District(s)</u>
Strait of Georgia	17110002	King	7,8,9
Nooksack	17110004	Kitsap	1,6
Puget Sound	17110019	Thurston	9,3
Lake Washington	17110012	Whatcom	2
Duwamish	17110013		
Deschutes	17110016		
Upper Chehalis	17100103		
Hood Canal	17110018		
Fraser	17110001		

**APPLICANT INFORMATION**

**Organization (Grantee): Living Earth Institute**

Street: 1930 Woodland Creek N.E.

City: Olympia State: WA Zip: 98516

Web Home Page: [www.livingearth.org](http://www.livingearth.org)

Tax Status: 501(c)(3)

Tax ID#:

Fiscal Year (month/day): January 1

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**Primary Contact(s):**

Project Contact: Bruce Barbour

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Fax: 360-647-1234

E-mail: bruce@rbosold.com

**ASSISTANCE AGREEMENT REQUEST**

RGI Funds Requested:	\$	49,800
Total Matching Funds:	\$	(cash)
	\$	65,000(in-kind)
Total:	\$	114,800

**SIGNATURE OF APPLICANT**

*(An original signature page must be received with this application)*

*I certify that the above information is true and accurate.*

\_\_\_\_\_  
*Signature of Executive Director or Project Officer*      March 12, 2003  
*Date*

Bruce Barbour, Project Officer  
*Name, Title*

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**II. THE PROPOSAL** (3 to 5 pages) (70 points)

**1. Problem Definition:** (10 Points) (a) Diesel fuel extraction, production, transportation, spills, and use create countless pathways of air, water and soil contamination. As a liquid, diesel fuel is a persistent pollutant toxic to aquatic and terrestrial organisms, and contaminates surface and ground waters. When used as a fuel some of the toxic particulates produced during combustion are known carcinogens. These carcinogenic and mutagenic particulates flow with storm water to streams impacting aquatic life including endangered salmon species.(b) Every pound of diesel burned produces 22 lbs of CO2 and other greenhouse gasses. The size of diesel engines in use makes diesel exhaust a significant contributor to global climate change. (c) Most restaurants in the Pacific NW are presently charged \$20 to \$40 per month to have their waste vegetable oil (WVO) picked up and disposed. This fee creates an incentive to dispose of the WVO in other ways. Many urban storm drains are plugged with grease which can introduce high biological oxygen demand in already stressed urban streams. This project proposes to address these problems in an innovative grass roots approach.

**2. Justification:** (10 Points). This project will make simple, safe and efficient biodiesel technology available to farms, tribes, fleet operators and cooperatives committed to making biodiesel work in the Pacific Northwest. Small-scale biodiesel plants will be built and placed at selected sites in the Puget Sound region. Training and follow-up contact at each location will ensure safe operation and high quality fuel product. If within the first few months of operation the operators do not produce a baseline of 50 gallons a week, the biodiesel the plant will be moved to another site. All biodiesel produced by these plants will be assessed at fifty cents per gallon up to the cost of building, placing and training. This fee will be deposited in the Grass-Roots Biodiesel Account. When enough funding has been returned more biodiesel plants will be built and placed. The cost of materials in the production of biodiesel is about fifty cents a gallon. With the assessment each plant can produce biodiesel at about a dollar a gallon plus labor. Labor takes between one and two hours to produce a batch of biodiesel.

The power of making your own fuel cannot be underestimated. Some obvious biodiesel benefits include freedom from the high cost of fuel, coupled with the potential to create small businesses. Keeping resources in the community to build that community makes common sense. Making your own fuel gives you the power to create a new and sustainable future. This project proposes to tap that power for people with the commitment to make it happen.

But first, a little background on biodiesel.

Chart 1: Biodiesel Emissions Compared to Conventional Diesel Fuel		
EMISSION TYPE	B100 (neat 100% Biodiesel)	B20 (20% Blend)
<b>Regulated</b>		
Total Unburned Hydro Carbons	-93%	-30%
Carbon Monoxide	-50%	-20%
Particulate Matter	-30%	-22%
NOx (Nitrogen Oxides)	+13%	+2%
<b>Non-regulated</b>		
Sulfates	-100%	-20%*

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PAH (Polycyclic Aromatic Hydrocarbons)**	-80%	-13%
nPAH (nitrated PAH's)**	-90%	-50%***
Ozone potential of speciated Hydrocarbons	-50%	-10%

*Source: EPA results of potential health effects study, under Clean Air Act Section 211(b)*

\*Estimated from B100 result

\*\*Average reduction across all compounds measured

\*\*\*2-nitroflourine results were within test method variability

In 1895, Rudolf Diesel developed the diesel engine to run on raw vegetable oil. His one-hundred year old engine still runs on peanut oil. Today's diesel engine has been modified to burn petroleum diesel fuel. Biodiesel is a chemically processed vegetable oil that readily burns in modern diesel engines. Biodiesel can be made from raw vegetable oil, used French-fryer grease and/or lard. For every one unit of energy needed to produce biodiesel, 3.24 units of energy are gained. This is the best energy balance of any liquid fuel available. It takes more energy to produce petroleum diesel than you get from it. The overall ozone (smog) forming potential of biodiesel is less than diesel fuel. The ozone forming potential of the speciated hydrocarbon emissions was nearly 50% less than that measured for diesel fuel.

Sulfur emissions are essentially eliminated with pure biodiesel. The exhaust emissions of sulfur oxides and sulfates (major components of acid rain) from biodiesel are essentially eliminated compared to sulfur oxides and sulfates from diesel.

Biodiesel reduces the health risks associated with petroleum diesel. NOx emissions from biodiesel increase or decrease depending on the engine family and testing procedures. However, biodiesel's lack of sulfur allows the use of NOx control technologies that cannot be used with conventional diesel.

If biodiesel should spill during transport, the environmental effects are minimal and short-term, compared to a diesel fuel spill. Biodiesel is non-toxic and biologically degrades by 99.6% within 21 days of hitting the ground or marine waters. Another market for biodiesel is in its application during a petroleum spill to prevent damage to beaches and rocky shores.

Biodiesel is an excellent choice world-wide because; it can be used in all diesel vehicles, vessels and generators, used in blends, utilizes current fueling infrastructure, it's non-toxic and biodegradable, increases lubricity (1% biodiesel increases petroleum diesel lubricity up to 65%), higher Cetane rating, higher flash point, same engine performance, safe to transport and handle, and reduced emissions.

A 1998 biodiesel lifecycle study, jointly sponsored by the United States Department of Energy (DOE) and the US Department of Agriculture (USDA) concluded that biodiesel replaces net CO<sub>2</sub> emissions by 78.5%. Burning biodiesel in diesel engines releases 78.5% less carbon dioxide than burning petroleum diesel fuel. For every gallon of biodiesel sold 17.571 pounds of Carbon Dioxide is permanently displaced, (based on the US Department of Energy Fossil Fuel Conversion Factors Table).

Biodiesel is poised for rapid growth because the groundwork has been completed in three major areas.

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(1) Biodiesel is the only alternative fuel in the country to have completed the United States Environmental Protection Agency's (EPA) three-year, \$2.2 million testing regimen. Biodiesel is now registered with the EPA as a fuel additive and complies with all health effects testing required by 211(b) of the Clean Air Act Amendments of 1990.

(2) In November 1998 and January 2001, the Energy Policy Act amendments defined biodiesel as an alternative fuel and income tax incentives for diesel operators to use biodiesel.

(3) In December 2002, the American Society of Testing and Materials (ASTM) issued a permanent specification (D6751-02) for biodiesel fuel. ASTM is the premier standard setting organization in the U.S. The EPA has adopted the ASTM standard for biodiesel. These standards were critical to ensure fuel quality for biodiesel in the U.S. Market.

Oil feedstocks can come from waste oil sources or from virgin seed oils. The marketing of small-scale biodiesel plants in the Pacific NW will focus on free recycled vegetable oil. It has been estimated that 3-5 gallons of waste vegetable oil (WVO) is produced per capita in the Pacific NW. Washington State has a population of about 6 million people. That means that there is an estimated 24 million gallons of waste vegetable oil produced in Washington State alone. Assuming that the average household biodiesel plant in the Pacific NW produces 25 gallons a week Washington's waste oil could support 20,000 small-scale biodiesel plants.

Today most biodiesel is produced in the Mid-west at the industrial scale and is more expensive than petroleum diesel fuel. The reason for this is that industrial overhead, labor, transportation, and the high cost of virgin soy bean oil keeps the price of industrial biodiesel 3 to 4 times that of petroleum diesel.

These costs are dramatically reduced in a small-scale biodiesel plant. This is true because of the lower overhead, labor and feedstock costs found in small-scale biodiesel production. The material costs of producing biodiesel can be as little as \$.45 / gallon, this includes waste vegetable oil (WVO), and all necessary chemicals. A single 80 gallon batch of biodiesel will require about an hour of labor. The cost of a small-scale biodiesel plant is about \$3,000. The chemicals used are simply lye and alcohol (methanol or ethanol). The only waste is another product, glycerin, which can be used as soap or refined and sold. Making biodiesel is relatively simple once you figure out the process. This project will provide decades of small-scale biodiesel production experience to people and organizations in the Puget Sound region. The biodiesel plants for this project have been designed for safety, low cost, ease of use, and are highly efficient. The biodiesel plants will be manufactured by two biodiesel plant companies, Biodiesel Works and Biodiesel Gear. Training will be provided by Biodiesel Works.

This project will put the power of biodiesel fuel production and use in the hands of those with the motivation and ability to make it work.

3. **Milestones:** (5 points) Each biodiesel plant placed will act as an educational opportunity for other people in the target sectors. Biodiesel plants will be made available to other interested parties. Biodiesel production and use will spread with each success.

Each biodiesel plant placed will produce an average of 100 gallons per week or about 5,000 gallons per year. The life expectancy of a biodiesel plant is between 10 and 20 years. Each plant will produce an estimated 50,000 gallons of biodiesel in ten years.

This translates into 50,000 gallons of diesel fuel displaced by biodiesel, meaning less

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pollution to the water and soil and less diesel exhaust polluting the air. Each biodiesel plant will reduce CO2 emissions from diesel engines by 405 metric tons.

Six to eight biodiesel plants will be built, people trained and biodiesel produced within the first project year. Benefits from the biodiesel use will follow. Year two will take returning funds to the Grass-Roots Biodiesel Fund, build and place more plants, improved from lessons learned and the process will continue as long as there is an interest in producing biodiesel on a small scale.

### **4. Timeline:** (10 points)

**May 2003 – November 2003** --- Develop environmental benefits & accounting systems

**July 2003- January 2004** --- Purchase materials and build six biodiesel plants.

**November 2003** --- Place first biodiesel plant and train personnel in its safe operation.

**January 2004** --- Place two biodiesel plants and train personnel in its safe use.

**February 2004** – Place two biodiesel plants and train personnel in its safe use.

**November 2003 – December 2004** --- Provide ongoing training and learn from users on how to make improvements in plant designs and biodiesel production techniques.

**November 2003 – December 2004** --- Gather 50 cent per gallon on biodiesel produced from subsidized biodiesel plants to fund additional biodiesel plants.

**December 2004 – December 2005** --- Build, train, and place additional plants at new sites

**November 2003 – December 2005** --- Provide EPA with quarterly reports, or as required on progress made and obstacles encountered.

### **5. Feasibility/Capacity to Achieve Results:** (5 Points) **Living Earth Institute (LEI):**

Sustainable Development Program LEI provides education and technical assistance in establishing sustainable development. This effort goes beyond education programs to protect natural resources against adverse effects of new development. LEI also devotes resources towards developing restorative education programs to reverse damage caused by past development. Education of sustainability are guided by the concepts of "deep ecology". These concepts focus on a new ecologically-based science that promotes a sense of the human place coexisting with nature. The new science draws on design with nature, rather than the imposition on nature. LEI provides education and technical assistance to citizen groups pursuing projects in the sustainable use of natural resources. LEI's membership is knowledgeable on the issues of sustainability. The LEI membership uses their knowledge on sustainable development to educate citizen groups. LEI members also provides technical assistance to citizen groups to identify and select sustainable alternatives to adverse impacts from past or future development.

**Biodiesel Works of Washington State** is a for-profit think-tank of people, organizations, and businesses committed to the development of people and planet friendly energy products. Biodiesel Works has been developing, designing, operating and building small-scale biodiesel plants for three years. Biodiesel Works will act as contact and coordinator for this project. Biodiesel Works will supply biodiesel production training and small-scale biodiesel plants to identified farms, tribes, fleet operators, and cooperatives.

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This project uses proven technology and provides the training and follow-up technical assistance to ensure success on the ground. The staff has all the skills, training and experience to make this a quality project.

**6. Project Evaluation:** Describe the approach to be used for evaluating the short and long-term effects of the project. Ideally, environmental indicators should be used to document success, but shorter-term measures of success based on activity measures and project milestones are also valid. (10 Points) The evaluation of this project will be accomplished through first successful construction, placement, training and operation of the biodiesel plants. Monitoring and verifying CO<sub>2</sub> benefit will be relatively simple. All biodiesel produced for use in diesel engines will be accounted for. A conversion factor of 17.571 pounds of CO<sub>2</sub> will be multiplied by gallons produced the result is the pounds of CO<sub>2</sub> avoided. Verification of gallons of biodiesel produced will be monitored by, WSU Extension and/or Biodiesel Works.

**7. Baseline Inventory:** (5 points) The obstacles to small-scale biodiesel production can be found in the cost of installing small-scale plants and the training required to make the biodiesel plant successfully produce quality biodiesel. Presently only a few determined individuals and development professionals are moving biodiesel plants into the market place. In the Pacific NW there is a small following of biodiesel enthusiasts but no successful effort to make biodiesel production available to everyone. In the absence of this proposed project effective small-scale biodiesel plant placement will most likely grow slowly and into limited markets in the Pacific NW and beyond. If this project is funded small-scale biodiesel production will get a giant boost in the Pacific NW.

**8. Leveraging/Replication:** (5 Points) It is hoped that the project will evolve into a business that promotes biodiesel throughout Region 10 and the rest of the US. The object of this project is to make biodiesel production and use available to anyone committed to environmentally sound fuel independence. Interest is growing rapidly and will likely continue for at least another decade. It is highly likely that this project will continue to grow, be adopted and replicated throughout the US. Participants are willing to provide the labor, land and learning required to successfully produce biodiesel fuels. This project provides the technology and the training to make it possible.

**9. Alignment with Others' Plans and Priorities:** (5 Points) This project ties into many existing air and water quality plans as well as pollution prevention plans and other efforts. The Puget Sound Water Quality Action Plan, the Northwest Air Pollution Authority Plan, the Salmon Recovery Plan, the WIRA 1 Limiting Factors Report, The Solid Waste Plans for Whatcom, San Juan, King, Kitsap and Thurston Counties. The Clean Cities Coalition Plan for greater Seattle-Tacoma-Bremerton.

**10. Meeting Challenges:** (5 Points) We have already identified three biodiesel cooperatives, one tribe, one Public Works Department (fleet operator) and two farms that are committed to making and using biodiesel as an alternative fuel. The recent surge in biodiesel publicity has created a problem of too many interested parties. However, this increased interest will give us

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the opportunity to be more selective in placing biodiesel plants. Replicability is a key part of this project. We will collect a 50 cent per gallon assessment for every gallon produced up to the value of the plant and training. Tracking production and payments may be problematic. Re-payment of the cost of the equipment and training will be contracted in writing at the beginning of the program. Payment will larger depend on the honor system.

**III. BUDGET** (10 points)

This project proposes to purchase the components and to build at least six small-scale (30-110 gallon continuous batch process) biodiesel plants. It will also purchase the laboratory equipment necessary in the recycling of WVO into biodiesel and the equipment to store, filter and deliver fuel to vehicles. Training of personnel assigned to make biodiesel will be provided along with continuing technical support as questions arise. As biodiesel production begins, a fifty cent per gallon fee will be assessed. This fund will build, train and place more biodiesel plants in Region 10. A web site will be produced to describe the project and promote biodiesel to other potential users and producers

Budget Category	RGI Funds Requested	Matching Contributions (Including In-Kind)	Anticipated Partner Contributions (Including In-Kind)	Total	What will be purchased/accomplished?
Salaries & Benefits	12,800		30,000	42,800	Pays for construction of biodiesel plants and auxiliary systems and placement at a \$30.00 hourly rate Partner Contribution: Salary and benefits to attend training and then produce biodiesel over 2 year project period.
Travel	2,000		2,000	4,000	Site to site sales, set-up, training, checkups, collection. Partner Contribution: Travel to training and grease collection
Equipment	20,000	15,000		35,000	RGI will purchase the materials and tools to manufacture at least; Six biodiesel plants, six mini-labs, six collection systems, and six fuel delivery systems and a trailer to deliver plants <b>Match will purchase;</b> Demonstration diesel vehicle supplied with a demonstration small-scale biodiesel plant.

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Supplies/ Materials	1,000		6,000	7,000	Purchase office materials, methanol and lye for demonstration project. Partner Contribution: Will purchase methanol and lye for biodiesel production.
Contractual Services	11,000	6,000		17,000	Accounting and Purchasing 10% of grant. Training for biodiesel plant use. Contract to have web site developed. <b>Match:</b> Shop rental for production of biodiesel plants and systems
Printing/ Outreach	2,000			2,000	Web site development, educational materials.
Other	1,000		6,000	6,000	Telephone charges, postage, Partner Contribution: Land to site biodiesel plant for two years.
Totals	\$ 49,800	\$ 21,000	\$ 44,000	\$114,800	

We recognize that minor adjustments to the budget may need to be made on the final application for successful applicants.

**\*\* Budget Guidelines**

<u>Line Item</u>	<u>Additional Information the Applicant Must Provide</u>
Salaries & Benefits	Biodiesel plant and auxiliary systems manufacturing and delivery to sites is estimated at 10% of engineers annual salary for two years. Six dollars an hour are estimated benefits cost.
Travel	Travel will include site visits, trainings, troubleshooting, to all biodiesel plant sites originally placed throughout Puget Sound and potentially Region 10
Equipment	NOTE: None of these have a value of \$5,000 or more. Tanks, pumps, valves, pipes, connectors, joints , heaters, stands, connectors, static mixers, chemical venturi injection systems, digital camera, shop vac, ladder, digital movie camera, portable computer, electrical parts, timers, automation, lab equipment, beakers, gloves, PPE, pH meters, scales, hydrometers. Small trailer to deliver biodiesel plants.
Supplies/Materials	Methanol, sodium and/or potassium hydroxide, paper towels, rags, plumbing supplies,
Contractual Services	10% overhead will be paid to Living Earth Institute to manage this grant. Training will be contracted through Biodiesel Works to provide training to all biodiesel plant site personnel followed by technical assistance on request. Will contract for web site development.

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Printing/Outreach	Will develop a website to describe and promote this project specifically and biodiesel plants and products in general. This site will be maintained by Biodiesel Works. Flyers, brochures, decals will also be produced
Other (Please describe)	postage, long distance phone

**IV. STAFF QUALIFICATIONS (10 Points)**

**Bruce Barbour** is president of Biodiesel Works, has a BS in Environmental Sciences and an MA in Environmental Science, Policy and Administration from the University of Rhode Island. Bruce has 10 years of experience working for the Washington State Department of Ecology, managing large-scale grant funded projects specializing in land purchase, pollution prevention and, salmon restoration.

**Roger Leischner** is a process engineer with fifteen years of experience and has designed and built numerous small-scale biodiesel plants.

**Terry Watness** is a CPA in Olympia, with twenty years experience managing non-profit organizations.

**V. LETTERS OF COMMITMENT AND CONTRIBUTIONS (5 points) See Attached:**

**Project Partner Contributions:**

Please list the names of all organizations contributing funds, goods or services to this project and value of the contribution:

<i>Organization name; designate as (F)ederal or (N)on-Federal</i>	<i>Dollar value of contribution</i>	<i>Indicate nature of contribution (e.g, cash or specific goods and services)</i>	<i>Indicate whether contribution is (A)ppled for, (P)ledged, or (I)n hand</i>
San Juan County Public Works – Non Federal	\$7,500	Land, personnel, and materials to make biodiesel	Mostly in hand have pledge to provide materials to make biodiesel.
Biodiesel Works – Non Federal	\$21,000	Shop to produce biodiesel plants, ¾ ton turbo diesel powered demonstration vehicle, Small-scale biodiesel plant for demos.	In Hand
Olympia Biodiesel Cooperative – Non Federal	\$7,500	Land, personnel, and materials to make biodiesel	In Hand with pledge to provide materials to make biodiesel

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Bellingham Biodiesel Cooperative – Non Federal	\$7,500	Land, personnel, and materials to make biodiesel	In Hand with pledge to provide materials to make biodiesel
Two Farms and a tribe have made initial commitments to this project. – Non Federal	\$21,500	Land, personnel, and materials to make biodiesel	A Soon to be in hand, still have to get firm commitment in writing.