

# Clean Cities' Guide to Alternative Fuel Commercial Lawn Equipment







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Powering commercial lawn service equipment with alternative fuels is an effective way to reduce petroleum use. A single alternative fuel commercial lawnmower can annually use as much gasoline or diesel fuel as a commercial work truck. Alternative fuels can also reduce pollutant emissions compared with conventional fuels. Numerous biodiesel, compressed natural gas, electric, and propane mowers are now available to help keep the grass green and the nation clean.

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Image courtesy of Ferris Industries



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Turf grass is a fixture of the American landscape and the American economy. It is the nation's largest irrigated crop, covering more than 40 million acres.<sup>1</sup> Legions of lawnmowers care for this expanse during the growing season—up to year-round in the warmest climates. The annual economic impact of the U.S. turf grass industry has been estimated at more than \$62 billion.<sup>2</sup>

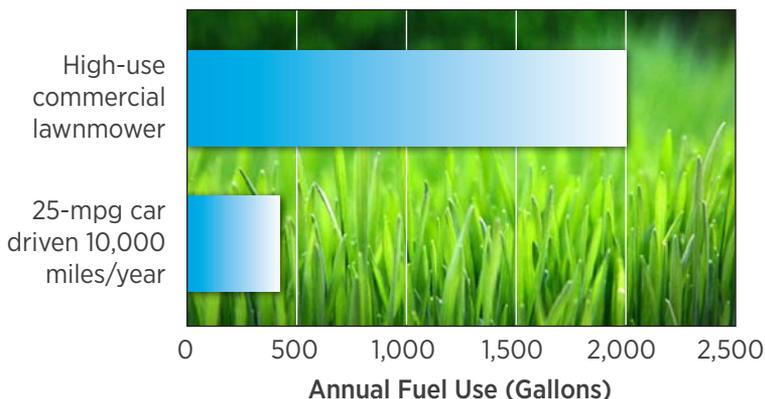
Lawn mowing also contributes to the nation's petroleum consumption and pollutant emissions. Mowers consume 1.2 billion gallons of gasoline annually, about 1% of U.S. motor gasoline consumption. Commercial mowing accounts for 35% of this total and is the highest-intensity use. Large property owners and mowing companies cut lawns, sports fields, golf courses, parks, roadsides, and other grassy areas for 7 hours per day and consume 900 gal to 2,000 gal of fuel annually depending on climate and length of growing season. In addition to gasoline, commercial mowing consumes more than 100 million gallons of diesel annually.

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<sup>1</sup> Energetics Inc. 2009. *Propane Reduces Greenhouse Gas Emissions: A Comparative Analysis*. Washington, D.C.: Propane Education & Research Council.

<sup>2</sup> Haydu, J.J.; Hodges, A.W.; and Hall, C.R. 2006. *Economic Impacts of the Turf-grass and Lawn-care Industry in the United States*. Gainesville, Fla.: University of Florida IFAS Extension, <http://edis.ifas.ufl.edu/fe632>.





*Commercial lawnmowers can consume more fuel than a typical car. iStock*

Alternative fuel mowers are one way to reduce the energy and environmental impact of commercial lawn mowing. They can reduce petroleum use and emissions compared with gasoline- and diesel-fueled mowers. They may also save on fuel and maintenance costs, extend mower life, reduce fuel spillage and fuel theft, promote a “green” image, and may not be subject to operational restrictions on ozone alert days.

To help inform the commercial mowing industry about product options and potential benefits, the National Renewable Energy Laboratory produced this first edition of Clean Cities’ guide to alternative fuel commercial lawn equipment. Although the guide’s focus is on original equipment manufacturer (OEM) mowers, some mowers can be converted to run on alternative fuels. For more information on propane conversions, see page 8.

This guide may be particularly helpful for organizations that are already using alternative fuels in their vehicles and have an alternative fuel supply or electric charging in place (e.g., golf cart charging stations at most golf courses). On the flip side, experiencing the benefits of using alternative fuels in mowing equipment may encourage organizations to try them in on-road vehicles as well. Whatever the case, alternative fuel commercial lawnmowers are a powerful and cost-effective way to reduce U.S. petroleum dependence and help protect the environment.



## Biodiesel

Biodiesel is a renewable alternative fuel produced domestically from a wide range of vegetable oils and animal fats. It is nontoxic and can reduce pollutant emissions compared with petroleum diesel. It also improves engine operation by raising diesel fuel's lubricity and combustion quality. Biodiesel blended with petroleum diesel can be used to fuel diesel vehicles without modifying the vehicles—20% biodiesel and 80% petroleum diesel (B20) is the most popular blend. B20 or other biodiesel blends are approved for use with some diesel-powered commercial lawnmowers without modification. Contact mower manufacturers to determine if B20 is approved for use in their diesel products.

## Compressed Natural Gas (CNG)

Virtually all natural gas consumed in the United States is produced in North America, and, compared with gasoline and diesel engines, natural gas engines can produce lower amounts of some harmful emissions and the greenhouse gas carbon dioxide. The cleaner-burning nature of natural gas may result in reduced maintenance requirements, such as less-frequent oil changes, and extended mower life. In addition, natural gas does not spoil or clog fuel systems in lawn equipment during seasonal storage, whereas liquid fuels can.

Natural gas must be compressed and stored at high pressure to enable adequate mowing time. This sealed and pressurized fuel-storage system has the advantage of eliminating evaporative emissions and spillage, as well as the potential fuel theft sometimes associated with liquid-fueled lawn equipment. As of August 2010, there were more than 800 CNG fueling stations in the United States with stations in almost every state. Over the past decade, CNG has been the least expensive U.S. motor fuel.

### Dixie Chopper

- Web Site: [www.dixiechopper.com](http://www.dixiechopper.com)
- Dealer Locator:  
[http://dixiechopper.com/dealer\\_locator](http://dixiechopper.com/dealer_locator)

### Xcaliber Eco-Eagle

- Cutting Deck Size: 66 in.
- Engine: Generac 990 cc
- Manufacturer's Suggested Retail Price (MSRP): \$19,685
- Basic Commercial Warranty: 3 years



Courtesy of manufacturer



## Electricity

Electric power is quiet, requires little maintenance, and produces no tailpipe emissions. Electric mowers connected to an electricity supply with a cord or powered with rechargeable batteries are popular for residential use, but the rigors of commercial mowing have limited their use for this application to date. However, recent improvements in battery technology have resulted in new products with potential commercial application. Hustler Turf's Zeon—the first all-electric, zero-turn-radius mower—provides up to 80 minutes of continuous mowing time, enough to mow more than an acre. The Ariens AMP Rider provides up to 75 minutes of continuous mowing time.

### Ariens

- Web Site: [www.ampbyariens.com](http://www.ampbyariens.com)
- Dealer Locator:  
[www.ampbyariens.com/whereRedirect.html](http://www.ampbyariens.com/whereRedirect.html)

#### AMP Rider

- Cutting Deck Size: 34 in.
- Propulsion: Traction Drive,  
4 horsepower (HP), 48 volts (V)
- MSRP: \$3,299
- Basic Commercial Warranty: None



### Hustler Turf

- Web Site: [www.hustlerturf.com](http://www.hustlerturf.com)
- Dealer Locator:  
[www.hustlerturf.com/pages/find\\_a\\_dealer.htm](http://www.hustlerturf.com/pages/find_a_dealer.htm)

#### Zeon

- Cutting Deck Size: 42 in.
- Propulsion: Hydro-Gear, 48 V,  
82 foot-pound (ft-lb) maximum torque
- MSRP: \$6,999
- Basic Commercial Warranty: 1 year



Photos courtesy of manufacturers

## Propane

Also known as liquefied petroleum gas or LPG and autogas, propane is the most widely available alternative transportation fuel in the United States. As of August 2010, there were 2,503 propane vehicle fueling stations with locations in all 50 states. Most propane consumed in the United States is produced domestically, and, compared with gasoline and diesel engines, propane engines can produce lower amounts of some harmful emissions and carbon dioxide, a greenhouse gas. The cleaner-burning nature of propane may result in reduced maintenance requirements, such as less-frequent oil changes, and extended mower life. Also, like CNG, propane does not spoil or clog fuel systems in lawn equipment during seasonal storage, which can be the case with liquid fuels.

Propane is stored as a liquid under relatively low pressure and becomes a gas at normal pressure (meaning it enters the engine as a gas). The liquid storage gives it a high energy density, so a mower can run a long time on a tank of fuel, while the sealed and pressurized storage has the advantage of eliminating evaporative emissions and spillage as well as potential fuel theft.

There are two options in the propane arena: Buying an OEM propane mower, or converting a conventional one to run on propane. One company, EnviroGard, patented the propane technology found on OEM mowers from many manufacturers and also converts gasoline mowers (and other gasoline-powered equipment) to propane. The company's conversion kits range from 6.5 HP to 37 HP.

Like OEM products, the conversions are certified by the U.S. Environmental Protection Agency. EnviroGard conversion centers throughout the country perform the conversions. Contact the company to locate the nearest conversion center. For mower fleets not near a conversion center, EnviroGard will send a mechanic to your location to perform the conversion. For large-volume conversions, EnviroGard will train the fleet's mechanics about how to convert and maintain the mowers. Propane mower conversions cost \$1,000 to \$3,000, including parts and labor. For more information about EnviroGard, visit [www.onyx solutions.com/lawn-care.php](http://www.onyx solutions.com/lawn-care.php).

To find other companies that could perform propane mower conversions, contact your state's Propane Gas Association (see [www.npga.org/i4a/pages/index.cfm?pageid=544](http://www.npga.org/i4a/pages/index.cfm?pageid=544) for a list of association Web sites) or use the Propane Education & Research Council's (PERC) Find a Propane Retailer tool ([www.usepropane.com/fpr.aspx](http://www.usepropane.com/fpr.aspx)).



## Ariens/Gravely

- Web Site: [www.gravely.com](http://www.gravely.com)
- Dealer Locator: [www.gravely.com/dealerlocator](http://www.gravely.com/dealerlocator)

### **Pro-Master XDZ 260H LP**

- Cutting Deck Size: 60 in.
- Engine: Generac 28 HP
- MSRP: \$12,699
- Basic Commercial Warranty: 2 years



## Bad Boy

- Web Site: [www.badboymowers.com](http://www.badboymowers.com)
- Dealer Locator: [www.badboymowers.com/locations.php](http://www.badboymowers.com/locations.php)

### **6000 Lightning Propane**

- Cutting Deck Size: 60 in.
- Engine: Briggs & Stratton 32 HP
- MSRP: \$11,699
- Basic Commercial Warranty: 1 year



## Bob-Cat

- Web Site: [www.bobcatturf.com](http://www.bobcatturf.com)
- Dealer Locator: [www.bobcatturf.com/Dealer\\_Locator](http://www.bobcatturf.com/Dealer_Locator)

### **Predator-Pro LP**

- Cutting Deck Size: 61 in.
- Engine: Generac 30 HP
- MSRP: \$13,032
- Basic Commercial Warranty: 2-year/2,000-hour or 5-year/500-hour



Photos courtesy of manufacturers



### **Cub Cadet**

- Web Site: [www.cubcadet.com](http://www.cubcadet.com)
- Dealer Locator: [www.cubcadet.com](http://www.cubcadet.com)

#### **TANK S LP**

- Cutting Deck Size: 60 in. and 72 in.
- Engine: Kawasaki 852 cc (60-in model)  
Kawasaki 999 cc (72-in model)
- MSRP: \$15,699 (60-in model)  
\$16,699 (72-in model)
- Basic Commercial Warranty: 3 years



### **Dixie Chopper**

- Web Site: [www.dixiechopper.com](http://www.dixiechopper.com)
- Dealer Locator:  
[http://dixiechopper.com/dealer\\_locator](http://dixiechopper.com/dealer_locator)

#### **Xcaliber Propane**

- Cutting Deck Size: 66 in. and 74 in.
- Engine: Generac 990 cc
- MSRP: \$13,065 (66-in model)  
\$13,199 (74-in model)
- Basic Commercial Warranty: 3 years



### **Exmark**

- Web Site: [www.exmark.com](http://www.exmark.com)
- Dealer Locator: [www.exmarkdealer.com](http://www.exmarkdealer.com)

#### **Turf Tracer Propane**

- Cutting Deck Size: 52 in. and 60 in.
- Engine: Kawasaki 24 HP
- MSRP: \$9,468 (52-in model)  
\$9,578 (60-in model)
- Basic Commercial Warranty: 2 years



Photos courtesy of manufacturers

Exmark continued

### Turf Tracer HP Propane

- Cutting Deck Size: 48 in. and 52 in.
- Engine: Kawasaki 20 HP
- MSRP: \$7,999 (48-in model)  
\$8,199 (52-in model)
- Basic Commercial Warranty: 2 years



### Lazer Z Propane

- Cutting Deck Size: 60 in. and 72 in.
- Engine: Kawasaki 29 HP
- MSRP: \$12,499–\$13,299 (60-in model)  
\$12,999 (72-in model)
- Basic Commercial Warranty: 3 years



## Ferris Industries

- Web Site: [www.ferrisindustries.com](http://www.ferrisindustries.com)
- Dealer Locator: <http://ferris.via.infonow.net/locator>

### IS3100ZP

- Cutting Deck Size: 61 in. and 72 in.
- Engine: Briggs & Stratton 895 cc
- MSRP: \$13,799 (61-in model)  
\$14,249 (72-in model)
- Basic Commercial Warranty: 2 years



Photos courtesy of manufacturers



## **Husqvarna**

- Web Site: [www.husqvarna.com](http://www.husqvarna.com)
- Dealer Locator: [www.husqvarna.com/us/landscape-and-groundcare/dealers/dealer-locator](http://www.husqvarna.com/us/landscape-and-groundcare/dealers/dealer-locator)

### **PZ6029PFX**

- Cutting Deck Size: 60 in.
- Engine: Kawasaki 29 HP
- MSRP: \$11,299
- Basic Commercial Warranty: 3 years



## **SCAG Power Equipment**

- Web Site: [www.scag.com](http://www.scag.com)
- Dealer Locator: [www.scag.com/locator](http://www.scag.com/locator)

### **Turf Tiger LP**

- Cutting Deck Size: 52 in. and 61 in.
- Engine: Kohler
- MSRP: \$12,900 (52-in model)  
\$13,065 (61-in model)
- Basic Commercial Warranty: 2 years



### **Turf Tiger Dual Fuel**

- Cutting Deck Size: 61 in.
- Engine: Kubota Dual-Fuel 31 HP (gasoline),  
29 HP (propane)
- MSRP: \$18,425
- Basic Commercial Warranty: 2 years



Photos courtesy of manufacturers

## **Snapper Pro**

- Web Site: [www.snapperpro.com](http://www.snapperpro.com)
- Dealer Locator: <http://snapperpro.via.infonow.net/locator>

### **S200xp**

- Cutting Deck Size: 61 in.
- Engine: Briggs & Stratton 895 cc
- MSRP: \$10,299
- Basic Commercial Warranty: 2 years



## **Zipper Mowers**

- Web Site: [www.zippermowers.com](http://www.zippermowers.com)
- Dealer Locator: [www.zippermowers.com/dealers.html](http://www.zippermowers.com/dealers.html)

### **STS-28 LP**

- Cutting Deck Size: 64 in. and 74 in.
- Engine: Kawasaki 28 HP
- MSRP: \$12,750 (64-in model)  
\$13,158 (74-in model)
- Basic Commercial Warranty: 1 year



### **VR-31 LP**

- Cutting Deck Size: 50 in. and 60 in.
- Engine: Kawasaki 31 HP
- MSRP: \$10,659 (50-in model)  
\$10,914 (60-in model)
- Basic Commercial Warranty: 1 year



Photos courtesy of manufacturers

## Special Considerations

Some mower engines are designed to run on alternative fuels with little or no modification. Others are not. Using alternative fuels or fuel blends that are not specifically approved for your equipment can cause serious damage to the engine or significantly reduce performance. To ensure alternative fuel or fuel blend use won't damage your mower, be sure to consult your equipment's owner's manual or contact the manufacturer or dealer.

## Incentives

Various financial incentives may be available for alternative fuels and alternative fuel mowers. For example, in June 2010, the Propane Council of Texas began awarding \$1,000 incentives for the purchase of dedicated propane mower purchases or conversions (on a first-come, first-serve basis). See [www.txpropane.com/propanetexasfueltexasproudpropanelawnmower.html](http://www.txpropane.com/propanetexasfueltexasproudpropanelawnmower.html) for more information about this program. A similar program run through the Central Texas Clean Cities Coalition incentivized 55 propane mower conversions and purchases. PERC offered \$2,500 incentives for the purchase of new propane mowers through its Propane FEED (Farm Equipment Efficiency Demonstration) program.

In 2009, the Greener Gardens Act was introduced in the U.S. House of Representatives. If passed, the Act would allow a tax credit for 25%, up to \$1,000, of the cost of qualified non-road equipment powered by certain alternative and renewable power sources, including alternative fuel lawn-mowers. Alternative fuel mowers also may be eligible for some federal and state incentives that are available for alternative fuel vehicles. See the Alternative Fuels and Advanced Vehicles Data Center's Federal and State Incentives and Laws section at [www.afdc.energy.gov/afdc/laws](http://www.afdc.energy.gov/afdc/laws) for more information about other incentives that may apply to alternative fuel mowers.

Another incentive is the unrestricted use of clean alternative fuel mowers on "ozone action days" in some cities. These are days when high ozone pollution levels trigger restrictions on operation of conventional fuel mowers, but alternative fuel mowers are left to operate freely because of their clean-burning characteristics. This gives alternative fuel mower operators an advantage over competitors who use conventional fuels only.



## Resources

iStock

Visit the following Web sites for more information about alternative fuels and alternative fuel lawnmowers.

All Propane Mowers

[www.allpropanemowers.com](http://www.allpropanemowers.com)

Alternative Fuels and Advanced Vehicles Data Center

[www.afdc.energy.gov/afdc](http://www.afdc.energy.gov/afdc)

AmeriGas

[www.amerigas.com](http://www.amerigas.com)

Blossman Gas

[www.propanemowerfueling.com](http://www.propanemowerfueling.com)

Ferrellgas

[www.ferrellgas.com](http://www.ferrellgas.com)

Heritage Propane

[www.heritagepropane.com](http://www.heritagepropane.com)

Metro Lawn

[www.gogreenmetrolawn.com](http://www.gogreenmetrolawn.com)

National Propane Gas Association

[www.npga.org](http://www.npga.org)

Propane Education & Research Council

[www.propanecouncil.org](http://www.propanecouncil.org)

Texas Propane Gas Association/Propane Council of Texas

[www.txpropane.com](http://www.txpropane.com)





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*Front cover images (top to bottom):* Courtesy of Cub Cadet (example of a diesel mower that can run on biodiesel), Snapper Pro, Ferris Industries

*Back cover:* Courtesy of Snapper Pro