



Biofuel Potential of Kentucky Rights-of-Way

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Alarming Trends in Biofuels

- Habitat destruction
- Fuelstock type
- Land use conversion
- Economic cost
- Fuel first, food second mentality



Prairie Switchgrass (*Panicum virgatum*)

- Cellulosic ethanol or a stock for heterotrophic algae
- Warm-season grass
- Perennial
- Erosion control
- High nutrient use efficiency
- Native to KY
- Difficult to establish





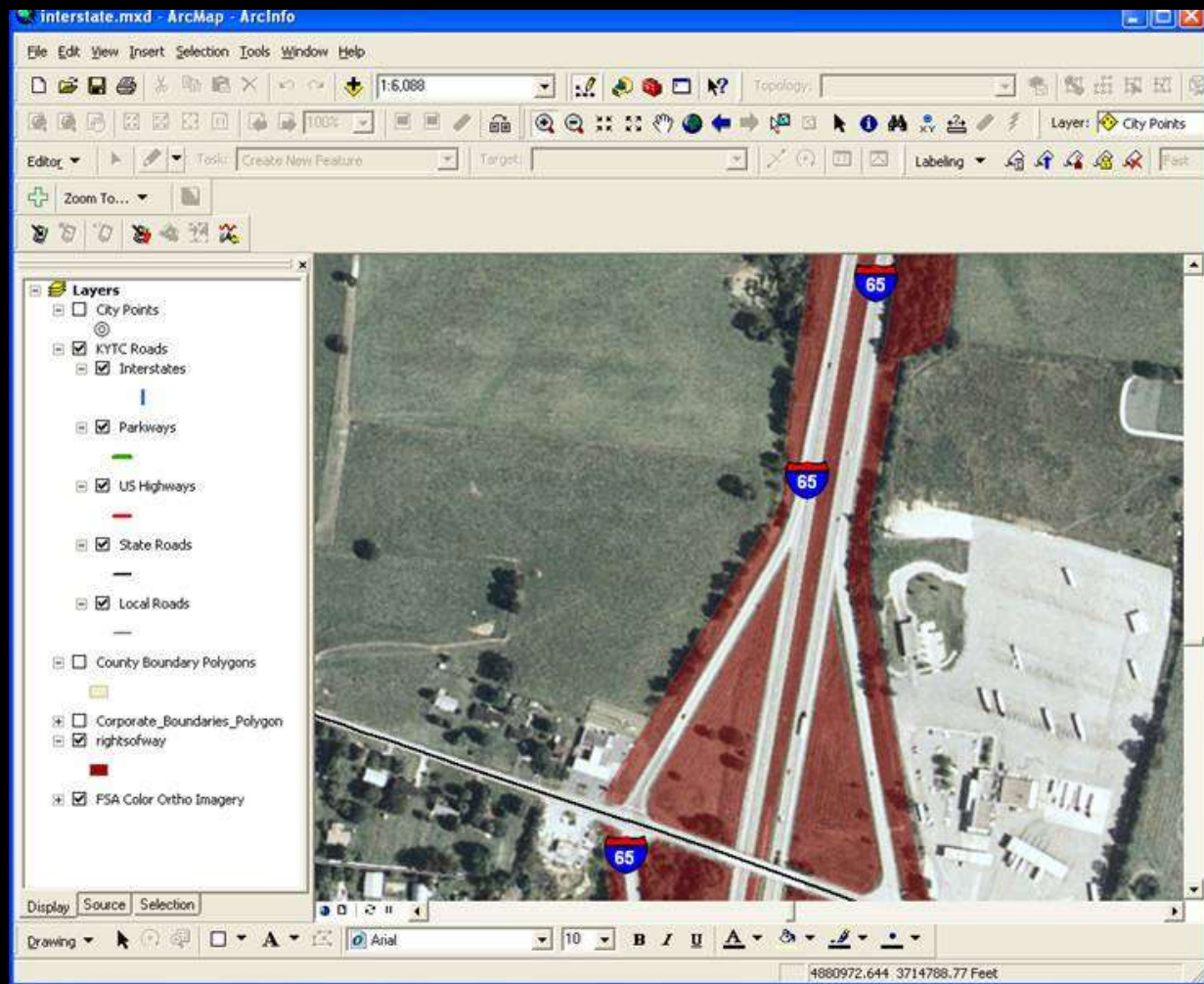
Rights-of-way

- Includes medians and lands adjacent to roadways
- \$4.356 Million at 4 cycles a year
- Not cropland
- Not “prime habitat”



Methods

- FSA 2008 Orthoimagery (2 foot pixels)
- Digitized treeless rights-of-way polygons = mowable area of Kentucky interstates and parkways





Methods

- Literature review for published switchgrass production values and ethanol conversion rate
- Records request for government fuel statistics
- Calculated potential ethanol production

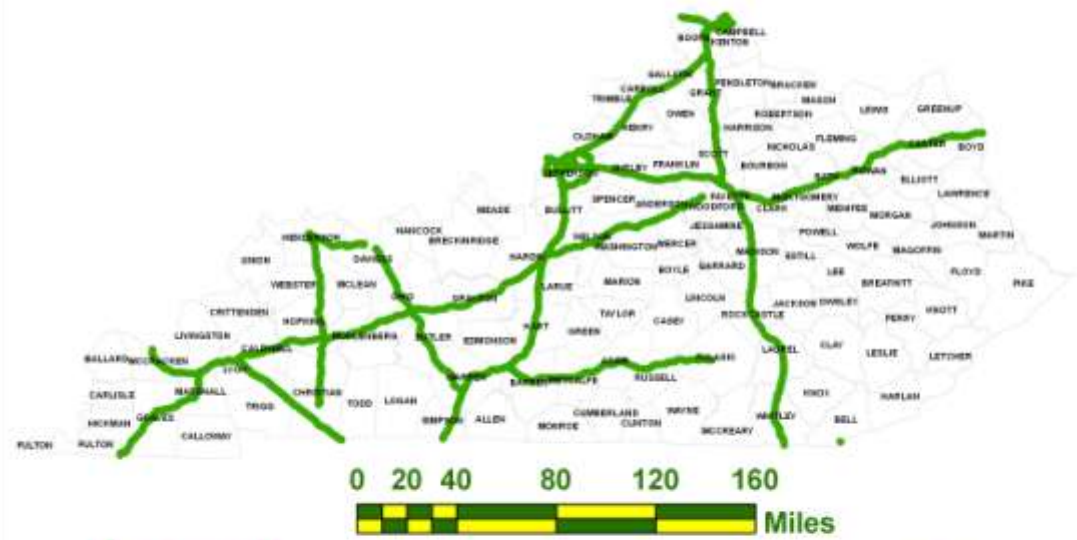
$$\begin{array}{l} \text{Potential} \\ \text{Ethanol} \\ \text{Production} \\ \text{(gallons)} \end{array} = \left(\begin{array}{l} \text{Mowable Area} \\ \text{(acres)} \end{array} \right) \left(\begin{array}{l} \text{Published} \\ \text{Switchgrass Production} \\ \text{Values} \\ \text{(tonnes/acre)} \end{array} \right) \left(\begin{array}{l} \text{Ethanol from} \\ \text{Switchgrass Conversion} \\ \text{Rate} \\ \text{(gallons/tonnes)} \end{array} \right)$$



Methods: Roadways Analyzed



Movable Areas of Highway Rights of Way



Legend

-  Movable Areas
-  County Boundaries





Results

Road	Linear distance (km)	Area (acres)	Area per linear distance (acres/km)
I-24	1020	2569	2.5
I-265	282	574	2.0
I-275	256	625	2.4
I-471	23	78	3.4
I-64	1679	3763	2.2
I-65	1192	2713	2.3
I-71	642	1424	2.2
I-75	1179	2815	2.4
All Sampled Parkways	4220	7002	1.7
Total	10,493.23	21,563	2.1

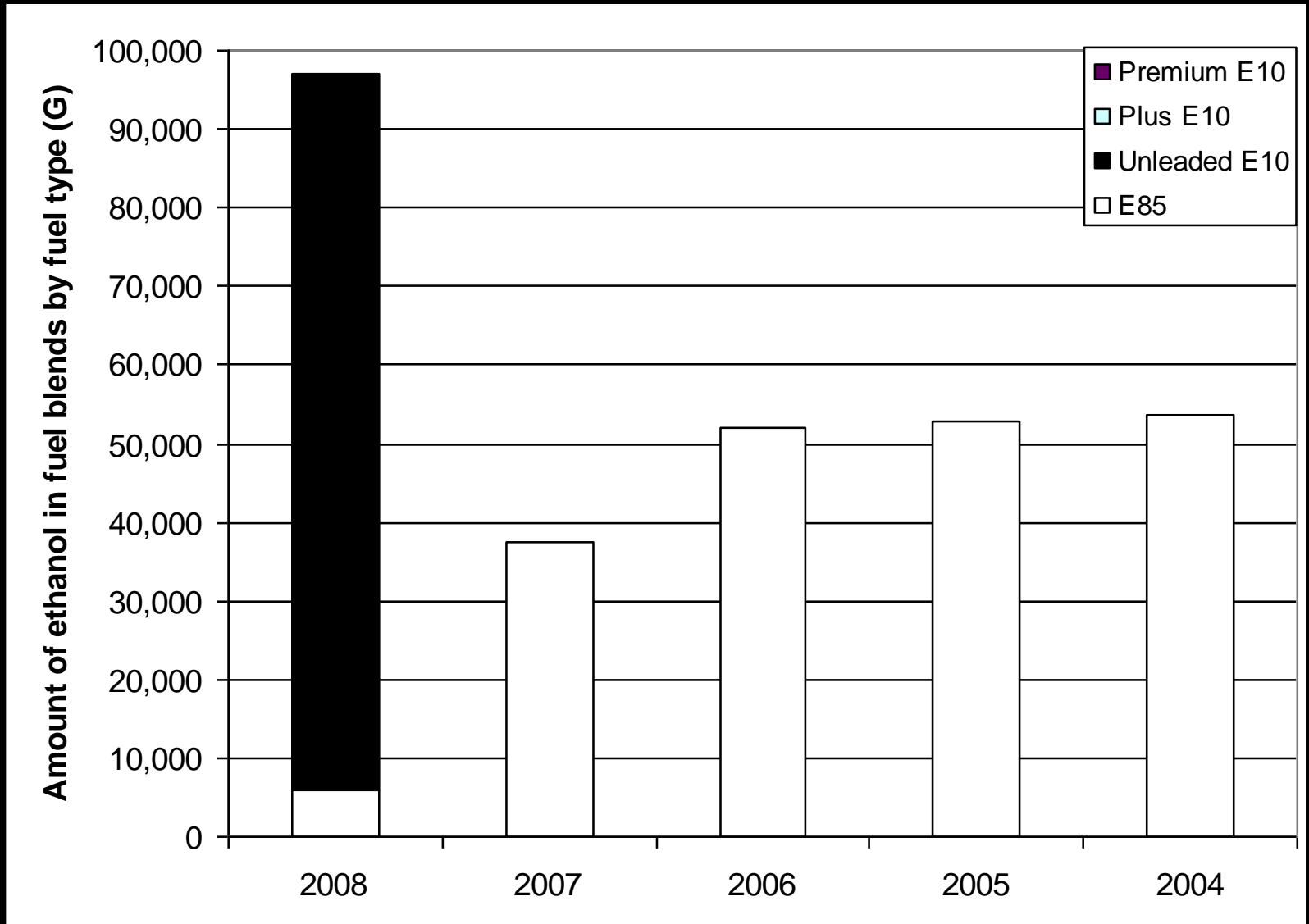


Ethanol Production Estimate

Cultivar Yield Ranges (Bransby, etc.):	0.0 to 18.0 tons acre ⁻¹ yr ⁻¹
Appalachia Region Yield estimate	4.4-6.5 tons acre ⁻¹ yr ⁻¹
Total Right-of-way area	21,563 acres
Potential switchgrass production	58,448 – 89,001 tons
Biomass to ethanol conversion rate (Lynd et al 1991)	80. gallons/ton
Total ethanol production	7,590,176 – 11,212,760 gallons/yr



Ethanol Use by Capitol Motor Vehicle Pool





Conclusion

- Ethanol should be produced in a sustainable manner to minimize the impact to the environment.
- Ethanol produced from the rights-of-way cannot replace all petroleum use in Kentucky.
- We must decrease our fuel demand.
- Ethanol may serve as a bridge until alternative vehicles or better public transportation are widely available and in use.



Conclusion Continued

- Ethanol can contribute by
 - Small-scale production
 - On farm
 - Regional
 - Niche markets
 - Prioritizing food before fuel
 - Utilizing land that is already at an economic cost
 - Rights-of-way
 - Under power lines
 - Mined lands



Further Research

- Potential Problems
 - Difficult to get Switchgrass established
 - Increased roadkill?
- Future Work
 - Economic feasibility study
 - Assess other marginal lands for biofuel production
 - Ethanol production from existing plant communities in rights-of-way



Diverse Biostock Communities

- Tilman, Reich, and Knops
- Cedar Creek Long-Term Ecological Research (LTER) Cambridge, Minnesota.



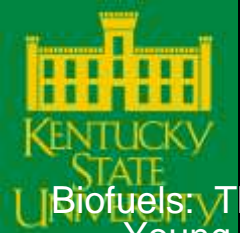
Photo: David Tilman,
University of Minnesota

”Diverse prairie grasslands are 240 percent more productive than grasslands with a single prairie species. That’s a huge advantage. Biomass from diverse prairies can, for example, be used to make biofuels without the need for annual tilling, fertilizers, and pesticides, which require energy and pollute the environment. Because they are perennials, you can plant a prairie once and mow it for biomass every fall, essentially forever.” D. Tilman



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Proposed General Atomics Biofuels Plant: Proximity to Rights-of-way

How much
dedicated
cropland could
be saved by
using the
rights-of-way?

