



Recycled Materials Web Map: Connecting Consumers to Producers

Clint Smith, Graduate Research Assistant
 Department of Civil, Construction, and Environmental Engineering - The University of Alabama
 Website: www.gisresearch.ua.edu



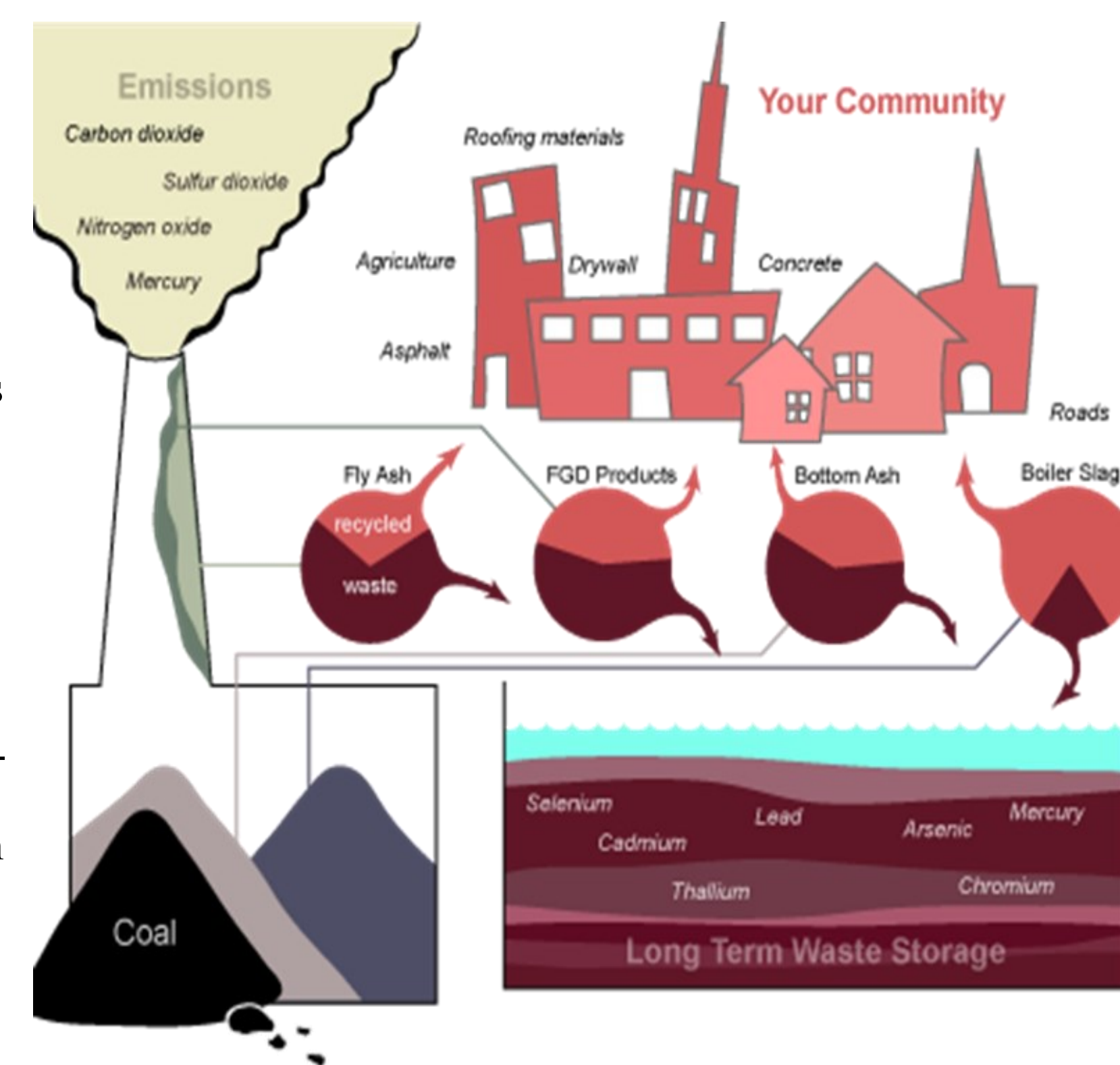
Abstract

An online Geographic Information System (GIS) web application that connects producers and consumers of recyclable material was developed to assist engineers and contractors in the beneficial reuse of recycled materials in transportation projects. The Recycled Material Web Map is comprised of four core layers: producers, stockpiles, specifications, and case studies. Producers of recycled material can locate their facility and enter contact information. The stockpile layer, connected to the producer layer, allows facility managers to add or update information about their recycled material stockpiles including material type(s), application(s), availability, and cost. Multiple stockpiles can be associated with each producer. The specification layer includes both Department of Transportation (DOT) specifications and environmental regulations pertaining to the beneficial reuse of nonhazardous recycled material based on specific location, material type, and application. The case study layer locates projects that successfully utilized recycled materials and includes information regarding the material type, application, volume data, and any additional documentation. As potential consumers of recycled material, engineers and contractors can pinpoint the location of a construction project, search for sources and quantities of recycled material that meet project specifications, and contact material producers. The web map utilizes search capabilities to locate nearby stockpiles to minimize transportation costs that typically dictate the use of large volumes of materials. The Recycled Material Web Map provides key information that engineers and contractors need to successfully utilize recycled materials, thereby preserving limited natural resources and benefiting the project and society as a whole. The web map is available at <http://rmwm.caps.ua.edu>.

Introduction

Hundreds of million of tons of nonhazardous industrial by-products are generated every year. These materials have many applications in other industries. The utilization of these by-products is limited due to a lack of knowledge about:

- Regulations
- Specifications
- Availability of the by-product.



Potential consumers of industrial by-products are willing to use them because of their low cost, and diversity of usefulness. Long term storage of these wastes also can lead to them being leaked into the environment if the landfill liner fails. As our planet's stocks of virgin resources depletes, it is important that we learn how to use our wastes beneficially. The

Recycled Materials Web Map (RMWM) efficiently connects producers to consumers of nonhazardous materials that be reused rather than sent to a landfill. The web map allows these producers and consumers to communicate with each other in real-time to find recyclable materials, and their applications, near them to reduce costs of use. Producers of these by-products can promote their material by entering, updating, and maintaining material source information, while consumers can search for these materials by locality or material type.

Acknowledgements

- ◆ Recycled Materials Resource Center, The University of Wisconsin - Milwaukee
- ◆ The Center for Advanced Public Safety at UA
- ◆ Brittany Shake, GRA, The University of Alabama
- ◆ Dr. Randy Smith, Associate Prof., The University of Alabama
- ◆ Dr. Andrew Graettinger, Professor, The University of Alabama
- ◆ Steve Burdette, Associate Director, The University of Alabama

Methodology

The schema used (below) of the database used in the RMWM. This shows the final design database structure to relate how the inputs will interact with each other.

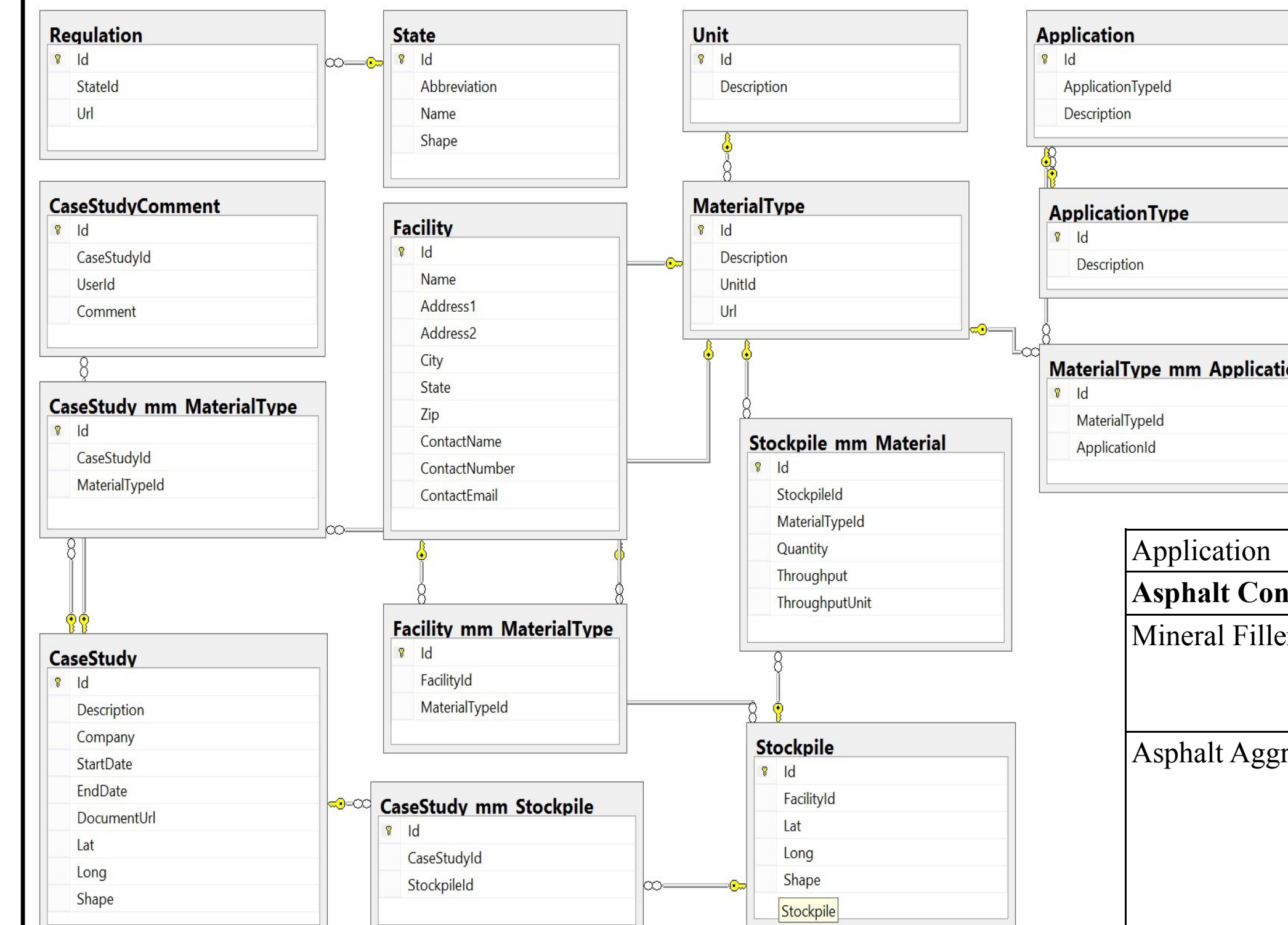


Table 2-1 (below) shows a list of recycled materials and what their applications can be. The applications of industrial by-products are numerous and show be acknowledged since these by-products are generated in large quantities that are usually sent to a landfill.

Application	Recycled Material
Asphalt Concrete Pavement	
Mineral Filler	Asphalt Plant Dust, Lime Kiln Dust, Sewage Sludge, Ash, Coal Fly Ash, Concrete Kiln Dust
Asphalt Aggregate (Hot Mix)	Blast Furnace Slag, Petroleum Contaminated Soils, Coal Bottom Ash, Reclaimed Asphalt Pavement, Coal Boiler Slag, Roofing Shingle Scrap, Foundry Sand, Scrap Tires, Steel Slag, Waste Glass, Mineral Processing Wastes, Municipal Solid Waste Ash, Nonferrous Slags
Seal Coat or Surface Treatment Aggregate	Blast Furnace Slag, Steel Slag, Coal Boiler Slag
Asphalt Cement Modifier	Roofing Shingle Scrap, Plastic, Scrap Tires
Portland Cement Concrete Pavement	
Mineral Admixture or Cement Additive	Coal Fly Ash, Blast Furnace Slag
Portland Cement Concrete Aggregate	Reclaimed Aggregate
Granular Base	
Granular Base Materials	Blast Furnace Slag, Nonferrous Slags, Coal Bottom Ash, Coal Boiler Slag, Petroleum Contaminated Soils, Combustor Ash, Reclaimed Asphalt Pavement, Foundry Slag, Steel Slag, Mineral Processing Wastes, Waste Glass, Municipal Solid Waste
Stabilized Base	
Stabilized Base or Subbase Aggregate	Coal Bottom Ash, Coal Boiler Slag, Petroleum Contaminated Soils
Stabilized Base	Coal Fly Ash, Lime Kiln Dust, Cement Kiln Dust, Sulfate Wastes
Supplementary Cementitious Material	
Flowable Fill	
Flowable Fill Aggregate	Coal Fly Ash, Quarry Fines, Foundry Sand
Supplementary Cementitious Material	Coal Fly Ash, Lime Kiln Dust, Cement Kiln Dust

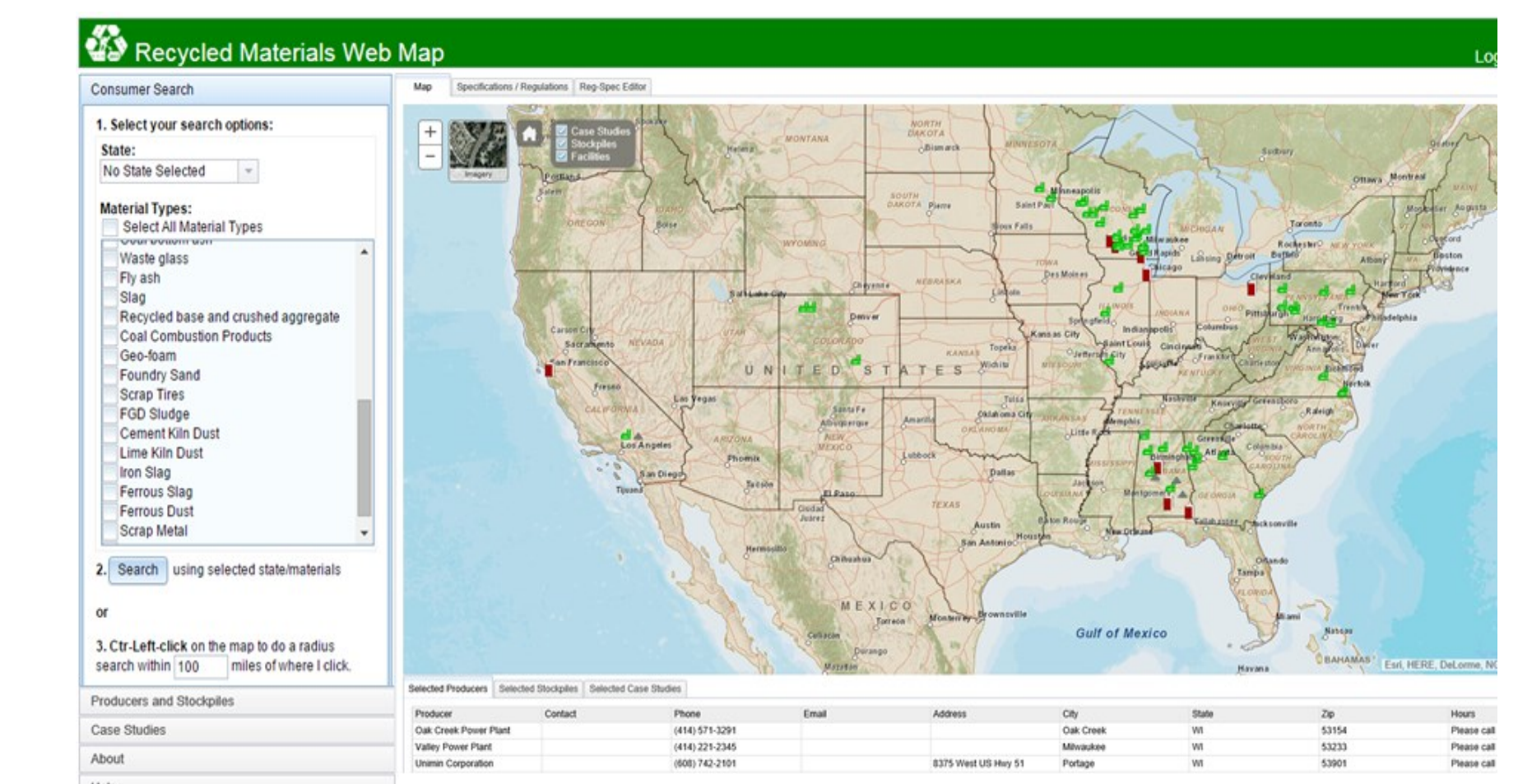
Once the website was made, producers could be able to place stockpiles, case studies, and research projects/papers and consumers could search through case studies, projects, papers, and materials. The use cases (below) describe how each functionality can be utilized. For example, an advanced user can edit, create, and locate regulations and case studies.

	General Consumer	Producer/Supplier	Advanced User (Researcher/Agency)
Facility/Owner	View contact information	Create/Edit	View contact information
Material/Stockpile	View quantities, applications, location	Specify/Edit/Locate materials, quantities, applications	View quantities, applications
Regulations	View Federal/State	View Federal/State	Create/Edit/Locate
Case Studies	View materials used, applications, hyperlink to literature/reports	View materials used, applications, hyperlink Involvement in case study shown on map	Create/Edit/Locate

Results and Conclusions

Phase I of the RMWM was finished and produced the following functionalities:

- Created is beneficial to the environment since it reduces the amount of wastes landfilled
- Allowed for consumers to search and buy these by-products to use in their own applications
- Generated route maps to aid with hauling costs



To test the website, stockpile and facility point shapefiles were uploaded with project location/address. Sample data was used from Wisconsin Stockpiles and Facilities. Then a user with consumer credentials searched for industrial by-products based off of distance. The website was able to generate a table showing the nearest five stockpiles (with contact info), a PDF document of the route overview, and a map document that contains all of the layers with appropriate symbology. The website is capable of geospatially managing various data sets such as material type, quantity, and applications.

Future Work

The Recycled Materials Web Map has recently finished Phase I. So moving on to Phase 2, there are many more objectives to be completed. A few of the proposed tasks to be done in Phase II include:

- ◆ Upload more case studies
- ◆ Approved materials list feature
- ◆ Increase amount of states and industries on site
- ◆ QA/QC regulations and specifications
- ◆ Add regulations and specifications for more states