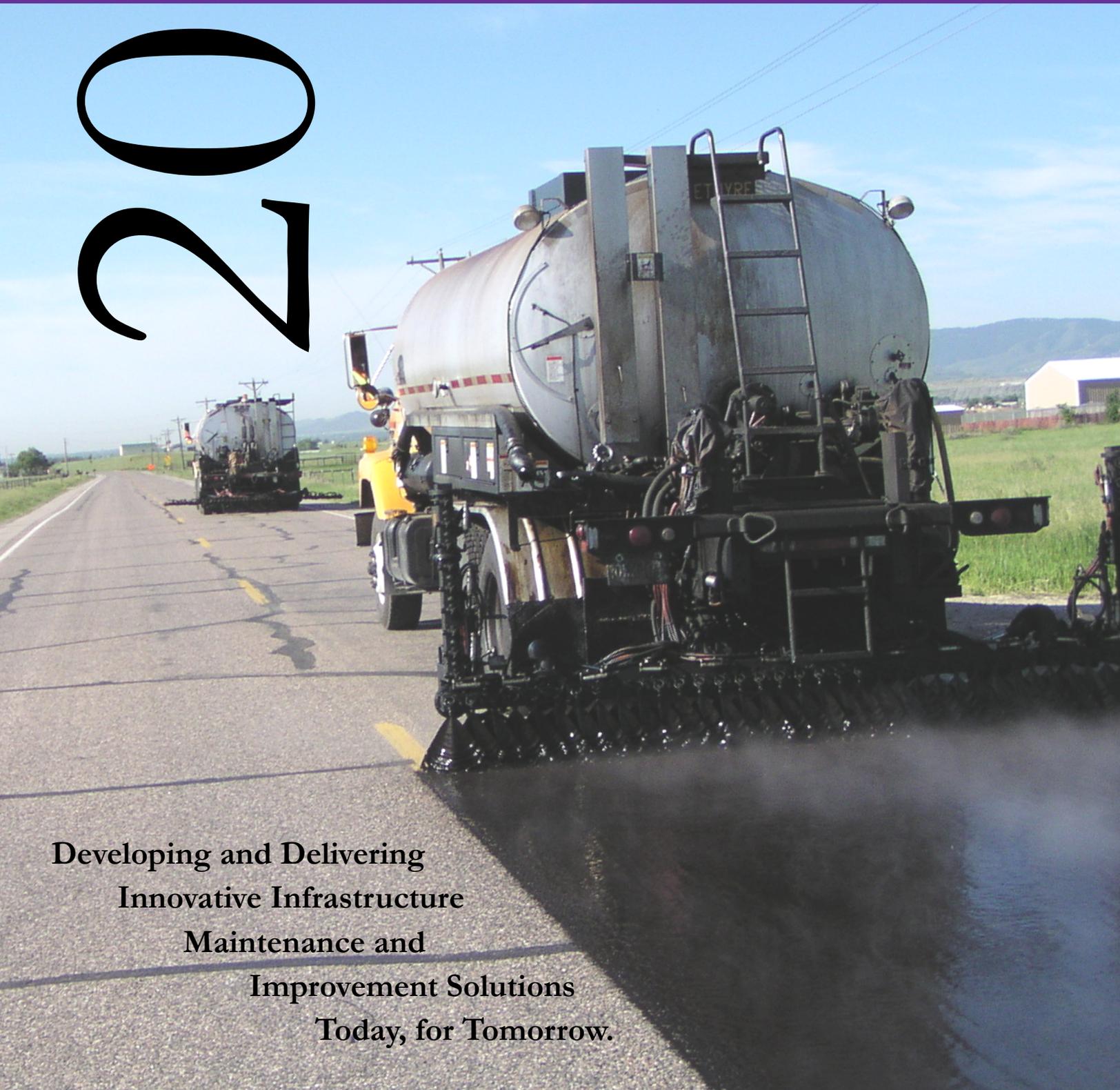


2012



ROAD AND BRIDGE



Developing and Delivering
Innovative Infrastructure
Maintenance and
Improvement Solutions
Today, for Tomorrow.

W elcome

to the 2012 edition of your Larimer County Road and Bridge Department's annual report.

Expect to find within, numerous images and articles chronicling efforts to protect and improve your local transportation network considering ever increasing energy costs. Our efforts are intended to both preserve an effective, efficient and safe transportation system as well as a positive and routine travel experience for you each day

Our responsibilities and mission include the recognition of the importance of a properly planned, constructed and maintained transportation system. This has been aptly described and supported in a Strategic Planning End Statement approved by the Larimer County Commissioners – “We will have safe, efficient and adequately maintained transportation systems.”

Our role, in supporting this commitment to you, is to plan, build, maintain and monitor your transportation infrastructure continuously. We pay specific attention to changing conditions and the impacts of our actions relative to Roadway Capacity, Surface Condition, Safety and the Cooperative Efforts we make routinely to stretch the benefits of our funding by working with others.

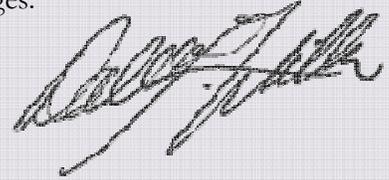
We are fortunate to have crafted an innovative approach to both paved road and non-paved road maintenance, but even that cannot be sustained indefinitely during such economic times as we are now experiencing. We are negatively impacted by the rising cost of petroleum products from fuel to asphalt materials. Two oftentimes ignored impacts to our ability comes from the percentage net loss of gas tax revenues (Highway Users Tax Fund “HUTF”) and the reduction in such revenue from a greater prevalence of

more fuel efficient and hybrid vehicles.

We will do our part by continuing to ask ourselves two fundamental questions ... “Are we doing the right thing and how will we know?” and “Are we doing the right things effectively and efficiently?”

We hope you will enjoy learning about your local transportation system and the services we provide. Please take the time to let us know how we are doing. If you have any questions, comments or suggestions for future editions, please do not hesitate to contact our administrative offices at (970) 498-5650 or me directly (970) 498-5653 or dmiller@larimer.org. We will respond promptly.

Please enjoy your trip through these pages.



Pavement Maintenance

Article by: Lonnie Berett
Paved Roads Group Manager



How Hot Mix Asphalt Pavements Are Made

To understand asphalt pavement maintenance procedures one should first understand what an asphalt pavement is, how it is made, how it is installed and how it ages. Asphalt paving mixtures are all basically similar. They are comprised of aggregate (rock), fines (sand) and a small amount, typically five to six percent, of asphalt cement (AC), from the bottom of the petroleum barrel.

Various quantities of these components are blended at high temperatures to manufacture the paving material. They are then transported to the job site, run through the paving machine and compacted to provide a smooth driving surface. The asphalt cement that binds the mixture together starts to break down or age as soon as it is exposed to heat while being mixed. Further exposure to air, water and sunlight combine to cause oxidation, the aging process of asphalt. More importantly, oxidation ages the asphalt cement that holds the aggregate and sands together to form the flexible asphalt pavement.

Why Apply Seal Coats to Pavements

Asphalt seal-coat treatments are mainly a preventive maintenance procedure applied to the asphalt pavement surface to extend it's life. These treatments are designed to seal and protect the pavement from harmful environmental conditions such as sunlight, rain, and snow. Surface treatments (chipseals) are also applied to enhance the wearing properties and improve the traction between the pavement and vehicle tires.

Asphalt seal-coat treatments will not cure problems beneath the pavement such as a base failure or deterioration of the material beneath the pavement. Surface treatments work well where the distresses are limited to pavement surface deterioration or where cracks are not severe. The seal coat reduces the amount of water which can infiltrate through the pavement into the underlying structure.

On The Cover:

Asphalt Emulsion is sprayed onto the road surface as part of the chipseal process.



Your Larimer County *Transportation System*

Includes:
 459 miles of paved roads
 443 miles of non-paved roads
 200 major structures (bridges with a span of 20 feet or more)
 440+ minor structures (crossings which span from 4 feet to 20 feet)
 3000+ culverts (this does not include driveway culverts)

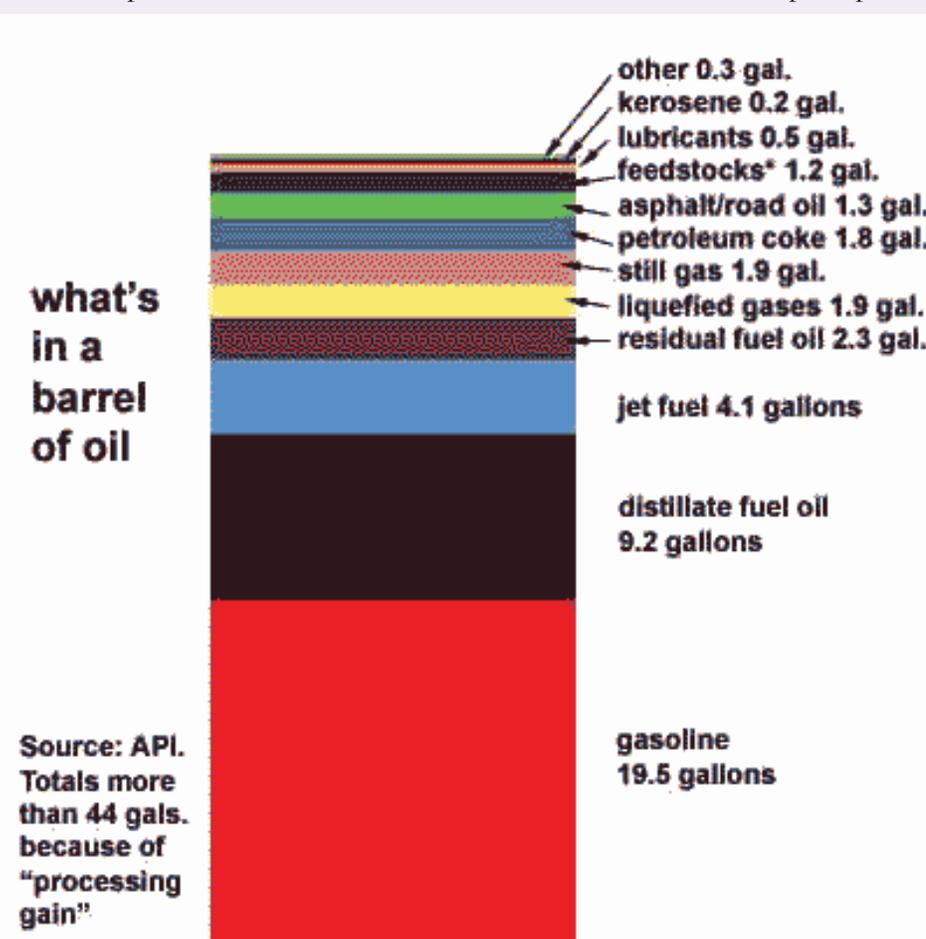
Facts About Asphalt and Oil — *Fluctuating Prices and the Effect on Road and Bridge Maintenance*

Q: How much liquid asphalt cement is needed per mile of paving a two lane road with a two inch thick asphalt mat?

A: On average, about 550 barrels or about 100 tons.

Q: How much of a barrel of oil is turned into asphalt products?

A: In the past, about 40 % of an oil barrel would be turned into asphalt products and now it's around 10 %.



Q: Why has the production of asphalt products changed?

A: The shift in refinery technology that led to the decline in asphalt production was spurred by increased oil prices. Oil refineries around the country are installing billion-dollar machines called "cokers" that are able to refine the chunkiest, low-grade and least expensive crude oil into highly profitable fuels, such as gasoline and diesel.

Q: What does a ton of asphalt cement (AC) cost?

A: At the beginning of the year (2012), a ton of asphalt — or 5.5 barrels — was selling for about \$550. At one point (2008) the price rose above \$800 per ton.

Q: How many (US) gallons of 87 octane gasoline can be made from one barrel of crude oil?

A: 19.5

Q: How much does the average gas station make on a gallon of gasoline?

A: Retailer (gas station) profit is about 1 to 5 cents a gallon.

Q: How has the number of roads and amount of traffic changed over the years?

A: While U.S. road miles have increased only 10% since 1960, they now handle almost four times the traffic.

Q: What causes bad roads?

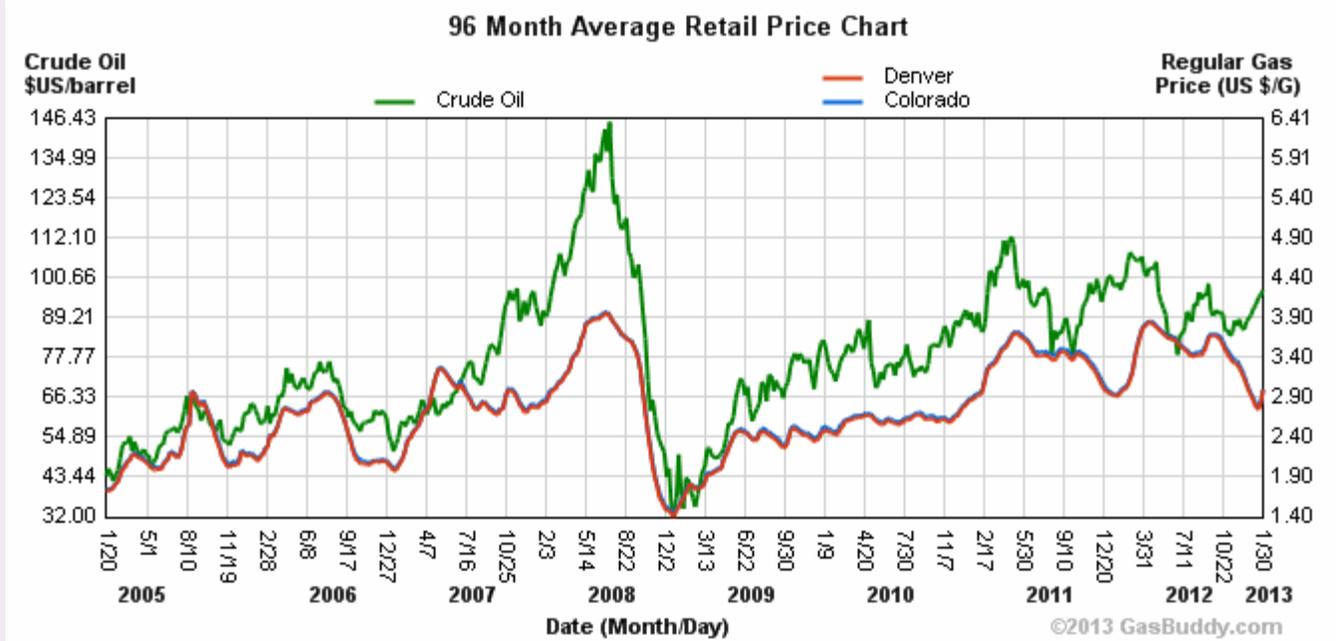
A: The biggest challenge to the life of any paved road is Mother Nature. The extreme cold of winter can open up pavement cracks. Summer's blistering heat can soften asphalt pavement so much that the weight of passing cars and trucks can cause dangerous ruts.

Q: What is considered a "Good Road"?

A: A good road is free of the ruts, cracks and potholes that can slow you down or worse, damage your car's tires and suspension. It's free of loose stones that can bounce up and damage car windows or paint. A good road allows you to drive at the posted speed, without the delays and congestion caused by extensive road repairs.

Fuel Costs and Grading Our Non-Paved Roads

Article and Pictures By:
Jim Frick, *Non-Paved Roads Manager*



This chart shows how fuel prices vary as the price of crude oil changes but not in a linear pattern. Since so much of what we do uses fuels, this can have a significant impact on our road maintenance program. Each time we grade a mile of road, it requires about 135 gallons of fuel. (That is using two road graders, a roller and a water truck.) In 2005, the fuel would have cost approximately 229.50 and today the cost is \$446.85 (\$1.70 vs. \$3.31 per gallon of diesel).

High Park Fire

The High Park Fire created drainage and erosion issues for us mainly in the Stove Prairie and Pingree Park areas. Rains also cause some flooding across some sections of roads.



Garrett Glascott cleans out a culvert that had been plugged with fire debris on CR 27 just south of the Poudre Canyon (Highway 14).



Structures Group — As Costs Increase We Must Become More Creative With Our Resources and Maintenance Techniques.

Article and Photos By: Ted Jensen, *Structures Group Manager*

The cost of fuel has a large impact on the items that we use daily to maintain the many roadway structures of Larimer County. For example, the metal culverts that we use cost more not only to be delivered but also to manufacture as energy costs rise. To reduce our delivery cost, we plan our work out further. This allows us to maximize our delivery load size and thereby reduce our costs.

Pipe is not the only product that increasing energy costs have affected. I am sure that everyone has noticed that things just cost more. This is not limited to products that are delivered but also the products that we pick up. For example, the



concrete patching materials that the Bridge Team use to maintain the hundreds of bridges in Larimer County or hose for our Vac Truck that our Pipe Cleaning Team uses to maintain our many culverts.

This is not to mention the higher cost of the fuel that we use daily whether it is the Ditch Cleaning Team maintaining the roadside drainage, the Pipe Installation Team installing culverts, the Pipe Cleaning Team keeping the culverts clear of sediment or the Bridge Team maintaining the hundreds of bridges in Larimer County. We work hard to maintain the bridges, culverts and drainage as part of the entire Larimer County road system while staying within our budget.

Rob Kennedy (Team Leader), Chris Fink and Tony Abromski compact material around a cross-culvert



Above—Mike Mossburgh and Chris Fink load material into one of the dump trucks while cleaning a roadside ditch.



Above—One of our older bridge structures at the inlet of Horseshoe Lake in Loveland.

Right—Bryan Smith (Team Leader) and Robert Pina apply grout between the stones on the wing walls of the bridge so that we can help this bridge last for several more years. As traffic increases, we often see the need to replace these older structures because they are not wide enough to handle current traffic demands.



*E*volution of Equipment due to Emission Standards

Article and Pictures By Justin Hersh, *Materials and Equipment Manager*

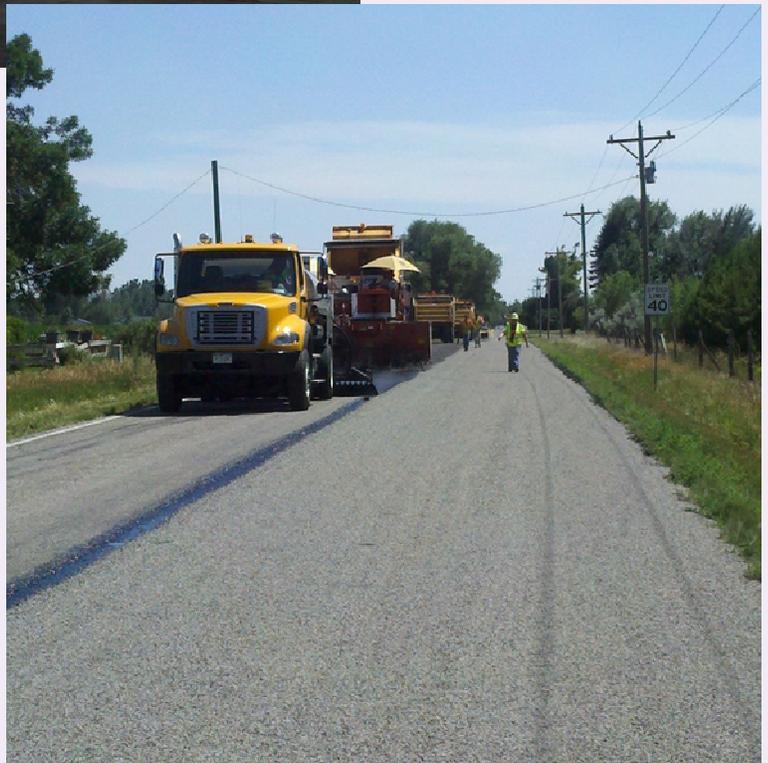
The heavy equipment world has seen some major changes over the past century due to a myriad of reasons, most related to productivity. Over that last decade, however, the most drastic changes have been due to evolving diesel engine emissions standards. The E.P.A. and diesel engine manufacturers have been working to make diesel engines more environmentally friendly, yet trying to keep them productive and efficient. For some time, we have been studying these standards and evaluating the changes that they would cause in both segments- “highway” and “off-road”. In early 2012, Road and Bridge began to replace some heavy equipment and trucks with equipment that has met the latest E.P.A. requirements for diesel engines. These new standards (while reducing harmful exhaust emissions) have resulted in larger cooling and exhaust systems, and overall different engine dynamics- causing the equipment to be larger, and requiring some additional operator and technician training. All of these changes unfortunately, for the most part, hurt engine productivity and fuel economy- all while the costs to purchase and maintain these engines have increased. These factors (not to mention the cost of fuels) have us continuing to look for the best possible ways to make every machine productive

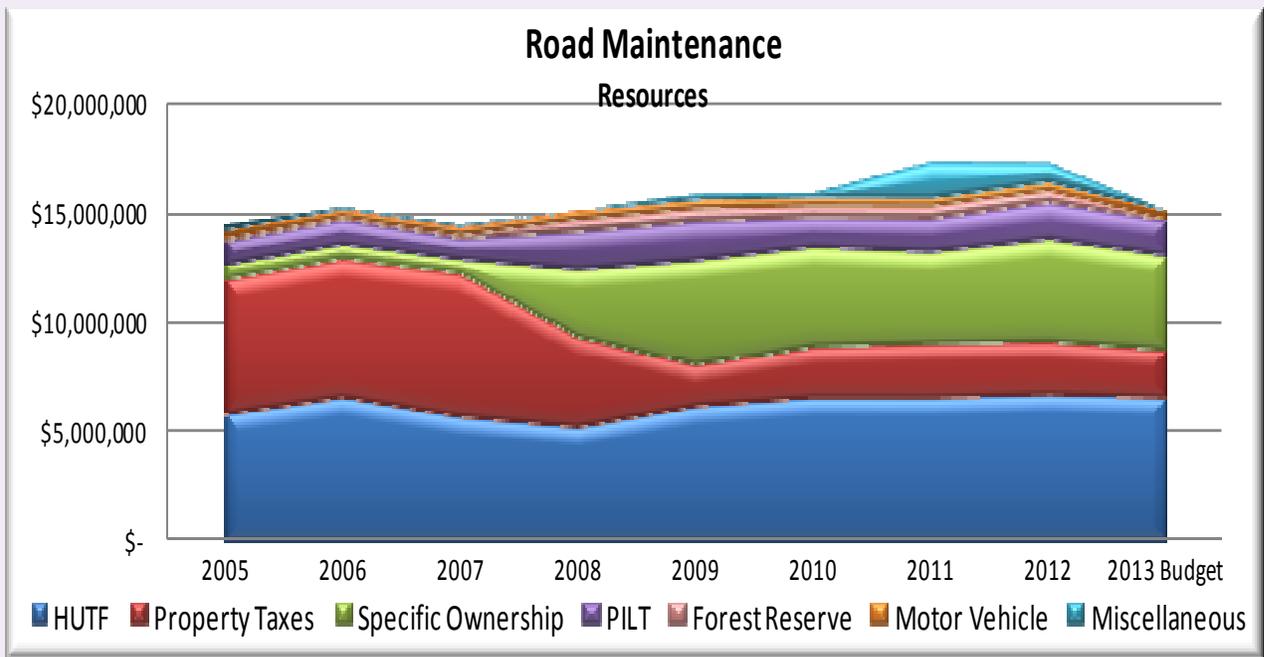
and efficient. This can be quite a moving target- especially in the realm of government road maintenance- we know that we are not there yet, nor will we find a “cure-all” or permanent fix. We will however, take as much care as possible to guide our equipment and operations into a hopefully “greener”, yet productive future!



Above—Even though these front-end loaders are exactly the same size class, the machine on the left meets the latest emissions standards for off-road equipment (Tier 4 interim) which requires a DPF (Diesel Particulate Filter) on the exhaust system. There are noticeable size differences-which can create difficulties for the operator, such as limiting rearward vision.

Right;;Operator Don Pew applies emulsified asphalt for our chip-seal program. Don is operating one of our distributor trucks that meets the latest emission standards for on highway vehicles (Tier 4 final). This engine utilizes a DPF as well a Selective Catalyst Regeneration (SCR), which requires Diesel Exhaust Fluid.





Highway Users Tax Fund (HUTF) is a motor fuel tax that has not seen any significant growth since 2009, with the implementation of Funding Advancements for Surface Transportation and Economic Recovery (FASTER). In addition, there has been no rate increase since 1991. It is anticipated that this revenue will not see any growth in 2013 and will start to decline in future years as a result of rising fuel prices and more fuel efficient cars being driven.

Property Taxes represent 15% of Road and Bridge Maintenance revenue. State statute requires 50% of Property Tax revenue received by Road and Bridge to be transferred to local cities and towns, less exemptions listed in the statute. As a result of budget reductions, this funding is estimated to decrease by 9% by 2015.

Specific Ownership Tax comes from vehicle license fees. In 2008 the County began allocating a larger portion of Specific Ownership Tax and less Property Tax to the Road and Bridge Department so that a larger portion of funding will remain with the County.

Payments in Lieu of Taxes (PILT) are Federal payments to local governments that help offset losses in property taxes due to nontaxable federal lands within their boundaries.

Forest Reserve is a share of revenues generated from National Forest Lands. This funding was increased with the Secure Rural Schools and Community Self-Determination Act from 2008 - 2012. This Act expires with Fiscal Year 2012 and there will be a 90% decrease in 2013 and ongoing.

Motor Vehicle Tax is a tax on vehicles with mounted equipment.

Miscellaneous revenue includes revenue as a result of shared projects with other local municipalities.

Any changes in funding listed above can have a positive or negative impact on the road conditions show in the following graph.

Road conditions are assessed annually to assist management in planning for maintenance and capital projects. The % of paved roads with grades “D” or “F” has decreased from 22% to 9% in the 8-year span. However the percentage of paved roads with an “A” grade has decreased from 34% to 24% with a significant improvement of 6% in 2012 from 2011. The average non-paved road conditions have remained consistently above average in the same period.

