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of Public Health
and Environment

2008 Annual Report to the Colorado General Assembly
On the Status of the
Solid Waste and Material Management Program
In Colorado

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SECTION 1:

INTRODUCTION

Colorado's Solid Waste and Material Management Program (the Program) is located within the Hazardous Materials and Waste Management Division (the Division) of the Colorado Department of Public Health (the Department). The Program is responsible for ensuring compliance with laws pertaining to the management of solid waste. The authority for this program is in the Colorado Solid Waste Act, C.R.S. 30-20-100.5, et seq. (the Act), and the federal Resource Conservation and Recovery Act, Subtitle D (RCRA-D). The U.S. Environmental Protection Agency (EPA) approved Colorado's Solid Waste Management Plan and, by doing so, the authority to implement requirements for the management of solid waste in Colorado.

Primary elements of the Program include compliance assistance; compliance monitoring and enforcement; remediation; permitting; and information management. Each of these program elements is discussed in the following sections. This report is comprised of three major sections reporting on the Programmatic efficiency and effectiveness through the end of the state fiscal year 2008, the state of recycling in Colorado 2007, and the state of composting in Colorado 2007. The recycling and composting sections based on data for calendar year 2007 (Section 2 and Section 3 respectively) are entirely new, and we are pleased to present this information. These sections contain information condensed from full reports on the respective topics as required by HB 07- 1288. The full reports on recycling and composting in Colorado may be obtained from the Program's web site: (http://www.cdphe.state.co.us/hm/sw/swrecycling.htm).

As of December 2008, the Program regulates approximately 307 facilities and associated waste management activities including, but not limited to municipal solid waste (MSW) landfills, industrial and special waste landfills, asbestos contaminated soil sites, incinerator ash disposal facilities, transfer stations, recycling facilities, scrap tire facilities, solid waste incinerator facilities, infectious waste facilities, waste impoundments, composting operations, spill responses, property reclamation and redevelopment projects and waste motor vehicle tire haulers. Facilities may have multiple active operations at their sites, such as an MSW landfill with an aggregate recovery area, a composting area, and a scrap metal recovery area all co-located at the same site.

In addition, the Program reaches out to the regulated community via facility technical assistance, training, partnering meetings, presentations at conferences, and active participation and support of professional organizations such as the Solid Waste Association of North America (SWANA) and the Interstate Technology Regulatory Council (ITRC).

A unique aspect of Colorado's solid waste management framework is the construct of dual regulatory jurisdiction. The Act specifically gives both the local governing body (usually a county or municipality) and the Department complimenting jurisdiction over the location, design, and operation of a solid waste facility. The local governing body must issue a Certificate of Designation prior to operation unless the operation qualifies for one of only eight (8) exemptions identified in section 30-10-101(6)(b), C.R.S. The application must be forwarded to the Department for review and recommendation prior to issuance of the Certificate of Designation. If the Department recommends approval or approval with modifications of the application, then the local governing body may either approve or disapprove the application. If the recommendation includes an approval with modifications, the local governing body must incorporate the modifications into their final decision. If the Department recommends disapproval of the application, then the local governing body must disapprove the application, and they cannot overrule the Department's recommendation. In addition, the local governing body may revoke the Certificate of Designation, as they deem appropriate. The Department's authority ascribes to the design and operational aspects of the facility, while the local governing body controls the land use and also covers the operational aspects of the facility.

The Solid Waste Management Program does not receive any monies from Colorado's General Fund, and is 100% fee supported. The Act and the Regulations (6-CCR 1007-2) provide three means of collecting fees to support the Solid Waste Management Program. As follows:

1) Solid Waste User Fee: This is a fee paid by the waste generator based on volume/weight of waste disposed of at a landfill, also known as a "tipping fee,"
2) Hourly Activity Fee: This is an hourly fee assessed for prescribed services rendered by solid waste staff to facilities, and
3) Annual Facility Fee: This is an annual fee remitted by facilities that are not required by the Act to pay the Solid Waste User fee.

In 2007, the General Assembly passed House Bill 07-1288. The following report is submitted to comply with the requirement to submit an annual report to the General Assembly on February 1st of each year describing the status of the Solid Waste Management Program and the efforts of the Department to carry out its statutory responsibilities at the lowest possible cost without jeopardizing the intent of the statute.

ORGANIZATION AND STAFFING:

The Solid Waste and Material Management Program had the equivalent of 6.5 staff during most of state fiscal year 2007-2008. Three new staff were added during the last half of the fiscal year. One person with very strong geotechnical expertise was added to the Grand Junction office. Two additional staff were added to create the Data Management Group in Denver. The addition of the new staff afforded the opportunity to reorganize the Solid Waste and Material Management Program. Staff resources are now divided into three functional groups including; 1) the Solid Waste Permitting Unit, 2) the Inspection and Enforcement Group and 3) the Data Collection and Management Group. The Data Management group serves the entire state. Their data collection, analysis and presentation efforts are detailed in sections two and three of this report dealing with the state of recycling and composting in Colorado. The Permitting Unit and the Inspection and Enforcement Group also serve the entire state, but are allocated based on

defined territories. Maps depicting the staff assignments are located on the Program's web site. The reorganization created a programmatic structure to accommodate the need for and to facilitate the future growth of the solid waste industry in Colorado. Future growth in the Program will be needed to better serve the ever-increasing numbers of solid waste facilities and the demands of our facilities. Certainly there was, and still is to some degree, an adjustment period as staff move into their new assignments. However, the reorganization will greatly benefit our efficiency and productivity in the near term and the future. The staff share duties and responsibilities including, but not limited to, customer and facility technical assistance, conducting inspections and subsequent follow-up activities, and permitting. Of these activities, customer and facility technical assistance occupied 20% of their time, inspections and enforcement accounted for 15% of their time, policy and regulation development accounted for 12% of their time, and 15% of their time was allocated to permitting activities.

During 2008, the Program continued it efforts to improve efficiency and effectiveness following the passage of HB 07-1288. Examples of the types of activities being pursued to improve the program and their status are presented below:

1) Improved facility assistance delivered on inspections: Ongoing.
2) Streamlined inspection and reporting process: Transfer station inspections forms were updated and will be used as a model in the new database development process.
3) Increased team training to remain current with industry practices: Training included short courses to selected staff on solid waste liners, alternative landfill covers, and innovative cover and lining techniques. Additional training was offered to educate the Data Collection and Management staff on recycling data collection and metrics development.
4) Development of workload tracking tools: Ongoing.
5) Improved database evaluation techniques: The facility identification and project management portions of the database are nearing completion and should be launched during the spring of 2009. Staff has already begun structured training on the new software.
6) Improved data collection (e.g., waste tires, recycling, and compost facilities): The recycling survey forms were significantly revised and improved to be more user friendly, while facilitating the collection of more detailed information.
7) Improved customer and facility outreach: Outreach efforts included the compost, exploration and production waste impoundment and geotechnical workgroups.
8) Cross-media integrations with:
    a) Air Pollution Control Division: Regarding asbestos contaminated soil and manufacture home disposal issues.
    b) Water Quality Control Division: Regarding waste impoundment management issues.
    c) Colorado Oil and Gas Conservation Commission: Regarding the regulation of oil and gas waste residuals mostly related to brine pit facilities.
    d) Colorado Department of Agriculture: Regarding compost regulations and avian influenza response planning.
    e) Mined Land Reclamation Board: Regarding waste water impoundment authorities and the appropriateness of terminating post-closure care and funding.

f) Colorado Department of Transportation: Regarding spill response interactions and coordination.

9) Continued refinement of workplans:
   a) Quantifiable annual workplan
   b) 2-year workplan, and
   c) 5-year workplan.
10) Upgrading of the Solid Waste Management System and supporting database.

During 2008, the Program continued implementation of the activities noted above and pursued several new efficiency improving activities including: a) an electronic fee calculating and reporting form that significantly reduced the number of fee calculation errors and the amount of time to identify and reconcile the errors, b) an improved inspection prioritization methodology, c) pre-project scoping meetings with facilities to manage expectations and streamline the submittal and review processes, and d) the development of a document review effort matrix to help evaluate our review efficiencies.

ACCOMPLISHMENTS, IMPROVEMENTS, AND INNOVATIONS

Even before passage of HB 07-1288 in 2007, the Division initiated efforts to streamline processes and develop innovative ways to improve the Solid Waste and Material Management Program. These efforts continued through 2008 and will continue into the future. The Program's goal is to be "efficient and effective" as described in the legislation. Each of our program elements must demonstrate its efficiency and effectiveness through a series of metrics, some of which continue to evolve as our data tracking and management capabilities improve. Some of these efficiency and effectiveness metrics are reported in the following sections. The intent of this report is to present a snapshot of the Program's 2008 achievements. In addition, this report describes efforts and activities to be implemented in the future to improve the effectiveness and efficiency of the group. These planned activities will continue to be developed into measurable quantities for future reports.

Information Management

In order to measure Program activities, it is critical to have a good data system for data collection, storage, analysis and reporting. The Program uses the Solid Waste Management System (SWMS) as its primary database. The system is antiquated, limited in capability, storage and function, and is also unstable. In addition, some of the data used by the Program is housed in two other separate and distinct databases. The separation of information causes pronounced work delays related to information integration and inconsistencies in information.

During 2008, the Program, along with other programs in the Division, used the data collected from an exhaustive data needs assessment and gap analysis to begin the development of a new database system. The assessment and analysis determined the capabilities of the current system and potential needs and capability requirements of a future system. The new database system underwent conceptual development and detailed system design and configuration began during 2008. The facility identification and project management portions of the system are nearing completion and should be ready for full scale testing and use during the spring of 2009. Staff has

already begun structured training on available portions of the new system. This will enhance staffs' familiarity with the new system, ease the transition to the new system, and expedite staff utilization of the system. The new system will go far beyond simple data collection, storage, analysis and reporting currently available by allowing us to collect, analyze and report on the following types of information:. Key attributes of the new system will include, but not be limited to the following:

1) Type of facility and location
2) Number of Certificate of Designation Applications
3) Compliance statistics
4) Self Certification
5) Customer and facility Outreach
6) Effort and Resources
7) On-lining billing and invoice system
8) On-line document and data submittals
9) On-line availability of electronic submittals

This system enhancement will be an appreciable resource commitment in 2008 and 2009 including time and funding. The results should be a single fully integrated data and information system that will enhance and improve many of the administrative, functional, reporting, and outreach aspects of the Program. In addition, the Division is already planning on using similar system elements developed for the Solid Waste and Material Management Program as templates and directly applicable software solutions for other programs in the Division.

With the new system, the Division will be able to track how much time and effort is spent on different aspects of work. Improvements in the billing system will allow tracking of staff time spent reviewing specific documents. This will improve managers' ability to identify areas that are consuming inordinate amounts of time, and will facilitate workload balancing among staff. The system will also improve the Division's ability to be accountable to those paying fees by providing a detailed invoice of our activities. This information will greatly improve our work measures, efficiency, effectiveness and accountability.

Improved effectiveness and efficiency metrics and measures will be developed and reported on prior to and following implementation of the new database system. In addition, one of our strongest outreach features is anticipated to be an internet-based, interactive, customer-oriented solid waste and material management mapping and information capability. This system was developed during 2008 to present Colorado's available recycling resources using existing software capabilities, and will be migrated to the new system once it is fully operational. This service will provide the types of solid waste disposal and/or material management facilities located within a designated radius including facility contact information and types of materials managed. In addition the Data Management Group is developing a Beneficial Use Directory to facilitate the reuse of materials such as concrete, fly ash, asphalt, and tires throughout the state. The new system will develop into an on-line electronic material swapping system with material types, available volumes and contact information.

Compliance Assistance

Another goal of the Program is for all regulated facilities to be in compliance with state laws and regulations. The traditional inspection and enforcement program serves as one primary mechanism for reaching that goal. However, compliance assistance is another integral element for obtaining and maintaining compliance. The General Assembly recognized the value and importance of compliance assistance in that expectations were established in two different locations within the Act and again in the Regulations as follows:

> C.R.S., 30-20-101.5(2): The department shall develop, implement, and continuously improve as necessary policies and procedures for carrying out its statutory responsibilities at the lowest possible cost while satisfying the legislative intent expressed in subsection (1) of this section. At a minimum, the policies and procedures shall, to the extent practicable, include the establishment of the following: .....(f) A preference for compliance assistance with at least ten percent of the annual budget amount of the program being allocated to compliance assistance efforts;"
>
> C.R.S., 30-20-111: The department and local health departments shall render technical advice and services to owners and operators of solid wastes disposal sites and facilities and to municipalities and counties in order to assure that appropriate measures are being taken to protect the public health, safety, and welfare. In addition, the department has the duty to coordinate the solid wastes program under this part 1 with all other programs within the department and with the other agencies of state and local government which are concerned with solid wastes disposal.
>
> 6 CCR 1007-2, Section 1.3.8: Technical guidelines, including specific technical factors, may be developed and issued by the Department to assist applicants, local governments, and the public.

While the Program does not have any staff dedicated solely to facility assistance activities, we are still very active in our outreach efforts. These activities include participation in professional organizations such as SWANA, ITRC and the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), hosting training activities, and engaging in local associations such as the Northeast Colorado Landfill Organization. Trainings offered by the Solid Waste Management Program during 2008 included sessions on:

1) Section 5.5; Participation in an ongoing Asbestos Contaminated Soil workgroup,
2) Evaluating, Optimizing and Potentially Ending Post-Closure Care at Municipal Solid Waste Landfills,
3) Designing, Constructing and Operating Bioreactors,
4) Ecological Land Reuse,
5) Hazardous Waste Identification,
6) Initiating Town Hall style outreach meetings to share updates regarding solid waste information and receive input from interested parties on how we can better serve their solid waste and recycling needs,
7) Alternative Final Covers for Landfills, and

8) Presenting the State of Recycling in Colorado data and information at the 2008 Recycling Summit.

The solid waste staff is one of our strongest outreach assets. They continue to provide valuable "on-the-ground" advice to owners and operators during sites visits and inspections. During 2008, the Program devoted over 20 percent of staff time to compliance assistance.

The Solid Waste and Material Management Program developed several compliance assistance services to assist the regulated community in managing solid waste. These compliance assistance services include the following activities:

1) A limited, but growing, range of solid waste guidance documents and compliance bulletins all of which are posted to the Program's web site;
2) An ever improving Web site (http://www.cdphe.state.co.us/hm/solidwaste.htm);
3) Compliance assistance information dissemination during inspections and site visits;
4) Waste management training to industry provided by our staff, and
5) Stakeholder forums to receive input and direction from interested parties.

During FY 2007, the Program initiated a four-year regulatory review and revision process. The goal of this process will be to create an up-to-date set of regulations that better represent the current status of the solid waste industry, are more understandable, and more concise. Another aspect of new regulations will be to add clarity and definition to new laws passed by the legislature. Toward that end, the Waste Motor Vehicle Tire Hauler regulations (6 CCR 1007-2, Section 15) and the Landfill Ban regulations (6CCR 1007-2, Section 16) were promulgated in 2007 as a result of 2006 legislation. Revising and updating the regulations will facilitate their consistent and more expeditious implementation both internally and among our facilities.

New and Proposed Regulations

During 2008 the Program promulgated three new portions of the solid waste regulations. The new regulations included: 1) new fee regulations (Section 1.7), 2) Composting Regulations (Section 14) and 3) the EP Waste Impoundment Regulations (Section 17). The fee regulations were revised to update the Program's hourly activity fee and adopt new annual facility fees. The Program is 100% self supporting and does not receive any General Fund money. The revised fee structure better accounts for our cost of doing business with the various solid waste and recycling facilities.

The Composting regulations were revised to address the issue of agricultural composting and to add clarity to definitions of the different classes of composting facilities. These revisions specifically integrated the Program's and the Colorado Department of Agriculture's authorities to regulate agriculturally exempt composting facilities. The regulations were also revised to update the finished product testing provisions to ensure that the material was safe for public consumption, to update the financial assurance requirements, and to improve the structure of the regulations for ease of use and implementation.

HB08-1414 ("the Act"), which was enacted by the legislature in 2008, directed the Solid and Hazardous Waste Commission to promulgate regulations specifically applicable to commercial

exploration and production waste impoundments. The Act prescribes several provisions that the rules must contain, including set-backs, fabricated liners, monitoring to prevent migration to groundwater, waste analysis and reporting, fencing and netting, contingency plans and financial assurance. The Act also specifies a schedule for existing facilities to achieve compliance with the new rules. The Hazardous Materials and Waste Management Division (HMWMD) proposed a new section, Section 17, to the Regulations Pertaining to Solid Waste Sites and Facilities (the "Regulations"), which were promulgated by the Solid and Hazardous Waste Commission in November 2008. In addition to implementing the statutory requirements cited above, the proposed new Section 17 regulations serve to update the existing requirements for EP waste impoundments, currently found in Section 9 of the Regulations.

The Program is currently working on re-writing the following existing regulations:

1) Financial Assurance,
2) Waste Impoundment, and
3) Infectious Waste.

We also envision proposing new solid waste regulations to facilitate completing an overall regulatory framework. New regulations may include sections on the following topics:

1) Fully integrated material management framework,
2) Corrective action/remediation/cleanup of contamination,
3) Construction and demolition debris,
4) Non-municipal waste haulers (e.g., septage, grease, and sand trap waste), and
5) Spill reporting.

The regulatory development process for both the existing regulatory re-write and the development of new regulations would include the following:

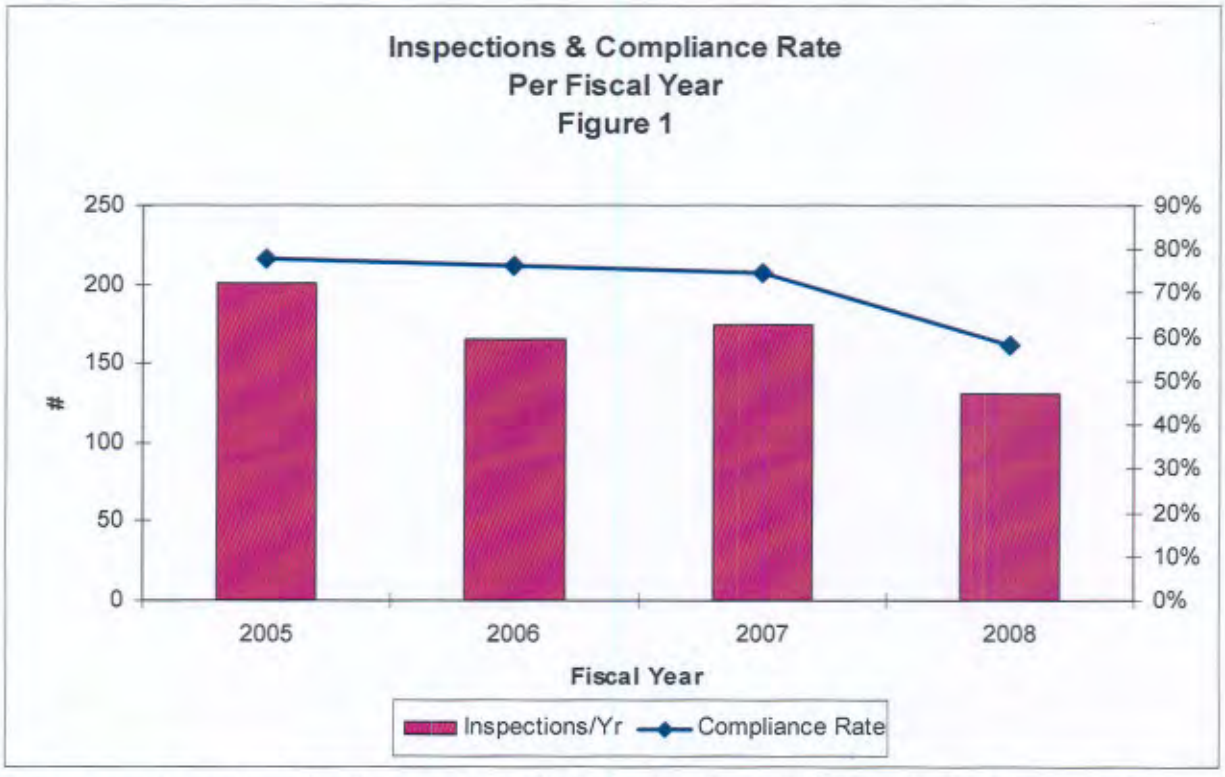
1) Reviewing the existing regulations,
2) Performing a gap analysis on the regulations and the status of industry,
3) Reconciling and rectifying internal inconsistencies and ambiguities,
4) Identifying points of interface with other regulatory programs such as odors with the air pollution control regulations, surface impoundments with the water quality control regulations or compost and fertilizer with the department of agriculture regulations and develop a fully functioning integrated regulatory integration framework.
5) Developing draft regulations,
6) Conducting an internal and external stakeholder process with the intent of working through any issues with the new regulations creating a product that industry can support, along with the Division, in front of the Solid and Hazardous Waste Commission for rulemaking, and
7) Identifying potential needs for guidance/policy associated with the new regulations
   a) Develop the guidance/policy,
   b) Post the guidance/policy to the web site, and
   c) Develop and deliver training on the guidance and/or policy.

<u>Compliance Monitoring and Enforcement</u>

Efficiency and effectiveness are very important in compliance monitoring (inspections) and enforcement. Efficiency allows adequate coverage of the regulated universe - compliance assessments can be completed and deterrence of non-compliance occurs. Efficiency measures include such items as work output per employee and timeliness of inspection and enforcement activities. Effectiveness ensures that inspection and enforcement activities protect public health and the environment. Effectiveness measures include improving compliance rates within the regulated community.

It should be noted that every inspection carries administrative responsibilities, such as preparation of a report and follow-up letter, potential informal and formal enforcement actions, litigation and tracking and data entry, all of which are also required to be performed on time and effectively. New for 2008, the facility specific financial assurance reviews were performed by the Program staff. These duties were previously performed by staff outside of the Program, but due to resource reallocations these duties were reassigned to Program staff. Prior to performing a field inspection, Program staff conducted a review to determine the solvency of the facility's financial mechanism and the appropriateness of the financial assurance amount. These additional duties increased staff workload on a per inspection basis.

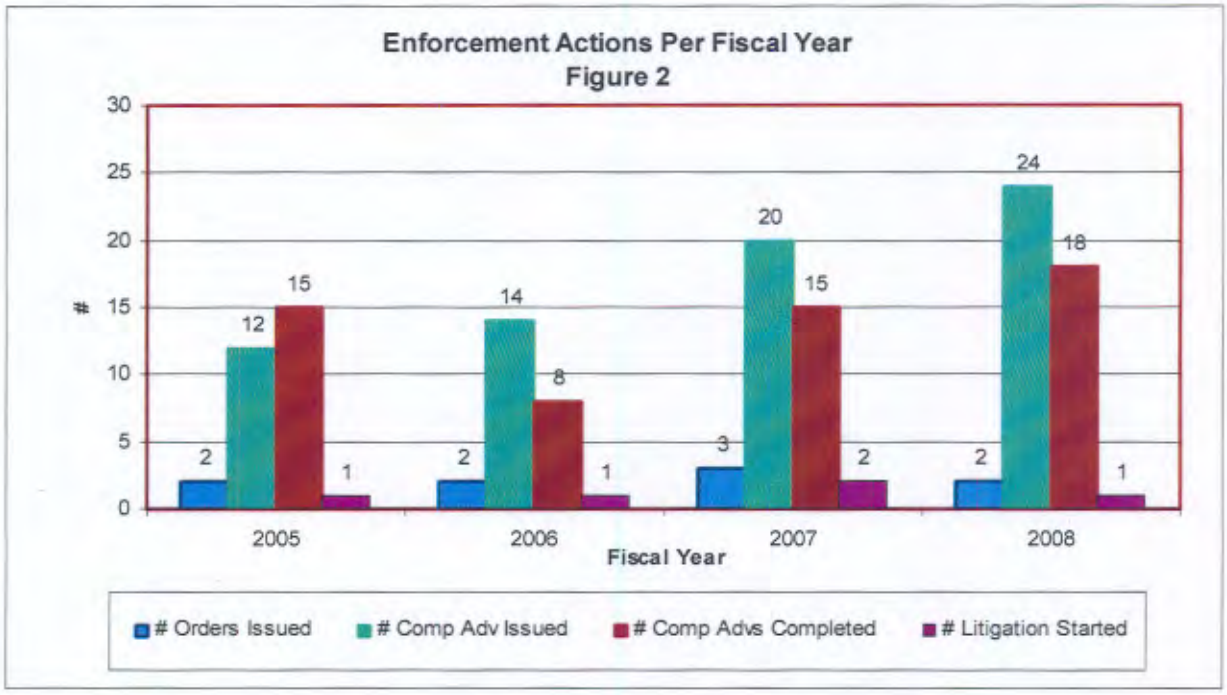
During 2008, the Program conducted 131 inspections resulting in 24 compliance advisories and two orders. The inspections documented an industry-wide 58% compliance rate, which is significantly lower than previous years, and discussed in detail below. The annual compliance rates and number of inspections are depicted in Figure 1 below.



The increased number of industry submittals for review by staff during the last two years has created a project backlog. Therefore the Program modified the inspection strategy during 2008

in response to the increased number of project submittals. The 2008 inspection strategy was modified to focus on sites and facilities that had not been inspected in the past two or more years or that were identified as noncompliant based on information collected during the 2007 inspections.

The modified inspection strategy was implemented by deferring inspections of facilities that were fully compliant for the past two years until 2009. This strategy generated several results. First, we performed fewer, but better targeted inspections. We were able to spend more time focusing on the facility types that struggle to maintain compliance. This, in turn, caused the apparent industry-wide compliance rate to drop from 2007 to 2008 because more historically non-compliant facilities were inspected.



The number of Compliance Advisories (informal enforcement actions) issued between 2005 and 2008 increased from 12 to 24 (See Figure 2). Four litigation actions were initiated between 2006 and 2008. In addition, 13 compliance advisories were resolved via an order or litigation. Seventy compliance advisories were issued between 2005 and 2008, with 69 being resolved either as a compliance advisory or after being elevated to an order or through litigation. The increased number of advisories issued and litigation actions initiated had a significant impact on staff because the advisories take more time and effort to generate. This is true because they require a more detailed analysis to: a) verify and document the apparent violations, b) develop actions and schedules to return the facility to compliance, c) work with facilities to implement the requested return-to-compliance activities, and d) ultimately verify and document completion of the requested actions and the facility's return to compliance. In addition, the litigation actions are a significant resource commitment by the Program. We anticipate that the modified inspection approach of targeting facilities with compliance problems will provide long term benefits by addressing some of the more problematic solid waste facility sectors, and helping to improve

their ability to operate in and maintain compliance. If the data confirms that this approach works, then we will adopt this methodology as a part of our routine inspection strategy.

Remediation

The Solid Waste Management Program conducts remediation activities through: 1) the investigation and clean up of asbestos contaminated soils at the request of the property owner in accordance with Section 5.5 of the Regulations, 2) a response to an imminent and substantial endangerment in accordance with the Act, or 3) an intra-divisional partnering relationship with voluntary cleanup activities. During 2008, the Program provided oversight at 12 asbestos contaminated soil remediation sites, 2 imminent and substantial endangerment sites, and 2 voluntary cleanup facilities.

The asbestos contaminated soil sites can take a considerable amount of time and effort. The larger asbestos contaminated sites, such as those located at the former Stapleton Airport redevelopment site, are similar to large hazardous waste corrective action remediation projects. The work at these sites falls into the Program's jurisdiction because of the asbestos contaminated soil regulations promulgated in 2006. We are currently participating in a workgroup comprised of asbestos contaminated soil owners and operators to update our guidance document. The result of this effort will add clarity and definition to the implementation of the regulations and expedite the investigation, management or remediation and redevelopment of the asbestos contaminated soil sites.

We are endeavoring to expedite the review and approval process of workplans and project completion reports. This will facilitate owners and operators returning properties to productive service as quickly as possible. One methodology to expedite our activities incorporates using pre-workplan submittal technical working sessions. We continue to encourage developers to participate in pre-workplan submittal scoping meetings. These meetings are used to explain the regulatory requirements, gain a better understanding of the developers' projects, and offer innovative approaches to resolve administrative, regulatory or implementation and strategy issues. These meetings are resulting in higher quality workplans being submitted that are easier to review with fewer issues being identified leading to quicker approvals.

Permitting and Document Reviews

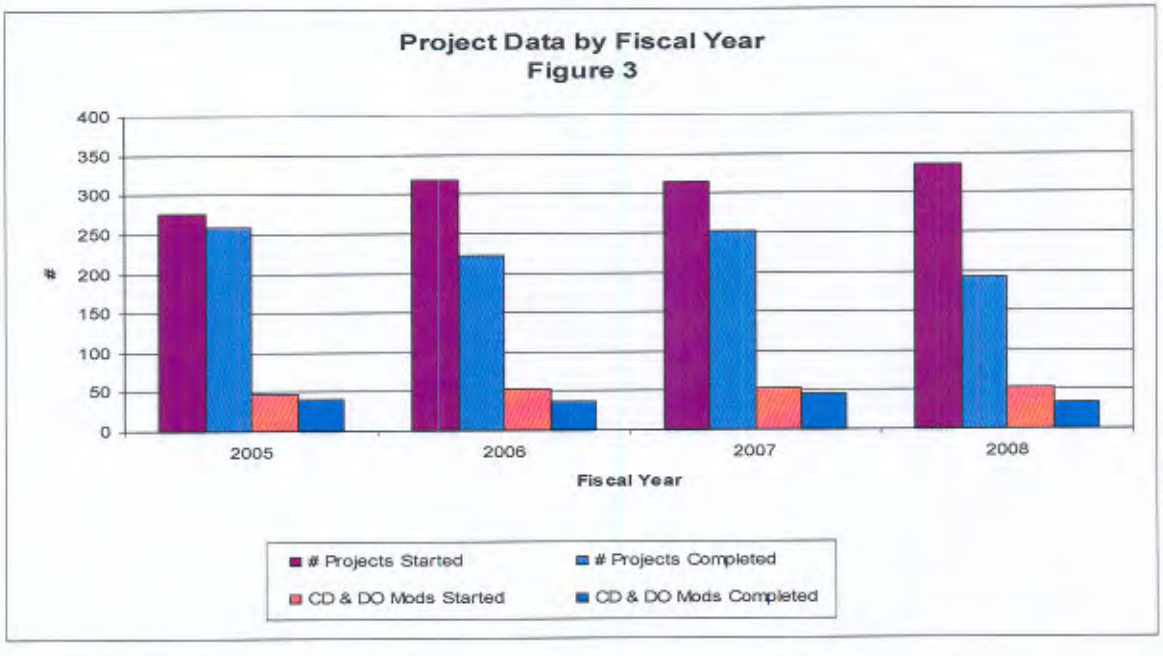
A variety of facility types manage solid waste in a manner requiring oversight by, and reporting to, the Program. In fact, more and more facilities are becoming material management facilities. Material management facilities are not simply solid waste disposal sites, but combine a variety of solid waste disposal and/or recycling activities at the same location. In addition, these facilities may have both open and closed areas of similar activities. An example of a material management facility might include management areas for:

1) Municipal solid waste disposal,
2) Non-friable asbestos disposal,
3) Friable asbestos disposal,
4) Residential tire, waste battery and used oil collection,

5) Green/Yard waste management,
6) White goods and scrap metal collection,
7) Household hazardous waste collection,
8) Used oil collection,
9) Used tire collection,
10) Used battery collection, and
11) Compost treatment, storage, and distribution operations.

We believe that these multi-function facilities will become the norm in the very near future. The current SWMS database is not able to track multiple operations at a single facility, nor the open and closed status of specific operations. We believe the ability to capture this information will be very beneficial to informing the marketplace regarding material reuse and management opportunities by improving waste management and efficiency for the entire state. As discussed in the data management section above, we very much look forward to collecting, analyzing and disseminating this information.

During 2009, 336 documents were submitted to the Solid Waste and Material Management Program for review. This is an increase of 22 over 2007. Figure 3 depicts an increasing trend in the number of documents submitted from 2005 through 2008. The graph also depicts a steady number of certificate of designation (CD) applications and design and operation (DO) plan submittals.



Because of the very heavy workload Figure 3 represents, staff spent an increased amount of time completing larger more complex projects such as new facility certificate of designation applications, rather than less-important projects. As a result, we did not complete many small projects (e.g., groundwater or gas monitoring reports) associated with low risk or low threat projects submitted in 2008 as in previous years. While there was a drop in the total number of

projects completed in 2008, staff did work on more major projects, in conjunction with providing an increased level of enforcement support.

The average facility response time was approximately 76 calendar days. This response time is, on average, approximately 18 days faster than 2007. The number of hours per response of several key deliverables increased, however, because we spent time on more complex high-priority projects. We are continuing to track data on time spent reviewing documents and have used it to develop a document review matrix. The matrix contains a list of the different types of documents that we receive for review. Each document type is then divided into a simple and complex document category. The Program then developed an estimated number of hours that should be required to review either a simple or complex submittal for each document type. This information is used by staff to evaluate their own review efficiency. In addition, the information is evaluated with staff during monthly workload evaluation meetings with management. This is a new process and will likely evolve over the next several years, but should yield a very powerful performance metric.

We are continuing to improve our ability to review documents and respond to the regulated community in a more timely manner by changing our review methodology. The program has implemented "two pass reviews." This is a review technique that staff and facilities alike are getting used to. The goal of the two-pass review process is to expedite the final approval of a given document. The methodology includes both reducing the number of reviews per document and the number of hours required to reach final approval of a submittal. The two-pass review operates as follows:

1) Receive and perform the initial review of the document,
2) Generate comments, if needed, related to clarifications or deficiencies in the document,
3) Send the comments to the facility,
4) Receive and review the facility's responses to the comments,
5) Create an approval-with-modifications letter related to the responses,
6) Send the draft approval-with-modifications letter to the facility for review and discussion of the proposed modifications, and
7) If the facility agrees with the modifications, finalize the document.

There are several advantages and options associated with this process. If the initial review indicates that the document may be approved without comment or modifications, then we do so. If the initial document may be approved with minor modifications, then we do so following discussions with the facility to ensure they agree with the changes. The two-pass review process is much more proactive and efficient than more traditional iterative correspondence process. Not all documents are amenable to this process; however we are endeavoring to use the two-pass review process whenever appropriate. In addition, if substantial issues still need to be resolved we can opt to issue comments, for further response and discussion, instead of modifications. We hope that the combined processes of pre-submittal scoping meetings and the two pass reviews will reduce the number of iterations, actual number of hours and the number of days to reach final document approval.

Program Funding

Cash fees fund the Solid Waste Management Program – no funding is received from the General Fund. There are three types of fees that fund the Program. The Solid Waste Users Fee constitutes the biggest portion of Program funding. It is a pass through fee paid by waste disposers and is also known in the industry as a "tipping fee." The fee is typically collected at landfills or other similar disposal facilities as part of the fee charged to dispose of solid waste at the facility. The hourly activity fees and the annual facility fees were previously described in this report. The present fee structure is expected to fund the program adequately through at least FY 2011. The cash fund balance will be evaluated throughout each year

CONCLUSIONS

A snapshot of the Solid Waste and Material Management Program is presented in Section 1 of this report. We started on effectiveness and efficiency improvements prior to the passage of HB 07-1288. However, we are still working on developing the new database system, which will include data cleanup and reconciliation, and believe that this is only a limited demonstration of what we hope are positive impacts of these measures. We do believe that significant improvement has occurred and is continuing to occur to further improve efficiency and effectiveness.

As discussed in this report, the Hazardous Materials and Waste Management Division has implemented significant improvements to the Solid Waste Management Program to satisfy the expectations set out by HB 07-1288 (Section 30-20-101.5(3), C.R.S). This report explains how these statutory expectations have each been met:

1) maintaining a program that is credible and accountable;
2) maintaining a program that is innovative and cost-effective;
3) developing level-of-effort guidelines for inspections, enforcement, permitting, and remediation;
4) streamlining the permitting and document review process; and
5) emphasizing compliance assistance efforts.

While this report covers only our first full year of reporting under HB 07-1288 we expect future accomplishments to include the following

- initiating a new data management system,
- reporting on a variety of new efficiency and effectiveness metrics,
- continuing our high level of customer and facility technical assistance,
- improving our facility response time,
- dramatically increasing inspection efficiency,
- improving the timeliness of enforcement actions, and
- streamlining the document review and permitting process.

SECTION 2

STATE OF RECYCLING IN COLORADO 2007

The following section is presented to satisfy our obligation in HB07-1288 that requires the Department to document Colorado's waste diversion rates. In addition, this section provides a compilation of our material flow documentation efforts minus the waste tire data that was forwarded on July 1, 2008 in the Fourth Annual Report to the Transportation Legislation Review Committee on the Status of Waste Tire Recycling In Colorado for Calendar Year 2007.

RECYCING OVERVIEW AND BENEFITS

Recycling in Colorado occurs at various levels from large industrial corporations to small residential grass roots programs, and is dependent on many geographic variables across the state. The varied recycling infrastructure in Colorado ranges from highly developed city mandates and cities with recycling rates above 50%, to entire counties with no recycling available. Although the philosophy of being "green" and living in an environmentally friendly manner is growing across the State, Colorado's 12.5% recycling rate significantly lags other states as noted in BioCycle's annual The State of Garbage report. Colorado, however, does not stand alone when compared to its neighboring states. The Rocky Mountain region has the lowest regional recycling rate at 9%; as compared to a national average of 28.5%. Based on the Program's data collection effort, Colorado's 2007 municipal solid waste (MSW) recycling rate is 16.6%, and the total recovery rate of all solid waste materials is 28.5%. Although Colorado still has a ways to go in its recycling rate when compared to other states, having more than a quarter of the total solid waste produced in the year being recovered is a noteworthy accomplishment.

The state of recycling in Colorado entails many complex variables yet is deserving of significant analysis. Recycling has many notable benefits including saving energy (See Table 1), reducing pollution,

Table 1: Colorado's 2007 Recycling Energy Savings per Material

Reporting Year	Tons Recycled 2007	Energy Savings from Recycling (Million BTUs)	Energy Use if Recyclables Had Been Disposed (Million BTUs)	Net Energy Savings (Million BTUs)
Glass	84,824	180,285.76	44,736.18	225,021.94
Corrugated Cardboard	180,540	2,783,595.09	41,307.65	2,824,902.74
Whole Computers	6,809	295,761.44	3,591.07	299,352.51
Food Scraps	17,714	-10,344.98	5,921.78	-4,423.20
Yard Trimmings	14,150	-8,263.60	5,840.00	-2,423.60
Ferrous Scrap Metal	1,009,572	20,157,317.52	532,448.27	20,689,765.80

Tires	37,618	1,954,755.84	19,839.73	1,974,595.57
Construction & Demolition	19,304	NA	NA	NA
Aggregate	1,333,931	142,493.33	703,515.21	846,008.54
Mixed Paper	291,044	6,677,073.24	71,277.16	6,748,350.40
Mixed Metals	20,121	1,505,175.68	10,611.82	1,515,787.50
Mixed Plastics	6,872	360,196.49	3,624.29	363,820.78
Commingled Recyclables	1,200	20,289.31	364.62	20,653.93
Mixed Organics	331,573	-210,454.91	135,083.27	-75,371.65
Other Recyclables	449	NA	NA	NA
Total as a Result of Recycling	3,358,449	33,847,880	1,578,161	35,426,041

conserving natural resources, reducing waste, preventing greenhouse gas emissions, expanding job growth, providing materials for instate manufacturers, and prolonging the life of landfills. This section focuses on the data provided by recycling facilities in the annual recycling facility reporting forms. The data is required by regulation to be reported on May 1 following the previous calendar year's recycling activities. The data in this section documents the various types and quantities of materials diverted from the solid waste disposal stream during Calendar Year 2007, the latest available information. The data obtained from the recycling facility reporting forms was analyzed to provide annual diversion rates per solid waste material, diversion trends in Colorado's waste streams, recycling rates per material type for the year and overall energy savings.

Energy Savings

One of the most notable benefits of recycling is the energy saved from using recycled material as feedstock in manufacturing processes as opposed to using virgin raw materials (See Table 1 above). The energy savings from recycling ranges dramatically depending on the specific material recycled, but the net result was a significant energy savings. In 2007, Colorado recycled enough material to produce an energy savings (35 million BTUs) that is equivalent to conserving over 6 million barrels of oil, or 285 million gallons of gasoline. Enough energy was saved to power the equivalent of over 341,000 average homes for a year. The energy saving also translated to a reduction in the amount of greenhouse gas generated.

Greenhouse Gas Emissions

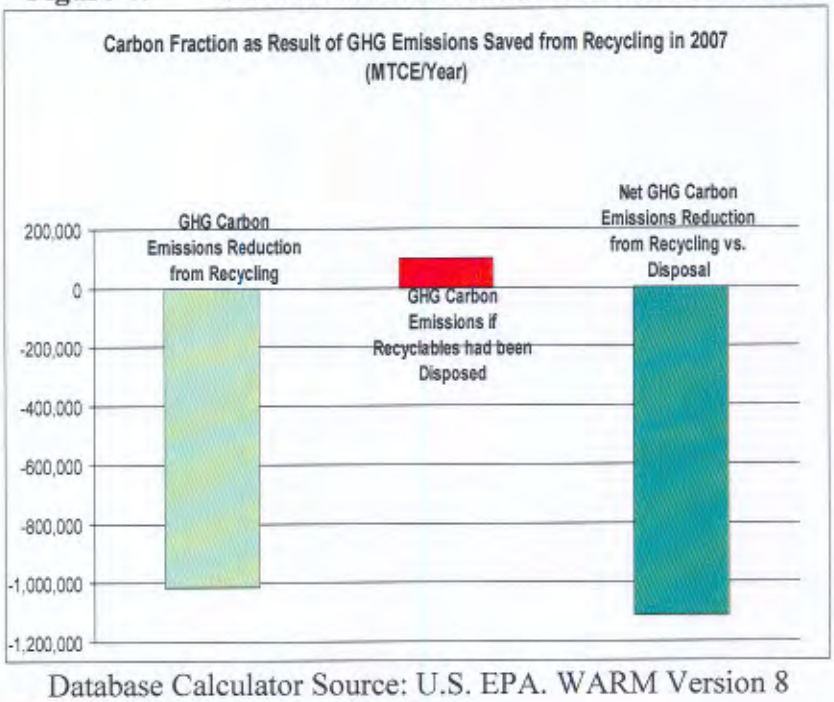
In addition to saving energy, recycling significantly reduces climatic impacts by reducing greenhouse gas (GHG) emissions. When considering the entire lifecycle of a product, GHG emissions are avoided on many levels such as: 1) an initial savings by conserving the resources required to extract raw materials, 2) secondary savings by reducing fuel used transporting and processing of raw materials, 3) tertiary savings by reprocessing spent materials which uses considerably less energy, and 4) quaternary savings by avoiding decomposition and GHG release from discarded organic waste.

Table 2: Greenhouse Gas Carbon Dioxide Emission Savings

2,000,000 MT-CO2E emissions avoided from recycling for the year equals: 511,000 cars removed from the road, 6.06 million barrels of oil conserved, and 13,607 railcars of coal conserved.

The Program used U.S. EPA's Waste Reduction Model (WaRM) to determine how much GHG emissions were reduced by Colorado's 2007 recycling efforts. Data analysis indicated that a total of 2,605,736 metric tons of carbon dioxide equivalent (MTCO2E) greenhouse gas emissions were eliminated by Colorado's 2007 recycling and composting activities. This savings is equivalent to removing over 511,000 passenger cars from the road per year. The materials recycled in 2007 are also equivalent to the environmental benefits noted in Table 2 and Figure 4 below. Table 2 lists carbon dioxide greenhouse gas facts, while Figure 4 presents the carbon emission reductions related to Colorado's recycling and reuse efforts.

Figure 4: Greenhouse Gas Carbon Fraction Emission



Database Calculator Source: U.S. EPA. WARM Version 8

COLORADO RECYCLING DISTRIBUTIONS AND AVAILABILITY:

Even though Colorado does not have a comprehensive recycling infrastructure, the majority of Colorado's residents **do** have access to some form of recycling. While most rural areas have reduced access to recycling operations, many have worked together to make recycling possible. Overall, access to residential recycling in Colorado is offered in nearly every major municipality. While curbside pickup of residential recyclables is not feasible in certain locations, many communities provide recycling drop off centers. In fact, more than 97% of Colorado's population living in a municipality has access to some form of recycling. Table 3 identifies the

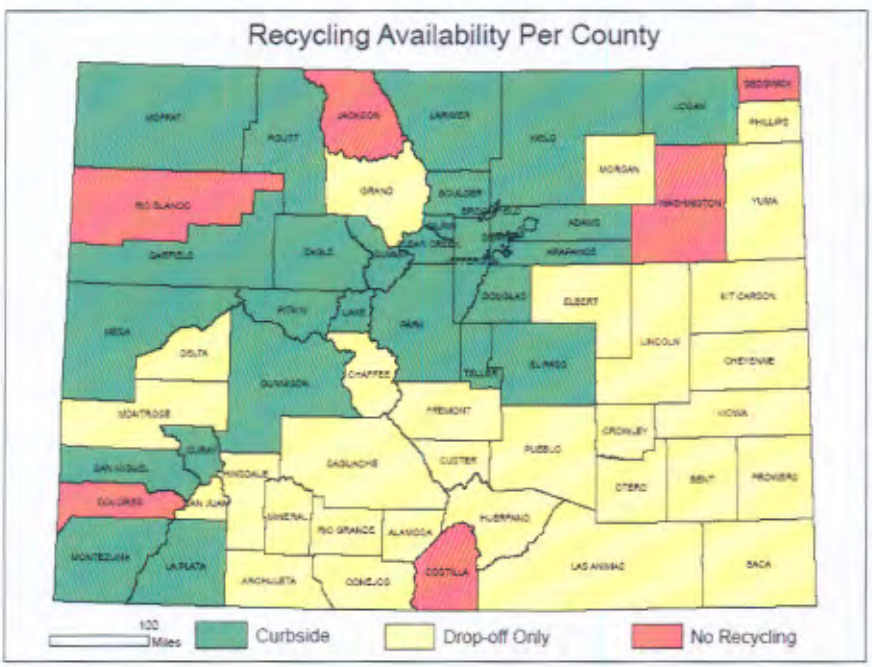
number and percent of residents and the number and percent of Colorado's cities that have drop-off, curbside or no recycling available.

Table 3: 2007 Residential Recycling Availability

	Population	% of Population	Cities	% Cities
Drop Off Recycling Only	263,180	7.76%	64	24.15%
Curbside Recycling	3,046,062	89.76%	108	40.75%
No Recycling	84,254	2.48%	93	35.09%

This information is depicted graphically on Figures 5 and 6. Figures 5 and 6 depict residential access to recycling in progressive detail and is presented by county and then by municipality respectively.

Figure 5: Recycling Availability Per County

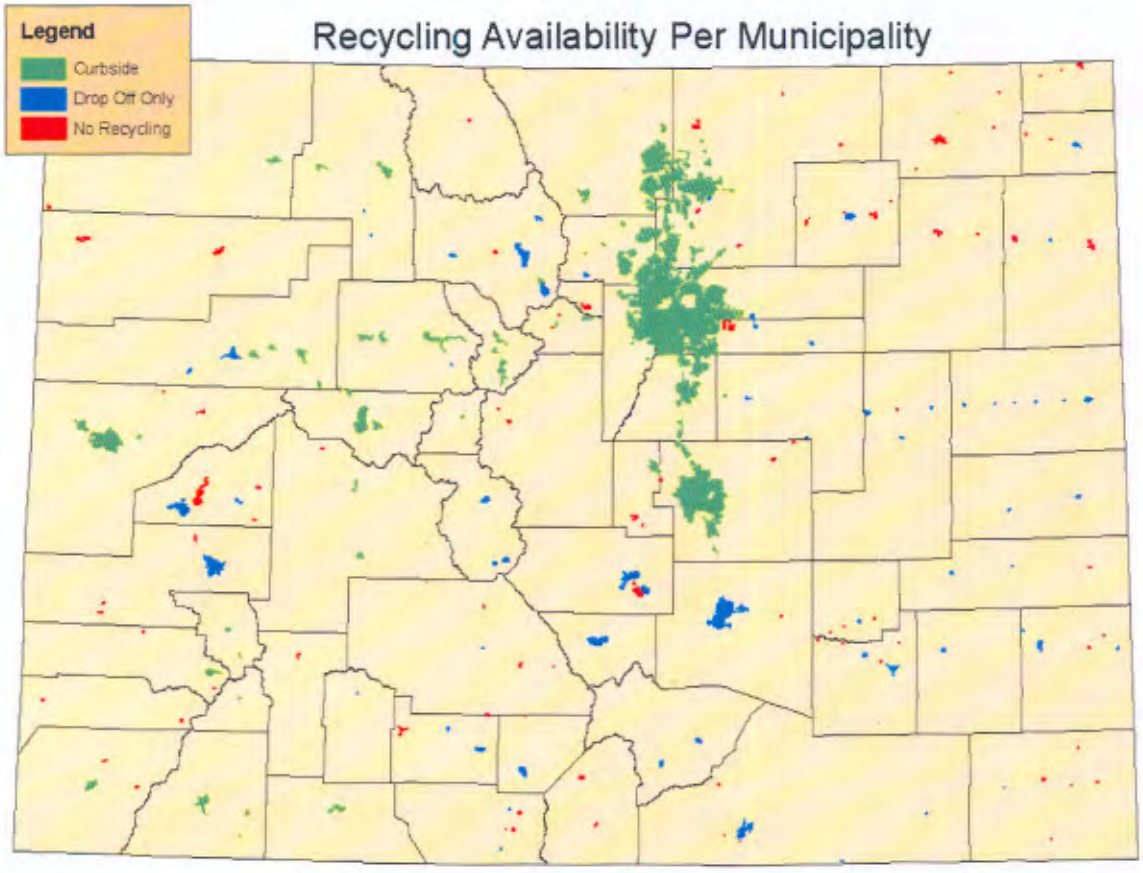


As shown in Figure 5, the distribution of recycling availability statewide is fairly clear-cut with more curbside recycling in larger metropolitan regions including the Front Range area, and the western mountain towns. Drop off centers are the dominant method of collecting recyclables in the eastern plains and southern region of the state which generally includes smaller, more rural towns. The recycling availability indicated in Figure 5 is based on whether recycling, either curbside or drop off, is available within the county and does not conclude that recycling is available throughout an entire county.

Almost every major municipality has some form of recycling option available (See Figure 6); however, there are still some large cities that do not provide recycling, such as the municipalities of Sterling and Pueblo. Recycling is available in communities ranging from Denver with a population of over 550,000 residents to small rural communities such as Branson and Kim with populations of 77 and 65 residents respectively. Some of the most notable towns with no available recycling include Brush, population 5,282, and Sterling, population 13,713. Towns that can significantly improve residential recycling by having curbside recycling available to

residents include Trinidad (population 9,078), Fort Morgan (11,051), Canon City (15,431), and Pueblo (104,121).

Figure 6: Recycling Availability Per Municipality



DATA COLLECTION METHODOLOGY

Authority

Under 6 CCR 1007-2 Section 8 of the Colorado Regulations Pertaining to Solid Waste Sites and Facilities, recycling facilities must register with and report annually to the Department on or before May 1st of each year regarding their recycling activities of the previous calendar year. The Department spent an extensive amount of time and effort to ensure comprehensive and reliable data was submitted on these forms. The reporting forms can be viewed at http://www.cdphe.state.co.us/hm/forms/recyclingformstandard.pdf.

The data was submitted either electronically online or via hard copy. Through extensive research and the assistance of contractors, the Solid Waste Program identified 189 recycling programs with 64 operations qualifying as recycling facilities as defined in the regulations, and required to submittal the annual report. This data formed the foundation for understanding material movement and management in and through Colorado. It is common for recyclable

material to flow from one recycling operation to another. To be sure the data was not counted twice and thereby inflating the amount of material recycled; facilities were asked to provide information on where recyclable material came from, and where it was sent. This reporting process helped eliminate material volume double counting, and it also provided information on material flow.

Material Classification

Not all recycling data collected on the forms counted towards the municipal solid waste (MSW) recycling rate. In order to accurately compare Colorado's MSW recycling rate with other states, and get a true idea of municipal material recycled, the Program adopted the US EPA's scope of materials accepted as MSW to calculate the MSW recycling rate. Additional materials reported on the forms, but those exempt from the EPA's MSW list, were included in the state's total recovery rate. The material classifications are presented below in Table 4.

Table 4: Material Classifications

Material Classification	
MSW Recyclable Materials (MSW recycling rate)	Non-MSW Materials (included in diversion rate)
Paper (includes cardboard)	Aggregates
Plastic	Oil
Glass	Construction & Demolition
Metals (non-ferrous and ferrous scrap metals)	Compost (non-MSW feedstock)
Electronics	Antifreeze
Organics (yard waste and composted food scraps)	
Batteries	
Tires	
Commingled	
Other (textiles, cooking oil, other small quantities)	

Once the data was collected, sorted by category and verified it was analyzed and used to calculate Colorado's MSW and Total recycling rates as depicted below in equations 1 and 2 respectively.

Equation 1: Colorado MSW Recycling Rate Calculation

MSW RECYCLING RATE (%) = MSW RECYCLED x 100 / TOTAL WASTE GENERATED

Equation 2: Colorado Total Recovery Rate Calculation

RECOVERY RATE (%) = (MSW RECYCLED + OTHER RECYCLED) x 100 / TOTAL WASTE GENERATED

RESULTS & ANALYSIS

The 2007 recycling data is presented below in a series of tables and graphs. Table 5 presents the tons of MSW recovered, the tons of total materials recovered and the total amount of materials disposed. The data in Table 5 was use in equations 1 and 2 to calculate Colorado's 2007 MSW and Total recycling rates as presented in Table 6.

Table 5: 2007 Colorado Material Totals

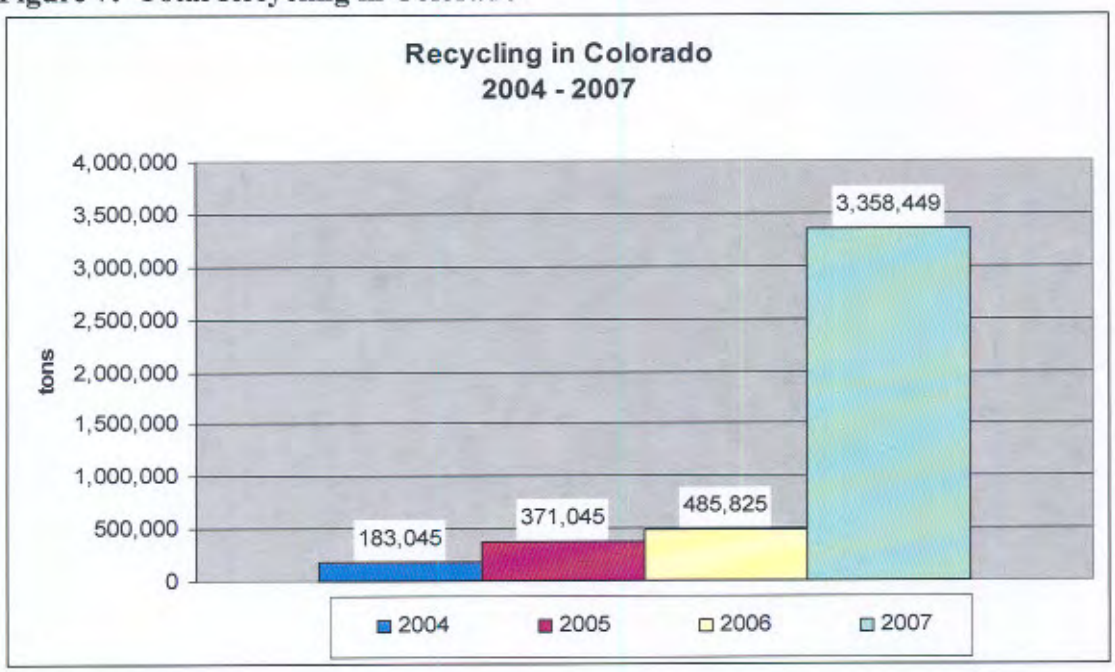
MSW Recycled	1,672,580 tons
Total Recovered	3,358,449 tons
Total Disposed	8,418,721 tons

Table 6: Colorado MSW and Total Recycling Rates

MSW Recycling Rate	16.6%
State's Total Recovery Rate	28.5%

In 2007, 3,358,449 tons of material were recovered and recycled in Colorado. This rate of recovery and recycling is 84% higher than any pervious year. As depicted in Figure 7, the 2007 recycling tonnage increased significantly compared to previous years due primarily to a doubling in the number of reporting facilities and the addition of new materials reported.

Figure 7: Total Recycling in Colorado



The increase in recycling and recovered materials is due mostly to the efforts of the new Program staff in the Data Management Group. These efforts included the identification of and data collection from newly identified recycling facilities and newly reported materials. Their efforts were facilitated by the revised and improved data collection forms. Clearly Colorado's new data collection efforts are providing a much better understanding of where, how and how much of which types of materials are being recycled. Colorado's Total recycling rate was divided into the MSW and Non-MSW recycling rates as depicted in Figures 8 and 9 respectively.

Figure 8: Recycled Amounts of Specific MSW Materials in Colorado

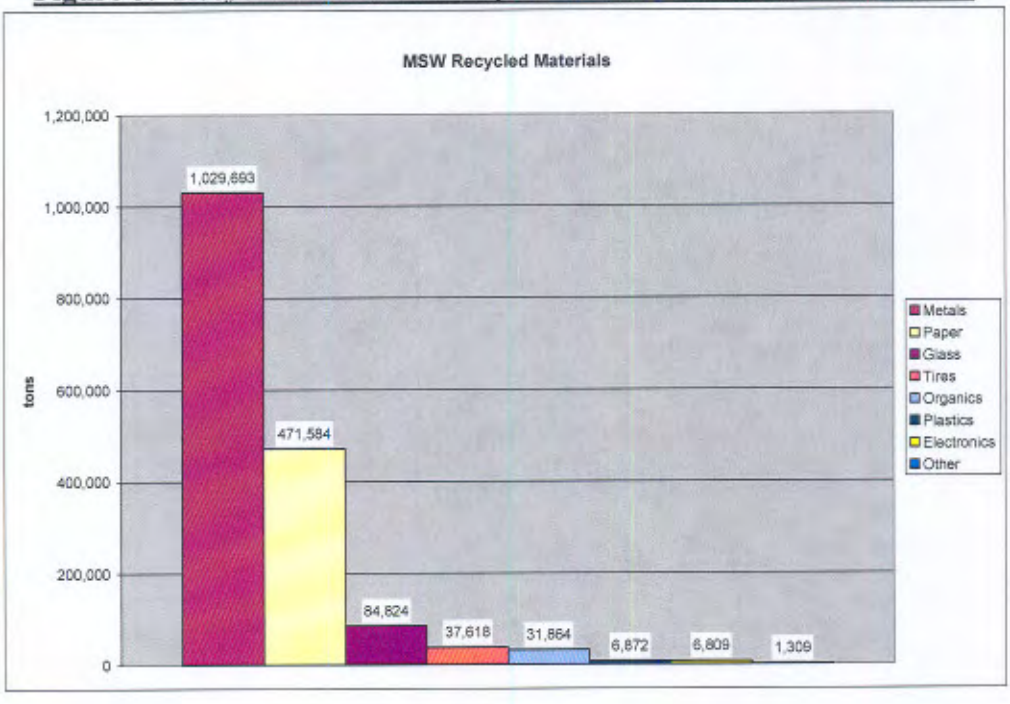
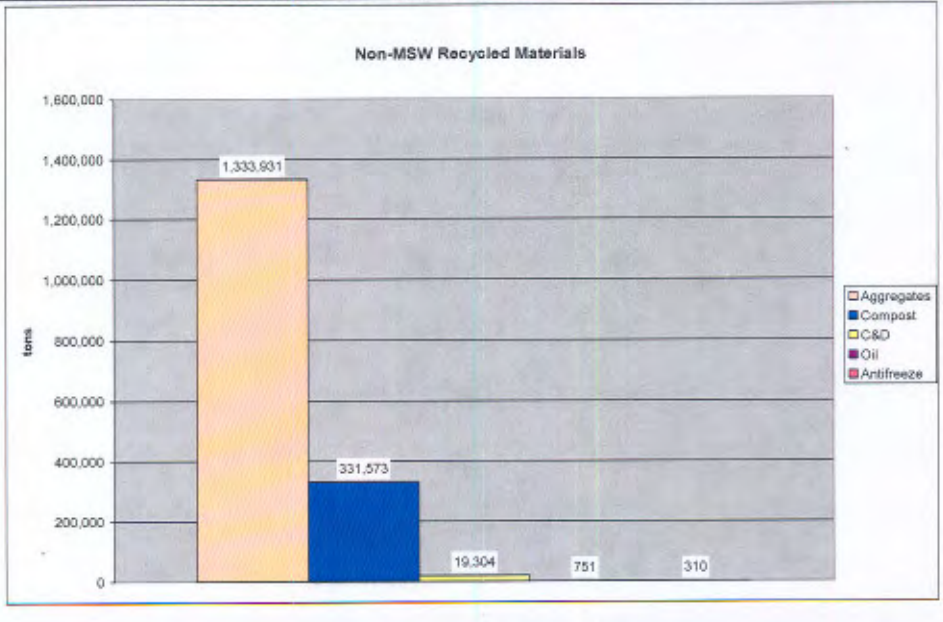


Figure 9: Recycling Rates for Specific Non-MSW Materials in Colorado



Metal recycled at the Rocky Mountain Steel Mill far outstrips all other materials identified in Figure 8. In fact, Colorado recycled more than twice as much metal as the next most recycled MSW material. Aggregates, such as concrete and asphalt depicted in Figure 9, represented the largest amount, by weight, of non-MSW material recycled.

The total amount of material composted in 2007 was 360,368 tons, as documented in the Composting Facility Report. This amount included 28,759 tons of MSW materials including food scraps and yard waste which is included in MSW Organics on Figure 8, and 331,573 tons of non-MSW compost from Figures 9 and 10.

Figure 10: Total Amount of Specific Materials Recycled in Colorado

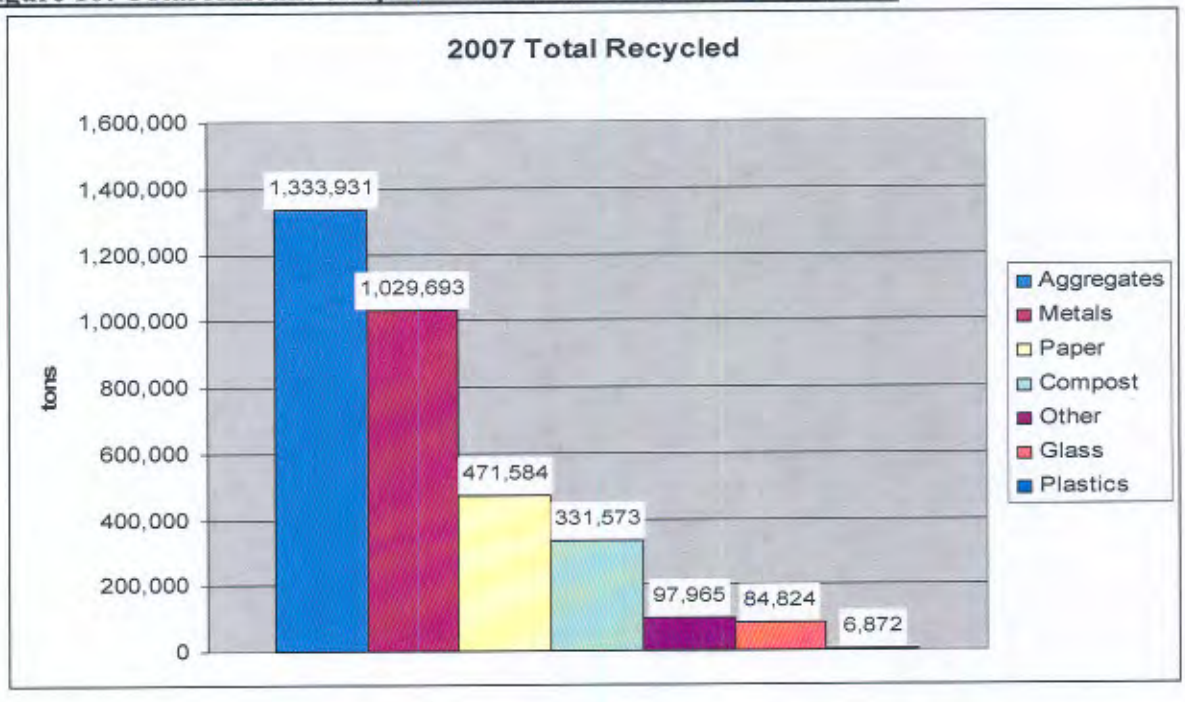


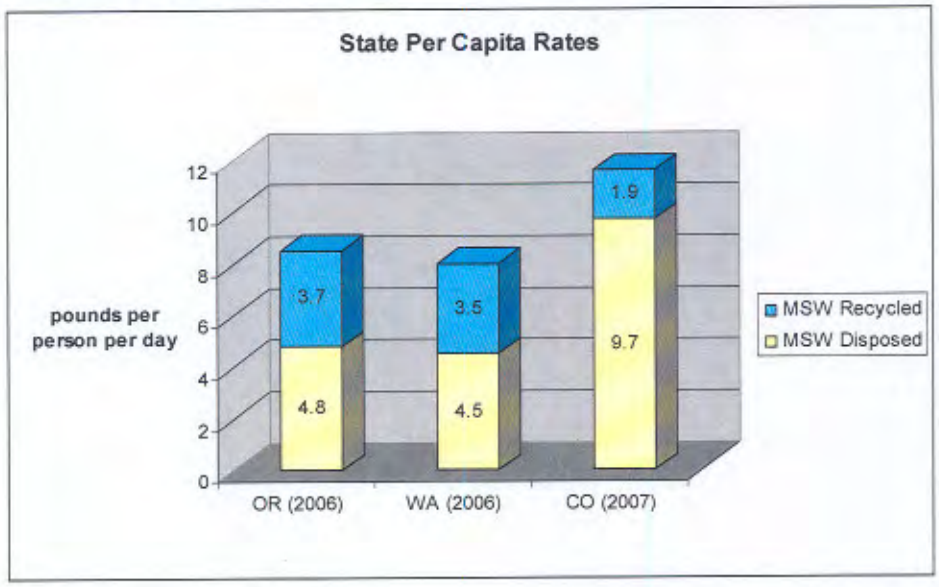
Figure 10 is a combined MSW and non-MSW graph depicting the seven most recycled materials, by weight, in Colorado. Although aggregate recycling is the leading material in weight, it is notable that 30% of the total recycled material is metal. Colorado is fortunate to have a strong end user market for recyclable metals. Use of recycled metals in steel production at the Rocky Mountain Steel Mills facility in Pueblo significantly increases recycling of this leading energy saving commodity in Colorado. Recycled glass also has a major end market within the state (Rocky Mountain Bottle Co.), but glass makes up less than 5% of the total materials recycled. The reason for this is that the Rocky Mountain Bottle Co. facility can use only very clean glass and only certain colors of glass.

Individual Recycling Data and Rates:

Figure 11 was developed to provide a comparison between Colorado and two other states with more mature recycling and material reuse programs. Comparison of our 2007 data with Washington and Oregon helps identify where we can improve. While the total amount of solid

waste generated per person in Colorado is not excessively more than the other states, the amount of MSW disposed of compared to the amount recycled shows Colorado lagging behind. Colorado residents disposed of almost twice as much MSW per person when compared to residents of Washington and Oregon.

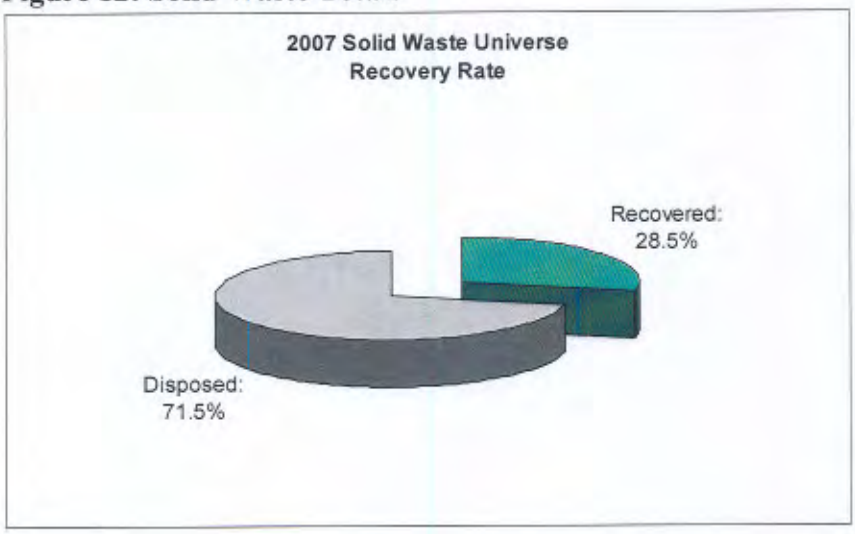
Figure 11 Per Capita Rates



In addition, we recycled only about half as much material as residents in Washington and Oregon. Clearly these are areas where we can improve. However, Figure 11 also provides potential goals for some of Colorado's recycling programs based on achievable recycling rates in other states.

Colorado's 2007 solid waste universe can be better understood now with data collection of not only the recycling rate, but the total recovery rate. Although Colorado still lags in its recycling rate when compared to other states, having more than a quarter of the solid waste produced being recovered is noteworthy (See Figure 12). Accounting for all of the materials recycled in Colorado indicates that there is quite a bit of non-traditional material being recycled. This is very encouraging as it indicates that there may be more opportunities for end user markets and job growth than if only tracking EPA's narrower universe of MSW recycled materials.

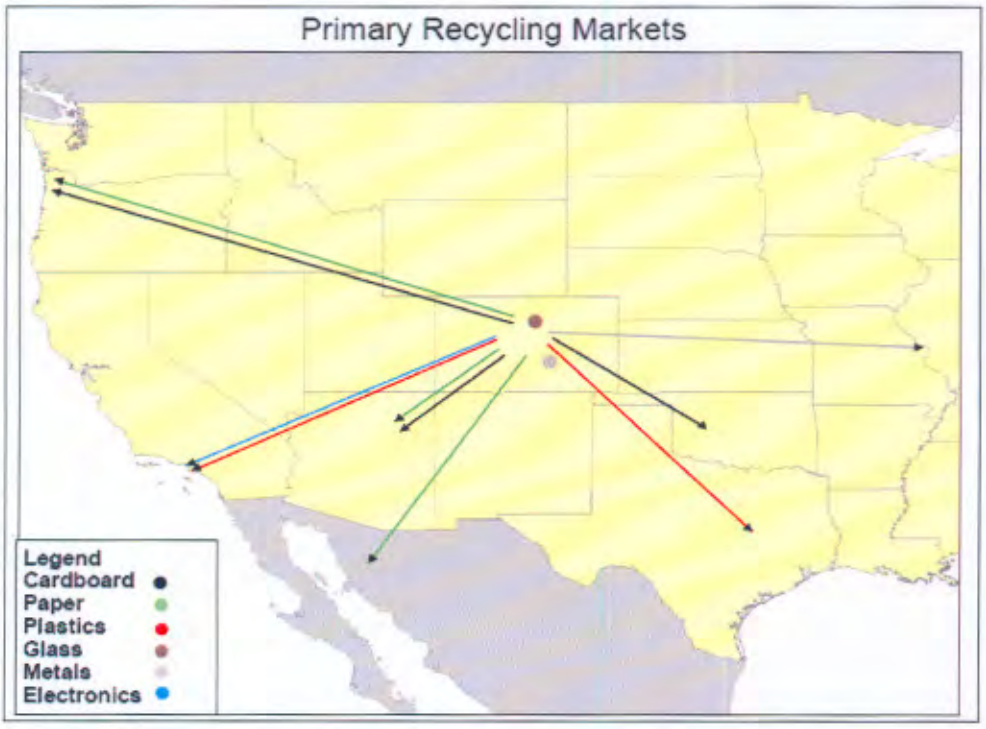
Figure 12: Solid Waste Totals



Material Flow & Quantity

Once the material is recycled then what? Certainly we wish to increase material recycling and reuse wherever possible. However, that is only part of the story. We also wish to inform the marketplace and foster the development of businesses and end user markets in Colorado. Colorado's limited number of manufacturers and end use markets for recyclable materials results in most of the material collected being shipped out of state for reprocessing and manufacturing. While the captured recyclable material flows to a variety of destinations, there are a few common primary recycling end use markets as depicted in Figure 13. The primary in-state end use markets of recyclable material utilize aggregate, glass and scrap metal. These markets are supplied by raw feedstocks or recyclable materials, and they draw in recyclable materials from other states

Figure 13: End Users of Recyclable Material



In addition to the common recyclable materials, many other commercial materials are reused in Colorado. Recycled commercial materials include tires, aggregates such as asphalt and cement, oil, and select other products.

IMPROVING RECYCLING RATES:

There are a variety of reasons given for not recycling. During the course of collecting data for this effort the team kept a journal regarding the most prevalent misconceptions and misinformation about recycling. We heard these often enough and shared information debunking these "myths" about recycling that we felt it worth while to set the record straight

about several of these perceptions. The following is a list of "recycling myths" and facts that help set the record straight.

Myth: Cities that provide recycling services to residents are losing money.

- Fact: Quite the contrary, the City of Denver's bi-weekly curbside recycling program generated more than $1 million dollars of revenue in 2007 from the sale of recyclable materials. This recycling program also happens to be the only revenue-generating source in the city's Solid Waste Management Division.

Myth: Small rural towns cannot effectively sustain recycling programs because of high shipping costs and because small communities do not provide enough material for economic collection.

- Fact: There are 31 towns in Colorado with populations under 2000 people that have curbside recycling, and 41 other towns with drop-off recycling. Of the 155 towns in Colorado with populations under 2000, 46% have some type of recycling options available to residents. The data indicates that the communities value recycling enough to provide it for their residents. These are purely empirical results. We are currently collecting fiscal data to evaluate the scalability of recycling throughout the state.

Myth: Waste diversion operations such as recycling facilities are neither beneficial to the economy nor support a profitable business sector.

- Fact: A study was conducted by California's Integrated Solid Waste Management Board. The study compared the waste disposal sector to the recycling and diversion sector. The results indicated that, per ton of material collected, waste diversion operations create twice the economic impact as compared to waste disposal. The economic advantage of the diversion industry is primarily due to the reuse of material and value-added reprocessing that support additional jobs and economic growth.

Myth: Colorado's low recycling rate is primarily due to a high percentage of Colorado residents who do not have access to recycling.

- Fact: A study conducted by the Solid Waste Program at the Department in 2008 found that of the nearly 3.3 million people living in Colorado's incorporated municipalities; over 3 million have access to curbside recycling. While 36% of Colorado's cities have no recycling available, the populations of those cities comprise only 2.6% of the total population of municipalities. Additionally, 41% of all cities have curbside recycling available and 24% have drop-off recycling totaling 89.8% and 7.8% of the population respectively. This means that over 97% of Colorado's population has ready access to either curbside or drop-off recycling.

Myth: Because Colorado has a small number of end markets for recovered materials, the long distances that materials must be shipped for processing offsets the benefits of recycling.

- Fact: According to the Oregon Department of Environmental Quality, per ton of material, one would need to ship aluminum 116,000 miles, newspaper 23,000 miles, and glass 2,000 miles respectively by truck before the transportation emissions would equal the GHG emissions avoided by recycling these materials versus using new materials. The high cost of shipping recyclable materials to distant end-markets is an obstacle to increasing recycling in Colorado. However, when commodity prices are good, many

companies make a profit collecting and shipping recyclables quite a distance. For instance, much of our recycled paper goes all the way to China for re-use.

Beyond the recycling myths there are other issues related to increasing material reuse in Colorado. Education and awareness are two of the key issues related to improving the recycling rates in Colorado.

Education & Awareness

Access to recycling and participating in recycling are two very different factors. The best ways to improve the residential recycling rate in Colorado are: 1) providing access to those areas of Colorado that do not have access now, 2) providing curb-side recycling in the larger population centers that do not currently have it; and 3) improve public participation through education, awareness and incentives.

While it may seem obvious, the first step to improving residential recycling is that residents must be aware that they can recycle, which is all too often overlooked. Many people have recycling provided by their city or private trash hauler, but do not know they have the opportunity to recycle, or what that opportunity means. To illustrate this, the City of Denver, which runs one of the most successful single stream recycling operations in the state at no extra cost to residents, has a recycling participation rate of only 44% (based on eligible single family home and small multi-unit building residents).

Incentives to Recycle

For more residents to participate in recycling, incentives and a better understanding of the true cost of a product are required to produce better recycling results. These will help people understand the impacts of solid waste management, the life cycle cost of materials and the variety of benefits that recycling can bring to their community. Unlike other utilities such as electricity or water, solid waste disposal is frequently offered at rates not based upon quantity, but provided at a flat rate often subsidizing the true cost of waste disposal operations.

Across the nation, volume based rate structures known as Pay As You Throw (PAYT) are being instituted, and are now in place for 26% of the nation's communities. The volume based rate structure charges for the amount of waste disposed. This type of a program provides an incentive to residents to minimize waste, because they are charged less for disposing of smaller material volumes. It also encourages recycling as a means of minimizing residential waste volumes. Studies on the effectiveness of PAYT concluded it is the single most effective action or method to increase recycling (SERA 2006). Oregon, Minnesota, and Washington, all of which have PAYT implemented statewide, rank as having the 1st, 2nd, and 5th highest recycling rates in the nation for the previous year (Biocycle 2006).

Local community efforts in Colorado that implemented PAYT rates have experienced high levels of success. Fort Collins switched to PAYT in 1996 and has seen an increase in recycling from approximately 17% to 27%. The most notable community using PAYT is the city of Loveland,

which leads all cities in Colorado with the highest recycling rate. Since implementing the PAYT structure in 1993, Loveland has had a recycling rate over 50% every year to date.

Projected trends of recycling

Recycling in Colorado has much room for improvement. With a growing emphasis on "green living" and the environment, recycling will hopefully be targeted as one of the most effective and easiest ways to live green. Additionally, new technologies in recycling such as the increasing availability of single stream recycling will likely result in an increase of participants and quantities collected. The Program will also be able to assist the municipalities that were identified as having gaps in their recycling infrastructure. The Program will assist them by helping to develop Best Management Practices for implementation of recycling.

Clearly much more work needs to be done to develop awareness of recycling opportunities and benefits. With the support of the Recycling Resource Economic Opportunity Fund to further infrastructure, education, and incentives for participation, recycling looks to be on the rise in Colorado.

SECTION 3

THE STATE OF COMPOSTING IN COLORADO 2007

Pursuant to Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Section 14.2.2) registered composting facilities are required to submit reports listing the quantity of finished product produced (used onsite, sold, or distributed), and the types of feedstock used and remaining onsite. These reports provide a detailed look at the amount and type of degradable materials collected by commercial composting operations. The last year of information is calendar year 2007 as 2008 Reports have not yet been submitted to the Department.

The Solid Waste and Material Management Unit can support Colorado's Climate Change agenda by providing generators of compostable materials with information on recycling and diversion options for organics formerly destined for disposal at landfills. Methane is quickly created as organic materials break down under anaerobic conditions (landfill conditions), and is up to twenty times more potent than carbon dioxide as a greenhouse gas. Decreasing the amount of organics entering the landfill directly decreases the amount of greenhouse gases created by landfill operations. According to the Environmental Protection Agency, between 25% and 30% of municipal solid waste is material that can be utilized by composting operations.

Registered composting facilities in the State of Colorado collected 879,121 yd^3 of compostable materials during 2007. This is equivalent to 360,368 tons of materials; an amount which is approximately 10% of the total materials diverted from landfills in Colorado during 2007.

Curbside collection of organic waste is underway for businesses and residents in the Denver and Boulder County area and the City of Loveland. Collecting organics at the curb is crucial to increasing municipal solid waste diversion rates.

IN 2007, COMMERCIAL COMPOSTING FACILITIES COMPOSTED 17,714 TONS OF FOOD WASTE. THIS IS EQUIVALENT TO THE FOLLOWING SAVINGS:

- The greenhouse gas emissions from 2,992 passenger vehicles; or
- CO_2 emissions from the electricity use of 2,164 homes for one year; or
- CO_2 emissions from 1,854,559 gallons of gasoline consumed; or
- CO_2 emissions from burning 85 railcars worth of coal

Types of Materials Collected

Composting operations require two types of materials to create a quality compost product. The first, "feedstock" has a high nutrient value that typically provides a source of nitrogen to the composting process. Examples of feedstock materials include chipped and ground material

including, but not limited to, green wastes (yard wastes), animal material, food wastes, manure, biosolids, and solid waste. The second, "bulking material," such as wood chips, straw or hay, provides a source of carbon to the composting process. Compost piles are most productive when bulking and feedstock materials are mixed in specific ratios developed for the types of materials being composted. Also, microorganisms, and the appropriate moisture and oxygen content are essential to expedite the breakdown of the materials. Compost has distinct advantages over other fertilizers because the composted material can act as a soil conditioner and moisture retention agent while providing a slow release form of nitrogen to enhance plant growth and development.

Figure 14 depicts the six largest types of feedstock materials identified by composting companies in the state during 2007: Animal material (e.g., mortalities, offal waste, bedding materials, or other materials directly associated with stock except manure) biosolids (sewage treatment sludges), manure, food waste, yard waste, and kiln-dried wood.

Figure 14

Top Six Compost Facility Feedstock Materials

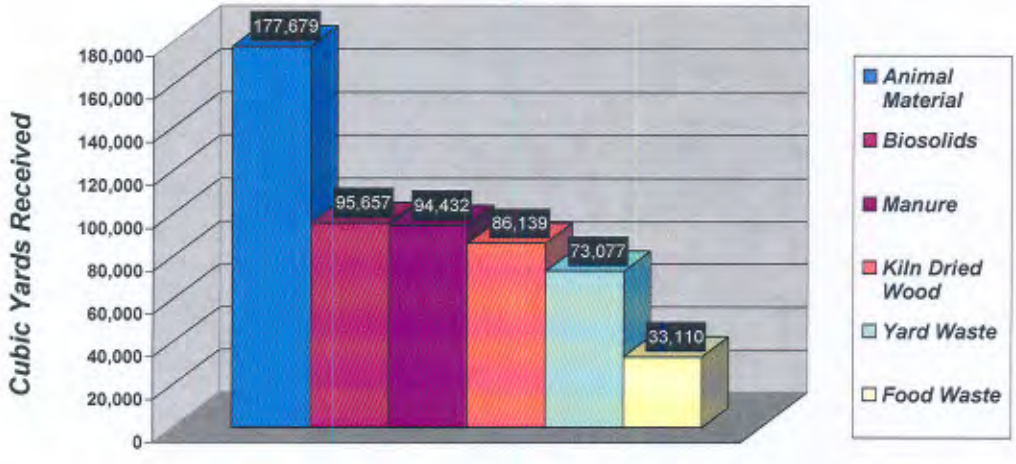
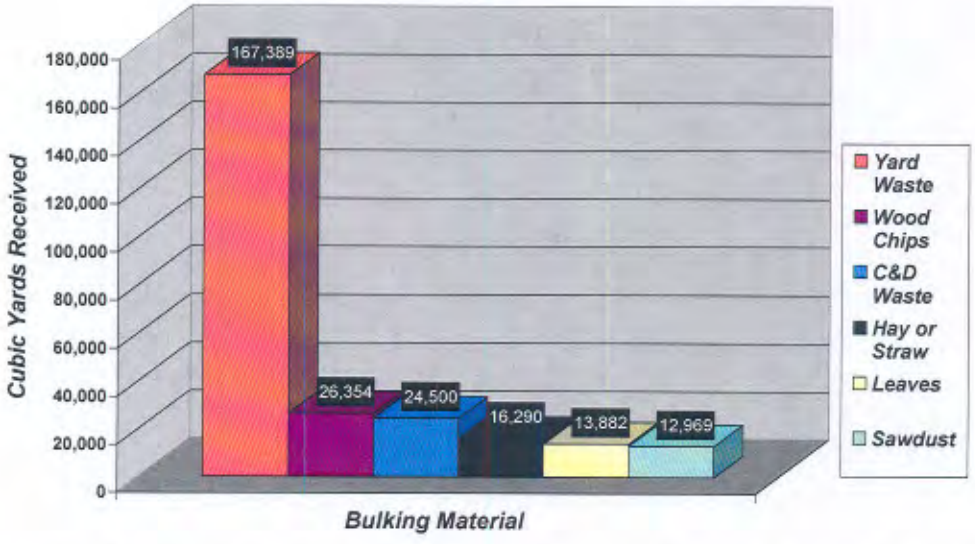


Figure 15 shows the six most processed types of bulking materials identified by commercial composters in Colorado this past year. Yard waste was the most frequently used bulking agent, with wood chips, construction and demolition waste, hay or straw, leaves, and sawdust all behind in volume processed. Diverting yard waste from landfills is important because of its bulky nature, and it provides quality nutrients and energy to the composting process. Yard waste may not be a viable bulking agent if the compost feedstocks already contain sufficient nitrates for the composting process. Adding yard waste to an already nitrogen-rich feedstock would be neither necessary nor appropriate. In fact, adding yard waste to some compost processes may be considered inappropriate disposal of solid waste. In addition, yard wastes must be managed very carefully because they will spoil or rot very quickly releasing nitrates into the environment. The

nitrates can contaminate soil, groundwater and surface water and can cause significant odors if not managed appropriately.

Figure 15:

Top Six Composting Facility Bulking Agents



The most abundant feedstock used in the composting industry is animal material, which is composed of mortalities, based on the survey data. Both animal mortalities and manure are an inevitable part of the livestock and poultry business. The average mortality rate is approximately fifteen percent annually. Animal wastes (mortalities and manure) can be costly to manage and dispose of. Mortalities are only 1 type of animal material, but it's the only one we mention here. Composting animal carcasses has become a safe alternative to landfill disposal. Universities around the country have developed methods that ensure pathogen destruction, and the methods allow farmers to use materials that are readily available onsite.

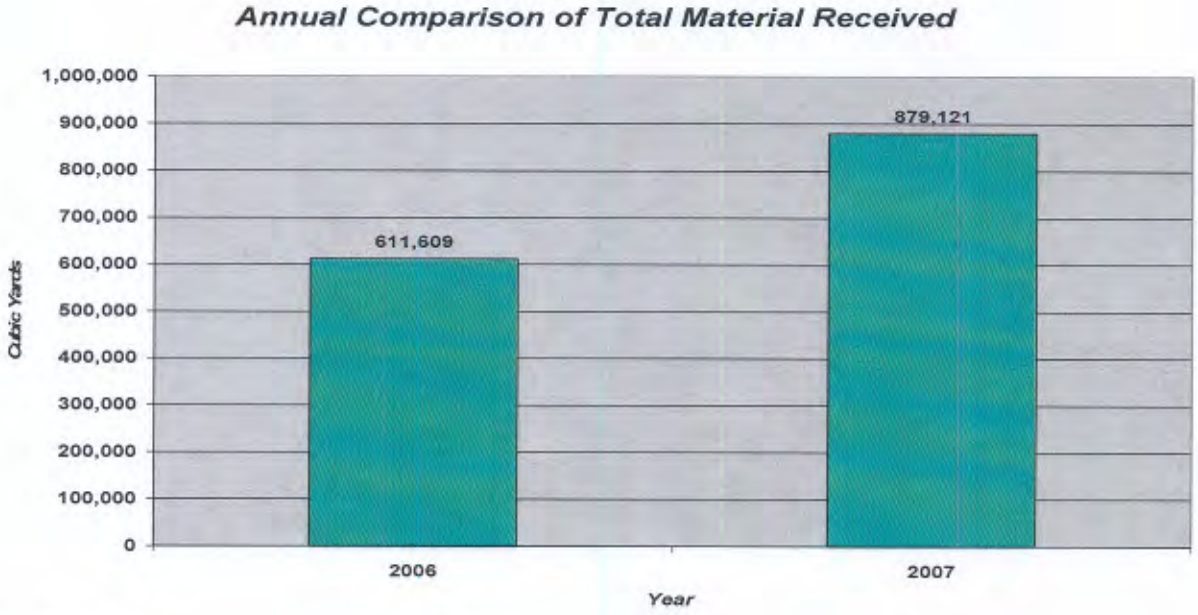
Many municipalities throughout the state operate yard waste collection facilities from which they create mulch for city use. The mulch is typically ground or chipped wood waste, such as bark stripped from trees or tree limbs chipped to a finer size. Mulched materials have not gone through the composting process, and they should not be marketed as compost. Mulch may be very valuable as landscaping cover, decorative accents, erosion prevention materials, moisture retaining agents or other products.

Annual Comparison

Composting facilities began reporting volumes of materials received in 2006. During 2006, 18 composting facilities reported a total of 611,609yd^3 of materials collected. In 2007, 20 composting facilities reported a total of 879,121yd^3 of materials collected.

Figure 16 shows the increase in the volume of materials accepted at registered composting facilities between 2006 and 2007. In 2007, there was an increase from the prior year of almost 44% of composting materials accept by registered facilities.

Figure 16



Conclusion

The composting industry in Colorado is rapidly expanding due to many factors including rising transportation costs, increased landfill maintenance costs, the high cost of petroleum-based fertilizers, and increased landfill tipping fees. Many publicly owned landfills have begun to separate organic materials to extend the active life of the landfill and in turn provide a soil amendment for landscaping companies, residents, and farmers. The addition of compost to soil has been proven to increase the permeability of fine soils, decrease the permeability in sandy soils, increase crop production, and decrease storm water run-off. These are qualities that have exponential benefits for an entire ecosystem because they reduce the need for water, and they reduce the need for synthetic fertilizers and pesticides that often have deleterious environmental effects.

The Solid Waste and Material Management Unit inspectors identify additional commercial composting operations each year. Many more composters are voluntarily registering with the Program. Registered composting facilities are required to operate in compliance with Section 14 of the Solid Waste Regulations to ensure the health and welfare of the surrounding area is protected. Facilities that distribute their product for use offsite must operate under controlled conditions and perform regular testing to ensure complete pathogen destruction and safe inorganic constituent levels.