

Organics Recycling Task Force



Compost



Presented to
David E. Hess
on August 7, 2002

Dear Secretary Hess:

At the 2001 Compost Conference sponsored by the Department of Environmental Protection (DEP) you challenged the attendees to develop ideas and programs to create further awareness of organics recycling and expand markets for organics recycling products in Pennsylvania. You asked that a report be developed to provide ideas for enabling the Commonwealth to further our recycling initiatives by managing organic wastes.

A result of your challenge has been the development of the Organics Recycling Task Force. The Task Force met throughout the past year to develop specific short-term targets. The attached report entitled, "Organics Recycling Task Force White Paper" has been developed through the stakeholder process.

The White Paper outlines key challenges and solutions to expanding the awareness of organics recycling throughout the Commonwealth. We ask that you view this report as a starting point for furthering support for organics recycling. The issues presented are interrelated and cross over many broad areas of the environment, economics, education and technology. This report should be a catalyst for change, not representing the end of a study but the beginning of a new emphasis on waste management, recycling and waste diversion practices. While Pennsylvania has benefited by unprecedented support in the past for recycling and composting activities through the Act 101 Grant Program, it is imperative that continual support in the future be maintained and expanded. The Organics Recycling Task Force supports the extension of the sunset date for the recycling fee authorized by Act 101 to support future recycling and organics recycling endeavors.

The recommended changes cannot happen without the support and hard work of many organizations and dedicated persons. While DEP has the authority and the regulatory obligation to oversee organics recycling, there are many opportunities for mentoring opportunities and partnerships to be formed to further the awareness of the benefit to local communities and the economy of Pennsylvania.

The Task Force meetings have provided an opportunity to openly discuss and identify challenges and barriers related to expanding organics recycling in the Commonwealth. Task Force members agree that the process of creating the White Paper has furthered understanding of stakeholder positions. Ultimate resolutions will require continuing this process of open exchange among peers.

We thank you for providing DEP support for the Organics Recycling Task Force. The ability of this group to meet and develop a report is verification that the process works and we commend you for providing us with this forum. We appreciate that we were given a voice that will be heard and look forward to our meeting with you to discuss this report.

Sincerely,

Nora Goldstein,
Co-Chairperson

Barry Smith
Co-Chairperson



Organics Recycling Task Force Membership

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Table of Contents

Executive Summaryp.3

Organics Recycling Task Force Recommendations.....p.4

White Paper Implementation Guidelines.....p.6

Economics and Marketing

Education, Training and Technology

Legislation and Regulations

Coordination and Strategy

Conclusion.....p.23

Attachment A “Brownfields to Greenspaces”,.....p.24

Prospectus for a Demonstration and Training Project

Executive Summary

The recycling and management of organic wastes is not a new concept. Pennsylvania has been effectively promoting and funding recycling and composting since the passage of Act 101, the Municipal Waste Planning, Recycling and Waste Reduction Act, in 1988. Most of the emphasis in regard to this law has been focused on the recycling and waste reduction of mandated materials such as glass, metals, paper, newspaper, plastics and leaf waste.

Since the inception of Act 101 it has become evident that other waste materials that are organic in nature can also be recycled or diverted from the waste stream. These materials such as manures, yard wastes, food wastes waste water residuals, and food processing residuals to name a few examples, can be easily managed and diverted from the waste stream and integrated into sustainable environmental management systems. Organics recycling is the collection, separation, recovery and sale or reuse of organic-based materials that would otherwise be disposed or processed as municipal or residual wastes and the creation and recovery of reusable materials other than fuel for the generation of energy.

An Organics Recycling Task Force was created at the request of Secretary David E. Hess as the initial step in reviewing how to promote organics recycling in a manner that is protective of the health, safety and environment for the citizens of the Commonwealth. The Task Force members included representatives of the municipal, commercial/industrial, regulatory and environmental communities. It was agreed at the outset that a consensus process would be used in developing these recommendations.

Needs, issues and recommendations were divided into four major areas: Economics and Marketing; Education and Training; Legislation and Regulations, and; Coordination and Strategy. Because these four areas are interrelated, there is some overlap between the recommendations. The attached full report provides background information that led to the development of the recommendations summarized below.



Miss Caron Beyl, sixth grader at Lancaster County Day School signs her winning 2002 Recycling and Composting Calendar Art at the awards banquet.

ORGANICS RECYCLING TASK FORCE RECOMMENDATIONS

I. Economics and Marketing

1. DEP should sponsor an economic and environmental impact study of the potential effects of increased organics recycling on job creation, waste management costs, recycling sector economy, waste minimization, reuse and product use industries (e.g., plant nurseries, landscape contractors, organic farms, etc). The findings can be used to develop and prioritize policies that have the most beneficial impact on increasing organics recycling.
2. Evaluate and modify current DEP programs that provide incentives or disincentives to private investment in the organic recycling infrastructure in Pennsylvania.
3. Create a web-based information clearinghouse using the data from the economic impact study. The database will include: generators of organic wastes; types and quantities of organic materials; processors; marketers/end users, and; uses.
4. Define categories of uses for compost and develop and recommend state-wide standards for these uses.

II. Education, Training and Technology

A. Education and Training

1. Promote organics recycling in schools, taking advantage of new Pennsylvania academic standards.
2. Create a library of existing compost education tools and related organic recycling resources.
3. Support and expand programs that educate the general public and public officials on what compost is and how it works, stressing quality products.
4. Support composting and compost use education by and for specific stakeholder groups, e.g., meatpackers, agricultural industries and mine companies.
5. Continue development of training and certification programs for organics recycling facility managers, operators, regulators, consultants, and end users.
6. Develop working demonstration sites for enhancing educational efforts.
7. Educate on uses of compost/organics in abandoned mine reclamation and brownfields restoration.

B. Technology

1. Promote new and existing technology for the industry that supports and enhances:
 - a) Organics processing, such as collection and composting equipment and energy production.
 - b) The utilization and marketing of recycled organic products, such as manufactured soils; In-situ blending of organics and other residual wastes, mine/brownfields restoration, and use of compost as an erosion and sedimentation control technology.

III. Legislation and Regulations

1. The sunset date for the recycling fee authorized by Act 101 should be extended.
2. Re-evaluate the current permit and operating requirements for composters.
3. DEP needs to examine existing authority and statutory obligations to better develop programs restricting open burning.
4. Continue discussions among DEP and stakeholders on how to balance regulatory barriers for commercial compost facilities with eliminating potential risks to the environment of the Commonwealth.
5. The regulations that impact and provide funding for organics recycling need to be identified and reviewed to determine how Pennsylvania can better serve the organics recycling industry with current regulations. The end product would be the creation of a user-friendly resource guide of Pennsylvania statutes, regulations, and policies that would provide a one-stop source of information relating to organics recycling for interested parties.

IV. Coordination And Strategy

1. Dedicate staffing within DEP to coordinate all issues relating to organics recycling, including: developing and revising associated permits, reviewing and revising regulations and legislation; developing an information clearinghouse database; expanding educational opportunities; developing standards for compost quality initiatives to expand the markets for organic materials.
2. Establish an Organics Recycling Subcommittee within a DEP Advisory Committee (e.g., the Solid Waste Advisory Committee) to tie organics recycling strategies into comprehensive solutions for existing environmental issues such as nutrient management, watershed protection, solid waste management and mine land reclamation. Interested parties would have the ability to advise DEP on issues relating to organics recycling.
3. As part of recommendations #1 and #2, identify stakeholders, existing programs and offices within public agencies, and common issues among stakeholders, in order to maximize coordination of effort and create new initiatives and strategies.
4. Use a regional and statewide approach to work beyond political and county boundaries to achieve goals and reach the critical mass needed for composting and organics recycling projects to be viable.

Organics Recycling Task Force: White Paper

Implementation Guidelines

This report is a summary and provides the goals and solutions for promoting and creating awareness of the benefits of organics recycling. This document should serve as a planning tool to increase the recycling rate for the Commonwealth and to further our recycling goals in the future.

I. Economics and Marketing

The Environmental Protection Agency, in partnership with the National Recycling Coalition, commissioned a study that concluded with the U.S. Recycling Economic Information Study (REI). The information gathered demonstrates recycling and reuse are large contributors to the national and local economies. In fact, the economic impact of recycling is greater in Pennsylvania than any other state in the Northeastern United States.

For the REI Study, R. W. Beck directly surveyed compost and miscellaneous organics producers for industry information. For the purpose of the study, organics producers were defined as producing compost, mulch, bark or bedding from yard and wood waste, biosolids, or other organics, also including vermiculture. The results for Pennsylvania's composting and miscellaneous organics producers indicate:

- The industries employ 424 people.
- Annual payroll is \$10,422,000.
- Estimated receipts are \$39,854,000.
- Estimated throughput is 318,000 tons.
- There are 30 establishments

Pennsylvania is one of the largest agricultural-based economies with the fourth largest horticultural production industry and the fifth largest food processing state. It appears that the data from the REI study may not be comprehensive, and that the full impact of the organics industry in Pennsylvania has not been fully explored. We would like to further analyze the impact of this industry on the economy and environment of Pennsylvania.

Organics Recycling is an integral part of the overall recycling industry in Pennsylvania because mandated municipalities, as defined in Act 101, must collect and manage or recycle specific materials, including leaf waste. This requirement allows for the development of ancillary businesses and employment opportunities directly related to organics recycling. As mentioned, recycling is big business in the Commonwealth and contributes significantly to the economy. There are several broad issues relating to the economics and marketing of organics recycling in Pennsylvania. They are:

1. Potential impacts of organics recycling on job creation, waste disposal costs, recycling sector economy, and secondary industries (e.g., plant nurseries, landscape contractors, organic farms, etc) seem large but are unclear:
2. Commercial organics recycling is often economically or logistically unfeasible under current conditions and state grants for organics recycling actually discourage private sector recycling:
3. A variety of uses and users (markets) for recycled organic products need to be developed.

A. ISSUE

1. Determine the potential economic impacts of organic recycling so that policies can be developed and prioritized for the most beneficial impact

Such an impact study must begin with the development of a database that identifies and classifies all sources of organic feedstocks in the Commonwealth. These feedstocks include, but are not limited to, animal manures, paper and forestry by-products, food processing residuals, and pre- and post-consumer food scraps. With the sources known, projections of distribution costs to move product to market and prices for recycled products (including mulches, composts and animal feeds) can be developed. Estimates could also be made of the cost of disposing of these materials rather than recycling them. By approximating of the amount of recycled products that might be produced, estimates can be made on the value of these materials to the producers. Those projections can be used for gauging impacts on employment, and to rank feedstocks for their potential to be recycled, including such characteristics as volume, cost of disposal, and contamination level. This would help prioritize funding and policy initiatives to get the most impact for the least cost.

The waste industry comments that up to 15,000 jobs will be lost if less items are landfilled, but there are 81,000 persons employed creating nearly 2.9 billion in annual payrolls in the recycling field. This impact encompasses recycling and composting efforts. There is a need to separately evaluate the economic impact of composting on the Commonwealth. According to recent studies, the recycling industry contributes \$18.4 billion in revenues in Pennsylvania. How much of this can be attributed to composting?

2. Utilize state funding to further supplement the economic feasibility of composting

- Current state regulations do not include specific language regarding permit compliance and operating costs from leaf and yard waste recycling to any other kind of composting for larger facilities (5 acres or more). A review is needed of the current regulations to provide for further opportunities for the expansion of commercial composting facilities.
- State grants are currently available only to municipalities. Sustaining a commercial recycling facility often requires a significant private sector investment. The private sector climate makes investment extremely difficult.
- Mandated municipalities are only required to provide for *leaf waste* composting. Composters who wish to compost other materials, but need leaves and yard debris, find that material is unavailable because public investment has already been made in leaf and yard waste composting. Therefore, these businesses are forced to find other carbon-based feedstocks, which often require additional permit approvals through the DEP. It would also be beneficial if leaf and yardwaste sites were approved to take in other carbon-based feedstocks other than leaf and yardwastes. This would enable existing sites to divert other non-traditional organic wastes such as food scraps and residual wastes.
- The government subsidization of municipal composting has created a barrier to private competition. Those same subsidized facilities are not required to make a profit, and thus they can distribute compost for free or at a reduced cost. This may create a situation where there is a perception of compost as having little cash value.



Pennsylvania has the largest curbside pickup program in the United States. Here yardwaste is waiting to be picked up and will be taken to a local compost site.

3. Public Private Partnerships

There is a need to explore public/private partnerships again. In the past, they were difficult to administer. Can we find a new way to make them work? Many privately owned projects would not have been economically sound either with or without the grants. Also, the public sector is there to fill a need in geographic areas where there is no private sector interest, and to provide a service that it is not profitable for the private sector. How can we structure public/private partnerships differently to make them work better? There is opportunity for private operators to manage public sites. This could be promoted to further public/private partnerships.

4. Identify barriers within the state's waste management infrastructure that prohibit the creation or expansion of organics recycling

Current waste disposal fees in Pennsylvania are relatively low. Pennsylvania has ample landfill capacity, such that we import more waste than any other state. This high supply keeps tipping fees low. Commercial recyclers depend on both tipping fees and product sales to make a profit. Low tipping fees do not leave much margin for attracting compostable feedstocks.

There needs to be an awareness and promotion program developed that stresses the importance of getting the organic wastes out of the general waste stream so that it will go to compost facilities and not to landfills.

5. Develop a variety of uses, users and markets for recycled organic products

The value of compost has been documented for many different uses, and new ones are always being explored. It is now recognized that different composts will work best for different uses.

- Currently there is not a clear understanding of the differences among composts or other recycled organic materials. Without this definition, poor quality, or “wrong” quality compost could be used, resulting in injury to nursery stock, agricultural crop or consumer garden crops. This lack of understanding and a history of periodic failures have resulted in a “buyer beware” climate that has discouraged investment and adoption of compost use by potential large users or user groups.
- Additionally, as markets develop for specific composts, they can easily outstrip the local available supply, again discouraging utilization and investment. Demand and supply need to grow simultaneously.

B. RECOMMENDATIONS:

1. Identify the generators of organic materials, the types and quantities of organic materials and the organic composting/recycling facilities in the Commonwealth

Create a clearinghouse of information on uses and markets

The clearinghouse should be a database accessed through a website that would be available to everyone. Both successful and unsuccessful case studies should be reported in a standardized format with key information on the characteristics of the compost and method of use. In order to standardize compost description, product testing needs to be promoted. Having this information available will make it easier to replicate positive results and avoid repeating failures. This will help current markets to be supported while new markets are developed.

A database should be developed that identifies and classifies the nature and quantity of all generators and potential sources of organic feedstocks in the Commonwealth, along with essential information on the generator. This should be tied to a geographic information system (GIS) resulting in an information clearinghouse. This clearinghouse would contain a list of composting and organic recycling operations. The clearinghouse would be an invaluable tool, allowing current and future recyclers or transporters to locate feedstocks for their operation, and generators to locate facilities that would be interested in taking their residuals.

2. Re-evaluate the current permit and operating requirements for composters

DEP should develop a listing of the current rules and regulations that pertain to organics recycling that explain the different permits for different feedstocks. DEP should consider creating a review committee to evaluate the appropriateness and impact of current permit requirements. This committee should be comprised of public and private sector composters, regulators, and other interested parties. The committee will evaluate which permit and operating requirements do not provide for a significant increase in environmental and health protection and prohibit public nuisances. The committee should make recommendations on revising or eliminating requirements that are not statutory requirements.

3. The sunset date for the recycling fee authorized by Act 101 should be extended

Grants should encourage the sustainability of organics recycling in the Commonwealth and ensure that private recycling companies are not prevented from competing with public facilities. Public facilities that receive grants must demonstrate that they are operating efficiently and sustainably. Continuing grants should be performance-based. Act 101 should be expanded to include other source-separated organics allowing for additional materials to be diverted from disposal and ultimately contributing to the state's recycling goal.

4. Define categories of uses for compost and recommended standards for these uses

Many state and national compost organizations are working on defining categories of uses for compost and minimum or recommended standards and specifications for these uses. The Commonwealth should work with and support these groups which include: the United States Compost Council (USCC), the Mulch and Soil Council, California Compost Quality Council, Association of American Plant Food Control Officials (AAFPCO), the Solvita Quality Assurance Program, and the Pennsylvania Composting Association. There are many opportunities to partner with these organizations to promote standards for the industry in Pennsylvania.

II. Education, Training and Technology

Composting education programs are currently available to compost facility operators, government officials, schools and Pennsylvania residents. A strong interest in these programs is evident across the state and indicates that the programming is resulting in a reduction of organic material in the waste stream. Further, increasing the amount of organics recycling in PA will require the continuation and expansion of education and training to audiences at many different levels.

Increasing awareness and acceptance of the need to recycle organic materials requires broad-based education on how organics recycling supports stewardship of our shared resources for future generations. To significantly increase organics recycling, participation from all levels of society - school children, parents, adults, commercial and industrial sectors, and elected and appointed government officials is required.

There must be increased support for, and participation in, state-wide organics recycling opportunities at levels ranging from the individual, to the family unit, to the municipal level and to commercial entities. This requires educational programs to inform citizens of recycling methods that they can adopt at an individual or family unit level must be continued and expanded, as well as education of municipal officials and planners of recycling methods suitable for the municipal or regional scale. Also needed is education and information for regulatory and policy making agencies on developing policies and regulatory programs that will encourage organics recycling, and make it economically feasible for commercial, industrial, and municipal sectors to become more involved in organic materials recycling.

The ecological and economic benefits of organics recycling must be made apparent at all levels. This requires demonstration of a variety of successful organics recycling programs from backyard composting of kitchen scraps and yard trimmings, to regionally based composting of organic feedstocks from multiple sources. Demonstration must also include utilization of the development of marketing concepts and for recycled organic materials in landscaping, the green industry, agriculture, mine and brownfield restoration, and other manufactured soils industries. Documentation of both economic and ecologic benefits must be an integral part of such demonstration. A vital component of any demonstration of organics recycling is that it be fully integrated within local and regional economic, political, and ecological systems.

RECOMMENDATIONS:

1. Education

a. Promote Organics Recycling in Schools

The Pennsylvania State Department of Education has adopted revised academic standards for school children that became effective on January 5, 2002. The new standards include requirements for environment and ecology so students will learn how their everyday lives revolve around the use of the natural world and its resources. Specifically section 4.2, of the academic standards, "Renewable and Non-Renewable Resources" mandates that students be presented with the opportunity to learn about organics recycling and composting. This is an excellent opportunity to develop lesson plans to incorporate organics recycling into a curriculum.

When students are introduced to and learn about environmental issues within the context of a larger system or cycle they are given the opportunity to understand the interconnected quality of the natural environment. The same is true for composting. When approached as part of the nutrient cycle, composting becomes an excellent model of how natural systems are innately self-sustaining.

A variety of compost education tools already exist. There are many lesson plans available on backyard composting, as well as worm composting, for all grade levels. Most of the lesson plans engage students in the science behind composting by setting up a small scale composting experiment. Students have the opportunity to see the decomposition process "in action." Additionally there are some schools that have incorporated in-vessel composting units to handle food waste from the cafeterias. By incorporating such systems into the academic curriculum, students have the opportunity to experience the cycling of organic materials, generally considered a "waste" into a valuable soil building material.

Programs that teach about composting as part of a larger context, such as gardening or restoration, would allow students to experience composting as part of the nutrient cycle. One example of this could be a hands-on program that would extend over the course of one or more school years. Students would start in early fall by setting up a compost pile as garden beds are being cleared. Classes would then meet a few times in the spring to apply compost to garden beds. Follow-up lessons over several years would allow students to monitor soil fertility and plant growth. A classroom curriculum on organics recycling would reinforce the actual hands-on experiences with composting and help students to cognitively understand the relationship of composting to the nutrient cycle.

Partnerships with organizations that work with school gardening and restoration programs are necessary to determine the feasibility of specific hands-on composting programs. DEP needs to contact these organizations that work with school gardening programs to see what possibilities exist in partnering on a hands-on gardening/composting program. Other initiatives include: contact with organizations that are working with restoration projects throughout the state to determine the feasibility of developing a hands-on composting/restoration program; selection of several schools to run pilot projects to develop a classroom curriculum on composting as part of the nutrient cycle; allocation of funding for the support and development of all of these types of programs.

b. Create a library of organic recycling resources

There are many sources of information currently available that should be consolidated into a centralized location. The consolidation of available and future resources would provide a service to the organics recycling industry, researchers, students and those searching for related information. This could be further developed into a clearinghouse concept where categories of information are made available. This could include educational lesson plans, instructional materials, industry data, and current research findings. Several options for the location of a clearinghouse include: the DEP website; Biocycle; Professional Recyclers of Pennsylvania (PROP); Pennsylvania Compost Association (PACA), or; a state university. This would require continual financial commitment to develop and maintain the informational resources at a central location.

c. Highlight and promote successful organic recyclers

There are many opportunities to highlight successful operators doing business within the Commonwealth. The adage that you “lead by example” will show others that composting and organics recycling is an economically viable business and makes “green” sense. An annual awards program could be developed for the “organic recycler of the year” at the annual compost conference. There are several awards programs sponsored by DEP that recognize organics recyclers. These include the Waste Watcher Awards, Governor's Awards for Environmental Excellence and the Governor's Award for Watershed Stewardship. The award winners from these programs could be highlighted by other organizations, stewardship, such as PACA or Biocycle.

d. Educate the public on what compost is and how it works, stressing quality products

Uses for compost range from bioremediation, to use on golf courses or organic farms, to residential landscaping. Various compost applications require certain characteristics for successful use. Within the compost industry, the quality and characteristics of products marketed as “compost” can vary greatly. In order to assure overall satisfaction, it is recommended that compost users be informed of the variety of compost available and the parameters that determine appropriate application.

Research in the following areas would help to develop a course of action: science-based compost parameters already established by the Pennsylvania Composting Association and the United States Composting Council, and the reliability of the data given; the effect of testing costs on compost manufacturers and the price of compost; other organic material industries such as peat, mushroom substrate, bark mulch, and how they approach variances in quality; literature already available on specifications for compost use; and the availability of funding to support financially the creation of additional use parameters beyond the ones already published. The new use parameters could be ones in high demand in Pennsylvania such as “compost for the creation of wetlands” and “brownfields reclamation.”

Support from compost manufacturers is necessary for their participation. Special consideration needs to be given to testing costs and their effect on the price of compost in relation to other organic materials such as peat, mushroom substrate, etc.

Residential and large-scale applications require two different approaches to educational programming. An example of residential composting education is the: “Composting - Recycling Naturally” slide presentation, used in the backyard composting classes throughout PA, sponsored by the Pennsylvania State Extension Service and DEP. This slide presentation teaches homeowners how they can best use compost for typical landscaping and gardening applications. At these workshops compost users could be informed of parameters that characterize different types of compost. One method would be to add a section to the “Composting Recycling Naturally” slide presentation addressing quality products and compost parameters to the current backyard composting presentations given by the Cooperative Extensions throughout Pennsylvania. Information could include mushroom substrate, peat, wood chips, etc., as well as compost. This could also be done by developing a brochure that is distributed to class participants.

Brochures on compost use and parameters could be designed and reproduced for distribution through backyard composting workshops and presentations, compost marketers, garden centers and landscaping supply businesses. In addition, PACA is seeking to expand their web site to include the directory of compost producers with updated data and compost use information. The Pennsylvania Department of Agriculture has already agreed to fund part of the project.

Both the U.S. Composting Council and the Pennsylvania Composting Association are encouraging the use of Quantified Parameters for Compost, and that data are provided to compost users when needed. The U.S. Composting Council has created the Seal of Testing Assurance (STA) program, the goal being “compost specifies, regulators and users accept ONLY STA compost for their specific projects.” A series of publications, created by the USCC, outline specifications for compost use for various applications, are available over the Internet.

Education on compost use parameters is not only necessary for compost manufacturers and marketers, but also compost users (i.e. landscapers, bioremediation projects, PENNDOT, storm water management and public works and park supervisors.) Using existing publications from the U.S. Composting Council on specific applications for compost use should also be encouraged.



e. Educate Public Policy Officials

To further increase awareness about organics recycling we need to educate our local and state public officials about the industry in regard to economic viability and the associated environmental benefits. This could be an ongoing awareness campaign sponsored by DEP and partners such as PROP, PACA, or Rodale Institute for government officials at the state and local levels. These officials are not permanent offices and personnel changes frequently. It is imperative to inform each newly appointed administration of the benefits of the industry and how it affects their communities. The benefits and motivation to recycle can be economic, environmental or even mandatory in communities, and the public officials need to know what role they will play in managing all wastes, including organic wastes, as a service for their constituents.

2. Training

a. Train compost facility managers and site operators at all levels

Technological advances and new composting ideas are introduced daily and it is important to keep up with new methods. Compost facility operators and managers at all levels within the business need to be continuously educated, not only to produce quality products but to take advantage of new opportunities in the field. This can be accomplished by promoting conferences, web-based training, industry association updates and journal articles.

Compost facility operators could be defined as anyone whose daily activities consist of operating and/or managing a compost facility. However, targeted attendees for training could also include public officials involved with solid waste/health departments, consultants working with compost facilities, government regulators of compost facilities, equipment vendors, technology service providers, and those involved in agricultural operations or research.

There are various means of reaching operators directly. A brochure could be developed and bulk mailed to all of those mentioned above. A newsletter could help spread the word that training is available and websites are a great tool for distributing information. Information could be placed on DEP's website announcing upcoming compost-related events.

b. Training for operators

DEP offers mandatory training for biosolids generators and land applicators. The training consists of a two-day course explaining the land application regulatory requirements for biosolids quality, sampling, site suitability, notifications, application rates, management practices, record keeping and reporting.

There are currently various education and training workshops available for operators through the PROP Certification Program, a statewide regulated program would however prepare all operators on the same level. A mandatory training program for personnel of compost facilities and mulching operations would provide the knowledge of new and upcoming technologies and a chance to get "back to the basics." A variety of topics could be covered in this training including components of solid waste, the composting process, composting methods, facility siting and preparation, composting procedures, monitoring and record keeping, marketing compost, troubleshooting and permitting processes.



c. Provide for compliance and regulation training

To comply with the Pennsylvania Waste Management Regulations, it should be required for operators at all levels to have compliance and regulation training. This could consist of a one-day course offered every year to be renewed when deemed feasible. In addition trade related conferences and field workshops with stakeholders could also be developed to provide continual educational opportunities.

d. Composting and compost use trainings sponsored by stakeholder groups

Having training courses on composting and compost use sponsored by and/or done in conjunction with stakeholder and industry groups including agricultural organizations, i.e. Pennsylvania Association of Sustainable Agriculture (PASA), large agricultural type industries and others, mine companies, green industries, contractors and construction companies, PENNDOT and brownfield remediation companies. All stakeholders, however, can participate in compost utilization programs. These training opportunities should lead to the development of best management practices documents that would establish standards for using compost and increasing the marketability of compost products. These best management documents would also help to ensure compliance with current regulations and promote good practices throughout the industry.

e. Develop a working demonstration and educational component

DEP along with PROP offers a Specialization Certificate in Composting and a Composting Operator Course Certificate. The Specialization Certificate in Composting consists of half, one and two-day courses aimed at providing composting professionals with continual and up-to-date composting knowledge. With the Composting Operator Course Certificate, operators become certified as an operator only.

Additionally, working demonstration sites are helpful in educating public officials about composting. A visit to a demonstration site can alleviate fears about vectors, odors and associated concerns with composting at both residential and municipal scale sites. In order for a composting site to be an effective educational tool it must demonstrate that it can be operated in a safe and environmentally protective manner.

3. Technology

a. Promote new and existing technology for the industry

To ensure competitiveness, production of consistently high quality products, and to gain access to new markets and opportunities, those involved in organics recycling at the municipal and commercial scale need to be aware of all advances in the existing and newly developed technology. Educational programs aimed at this sector must include information and demonstration of the best available technologies for organics recycling. This effort needs to include training and certification programs for those involved in organics recycling and processing, technology focused workshops and conferences, and demonstration of technologies. Technology training can be broken down into two broad areas:

1. Technology that supports and enhances organics processing -

- Collection equipment for municipal organic residuals, food wastes, other commercial/industrial organic residuals;
- Composting equipment for sorting, grinding, blending, mixing, turning, aerating, screening, and bagging and;
- Energy production equipment for anaerobic digestion and methane production.

2. Technology that supports and enhances the utilization and marketing of recycled organic products -

- Value added products processing: (potting mixes, manufactured topsoil, mulches) equipment for screening, blending/mixing, shredding.
- Prescription blending of feedstocks to produce manufactured soils for specific applications (athletic fields, lawns, planting beds, potting mixes, rooftop gardens, highway/roadside berms).
- In-situ blending of organics and other residual wastes for mine/brownfields restoration.
- Use of compost and other organics in specialized and emerging technologies such as constructed wetlands, acid mine drainage treatment, biofilters for odor control, bioremediation, and immobilization of toxic metals in contaminated soil.
- Equipment for testing of feedstocks and products for quality assurance and quality control that would aid in the development of finished product standards. •
Use of compost as an erosion and sedimentation control technology.

In addition to making operators aware of new technologies and demonstrating new technologies, a third aspect of technology education should include development and testing of technologies that would have broad benefits for the organics recycling industry. One example would be the development and validation of a web-based computer program to calculate mix ratios and blends to produce prescription manufactured soils from available feedstocks. Such a program would also have the capability of predicting physical, chemical and nutritional properties of selected blends, and would be available to any user statewide.

b. Educate on uses of compost/organics in abandoned mine reclamation and brownfields restoration.

Numerous mine sites throughout PA have been reclaimed using biosolids as well as other recycled organic materials. The ability of biosolids to transform toxic mine spoils to a soil-like media that is capable of sustaining plant growth and productivity are well documented. The use of composts and other organic materials as components of passive AMD treatment systems and in constructed wetlands is also well documented. Education is needed on two fronts: The general public needs to understand both the benefits and the risks of using biosolids, composts, and other organics in mine reclamation; Operators and regulators need to be knowledgeable of and utilize or promote the best available technologies and management practices for mine reclamation with recycled organic materials to ensure ecosystem restoration at the mine site and no adverse effects on, or deterioration of, off-site ecosystems.

Brownfields, or post-industrial land areas, are sites that have often undergone severe degradation of soil quality due to deterioration of:

- Soil physical properties (compaction, loss of topsoil, loss of organic matter, undesirable textural class due to spreading of ash, slag, construction debris),
- Soil chemical properties (loss of fertility, contamination with organic and inorganic pollutants, pH extremes, high soluble salts), and
- Soil biological properties (loss of nutrient cycling capabilities, loss of microbial diversity and abundance, vegetation dominated by invasive and non-native species).

Restoration of such sites to a functioning ecosystem requires a holistic approach that integrates soil, water, and vegetative systems within the urban context. Recycled organic materials are a key component in the restoration of degraded soil and vegetative systems. Composts, biosolids, and other recycled organic materials are also essential for many innovative treatment technologies for remediation or clean up of contaminated soil and water. The use and importance of organic materials needs to be emphasized in educational programs in this area, but must be part of a broader Brownfields restoration education program that targets:

- Urban citizens who stand to benefit from, and should be involved in, such restoration;
- Municipal planners who need to understand the benefits brownfields restoration can afford their communities;
- Environmental engineering firms and other companies involved in brownfields restoration, and;
- Producers of composts, biosolids, other recycled organics, manufactured soils.

Effective brownfields education must combine traditional “classroom” based learning with demonstration and hands-on experience. Innovative soil treatment technologies and ecosystem restoration are generally long-term processes and could best be demonstrated at a brownfield site dedicated to education, training, demonstration, and experience. The conceptual framework for such a Brownfields training facility is described in Attachment A, “Brownfields to Greenspaces, Prospectus for a Demonstration and Training Project”

III. Legislation and Regulations

In December 2000, DEP concluded the Regulatory Basics Initiative (RBI) that was mandated by the Governor's Executive Order 1996-1. This order required that all state agencies re-evaluate existing regulations to comply with new guidelines. The RBI involved various stakeholder groups including citizens, industry, advisory groups and non-profit organizations. This review of the regulations was extensive and the recommended changes have been implemented. It is evident that a major change in the municipal waste regulations will not be initiated in the near future.



A. ISSUES:

1. Statutes

Open burning of yard waste and other items pose a great problem for the citizens and the environment of Pennsylvania. Although there may be opposition to the implementation of a burn ban from some organizations, banning burning on a statewide basis would increase the composting of yard waste and other organic items because it would force communities to manage organic wastes in a different manner other than burning. DEP needs to examine existing authority and statutory obligations to better develop programs restricting open burning.

2. Funding

Each year DEP consistently provides Act 101, Section 902 grant funding for developing compost sites, collection of materials, expanding existing composting programs and educational and awareness efforts. There are many successful programs across the state and further incentives should be developed that recognize these programs and also promote expansion of these existing facilities.

DEP has conducted a waste characterization study at several Pennsylvania disposal facilities. This will provide information about the types/amount of recyclables, organic wastes and compostables available for capture in the waste stream in each region of the Commonwealth and will help with future planning issues and grant funding.

Preliminary data generated by the State's waste characterization study indicates there is much more leaf and yard waste remaining in the waste stream than previously thought. Grant funding for equipment is needed to continue and expand the collection of these materials from Pennsylvania's waste haulers and municipalities. It is too early to completely ban yard debris from landfills until data is collected and analyzed from the waste composition study and an infrastructure is in place to collect and recycle these materials.

The Municipal Waste Resource Recovery Development Act of 1974 (Act 198) provides financial assistance to establish resource recovery demonstration projects. The Act 198 Grant Program funds have funded recycling, composting and waste to energy projects. Eligible projects must recover at least 50 percent of the solid waste entering the system in the form of energy or materials. The Act 198 fund has not received a legislative appropriation since 1985 and has a current balance of \$500,000. This grant program should be expanded to provide for additional support in the research and development arena. The expansion of this program will entice energy recovery projects, which are becoming a priority to society.

3. Permits

The Municipal Waste Regulations govern the permitting and compliance requirements for organic recycling activities. There was concern by some members of the committee that the current regulations limit the feasibility of establishing new facilities due to excessive permitting requirements. One example is the requirement of bonding for composting facilities. The organics recycling industry feels the requirement to bond a facility is excessive. The current bonding worksheets give applicants the flexibility in calculating the financial assurance costs for the operation of the facility.

Based on the Department's experience it is necessary to provide financial assurance for all waste processing facilities. Particularly those sites that could potentially leave unprocessed or partially processed waste materials behind that would require cleanup using Commonwealth funds.

The current regulatory framework allows for different types of organic waste composting and processing via general permits. Throughout the discussions with the Task Force it became evident there is a lack of knowledge about the regulations and what can be accomplished under the scope of the current regulations. Further discussions should be initiated with DEP and stakeholders to evaluate the possibility of developing additional general permits that would benefit compost facilities and still remain protective of the environment.

4. Review existing collection and processing infrastructure

There is also a need to review and address infrastructure problems especially in rural communities. Two issues to consider include: how rural communities would, with little staff and equipment, collect and process the compostable or organic materials, and; how transportation costs to a central compost site could be minimized.

B. RECOMMENDATIONS:

1. It is recommended that the sunset date for the recycling fee authorized by Act 101 be extended so that support for these types of operations can continue to service Pennsylvania

Act 101 provides grant funding to counties and municipalities to establish and improve recycling programs, which includes yard waste collection and composting. By 1999, the Commonwealth had 187 municipal and 74 private compost sites and 52 direct land application facilities. It is recommended that the Act 101 recycling fee be extended so that support for these types of operations can continue.

2. The legislation and regulations that impact and fund organics recycling need to be identified, reviewed and evaluated. Appropriate resources should be allocated to:
 - Compile a list of all Pennsylvania statutes, regulations and policies that govern organics recycling and composting;
 - Solicit comments from stakeholders to identify specific regulatory impediments to further expanding the organics recycling industry, and;
 - Review the regulations and policies of other states with successful programs in order to determine their applicability in Pennsylvania.

The end product would be the creation of a user-friendly resource guide of Pennsylvania statutes, regulations and policies that provide a one-stop source of information relating to organics recycling for interested parties.

IV. Coordination and Strategy

Individual entities in the Commonwealth of Pennsylvania -- from state, local and regional government agencies to private businesses, trade groups and non-profit and advocacy organizations -- are involved with either managing, regulating or monitoring the management of, natural resources and organic residuals. Even though these entities have similar goals and priorities, they often work separately due to a variety of factors, including regulatory or bureaucratic restrictions, lack of communication, and competition for financial and other resources.

To advance and promote organics recycling and composting in the Commonwealth and to maximize environmental protection and resource management -- it is necessary to: eliminate duplication of effort; work in teams to achieve common goals, and; best use the resources and tools available. The first step in that process is to identify the entities and current programs and initiatives in order to maximize coordination of existing efforts. The second step is to prioritize what is most important to accomplish and then develop strategies to either make what is out there work more efficiently or create new mechanisms to achieve goals.



Secretary Hess drives a windrow turner at the Manhelm Township, Lancaster County compost site.

A. ISSUES

The primary issues relating to coordination and strategies:

1. Tendency toward duplication of mandates and initiatives;
2. Lack of knowledge on the part of various stakeholders of what those existing mandates and initiatives consist of;
3. Lack of linkages/understanding between identified needs of the Commonwealth in terms of preserving and managing its resources (e.g., land/soil, water, economic base) and the role organics recycling and composting can play in meeting those needs; and
4. Lack of a formal structure to coordinate existing and future initiatives.

Some existing issues that affect the coordination and strategy process are: current land use practices and their impact on the agricultural/food processing sectors in the Commonwealth's economic base; nutrient management requirements; overall watershed protection; the need to remediate brownfields and mineland; and challenges posed by local government structure that makes coordination of zoning and land use planning difficult.

B. COORDINATION

Overall, the process of coordination requires identifying existing players that exist now, and determining how to connect and coordinate them and their activities to advance composting and organics recycling in the Commonwealth.

Recommendations:

1. Establish staffing within DEP to coordinate all issues in the Commonwealth related to organics recycling

Dedicated staffing within DEP should be established to coordinate all issues related to organics recycling. Currently there are limited resources available to address the large arena of activities in the industry that is developing due to current educational efforts. While most related issues are dependent on DEP for approval and input, it is becoming evident that additional staff is needed to assist the program to expand the recycling organics initiatives. This would include oversight for:

- Developing and revising associated permits, reviewing and revising regulations and legislation;
- Providing assistance for the development of the information clearinghouse database;
- Expanding educational information and opportunities for educational institutions, and;
- Developing standards for compost quality initiatives to expand the markets for organic materials.



DEP staff, Mr. Carl Hursh and Mr. Todd Pejack help students plant flowers using compost.

2. Identify stakeholders

Stakeholders include existing organizations and who they represent, their mission, and structure that integrates the goals of the task force. The organizations include:

- Advisory Committees to DEP - Currently there are nearly 30 advisory committees consisting of representatives from private industries, consultants, non-profit agencies, citizens, local and county governments and state agencies. These advisory committees can provide perspectives encompassing the entire Commonwealth.
- Government Agencies - These include federal, state, regional, county, and local government agencies and related programs. There also is a need to identify government-sponsored programs that can assist in composting and organics recycling activities. One example is the Resource Conservation and Development Districts that are established under the U.S. Department of Agriculture's Natural Resource.
- Public/Private Agencies - Agencies or organizations that either have a public mandate or a vested interest in an area related to, or impacted by, composting and organics recycling. These include: watershed groups; industry councils representing industrial/economic base that either generate organic residuals, could help manage them, or would utilize end products from the organics recycling and composting processes; and related economic development and job training or creation of these programs such as MANTEC, which uses public funding to assist private businesses, and PennTap, which is funded by Penn State and federal grants to conduct private projects.
- Trade Associations - There is a need to identify organizations and stakeholders in the cross section of sectors that relate to composting and organics recycling. These include: Pennsylvania agricultural trade groups, food processors associations; biosolids associations, and; impacted industry groups such as contractors and construction companies.
- Public Interest Groups - These include public interest groups that have a stake in any or all of the issues related to composting and organics recycling. Some examples are PennFutures, Chesapeake Bay Foundation, Chesapeake Bay Alliance, League of Women Voters, Sierra Club, fishing, hunting and other sporting associations, and the Pennsylvania Resources Council.
- Educational Institutions and Organizations - This would include major universities and private colleges within the Commonwealth, Rodale Institute and public and private school districts throughout Pennsylvania.

3. Identify existing programs and offices within public agencies

Existing initiatives and offices within the Commonwealth's government agencies such as DEP and the Department of Agriculture need to be ascertained both to coordinate new initiatives within government agencies and to coordinate existing programs. Examples include:

- Growing Greener - A multi-agency grant program in the Commonwealth funding water quality projects throughout the state. Grants are available to watershed organizations, conservancies, conservation districts, municipalities, water authorities and others to restore waterways and wetlands, remediate acid mine drainage, etc. The agencies involved include DEP, the Department of Conservation and Natural Resources, PennVest and the Department of Agriculture. Compost can be used successfully for reclamation and stabilization of waterways and manure management. These issues are covered under the Growing Greener Program and compost should be eligible for funding under this umbrella.

- The DEP Office of Pollution Prevention & Compliance Assistance - In Minnesota and Wisconsin, large anaerobic digestion projects were funded by a similar office. Nearly every state has a compliance assistance division in an environmental agency that helps others to work within the regulatory structure. There should be assistance from within DEP, such as OPPCA, that can provide technical assistance, mentoring services and facilitation opportunities for the industry.

4. Identify common issues among stakeholders

Take inventory of relevant issues within the organizations and programs identified above to identify commonalities, differences and goals. Issues include:

- Stormwater management, erosion and sedimentation control, offsite development and/or land application
- Land planning, land utilization
- Water quality, water quantity under water conservation
- Regulations, requirements, monitoring
- Public participation and partnerships
- Education, training and technical assistance
- Nutrient management including nutrient sources such as biosolids, lawn fertilizers, etc. and the need to look at true management of nutrients (e.g., phosphorus affects land application of any nutrients)
- TMDLs or Total Maximum Daily Loads calculated for discharges to surface water: A TMDL sets a nutrient discharge budget based on the impaired watershed. It is like a prescription to clean up an impaired water body, TMDLs can be achieved with the introduction of organic materials as a restoration tool
- Energy production via renewable energy from organics recycling
- Economic development.

5. Integrate the Task Force's identified needs, goals, recommendations into a Larger structure

Ultimately, the goal of the coordination process is determining how to take specific recommendations and facilitate their implementation. For example, one recommendation may take 26 steps to get through that structure (agency or legislative process) whereas another recommendation takes three steps. Identifying the structures, agencies, players, etc. presents a roadmap for finding the most efficient and effective routes to advance composting and organics recycling.

C. STRATEGY

The purpose of the coordination phase is to identify what exists or needs to exist to advance composting and organics recycling in the Commonwealth. The strategies phase focuses on steps and plans to bring the identified structures and stakeholders together to achieve the goal of advancing composting and organics recycling.

Recommendations

1. Connect issues with various stakeholders to develop project teams

The need is to identify groups that have a stake in moving a strategy forward, and build strategic alliances around that commonality. This requires connecting different groups (state, county, municipal, businesses, etc.) and identifying the players within those groups who need to be involved to make things happen. In short, there is a need to create mechanisms to make things happen.

- Make sure the need is a real need before putting together a strategy. The strategy is to plug it into the identified issues of the larger constituency (e.g., a watershed or land preservation initiative).
- Renewable energy is an example of a current issue. The Commonwealth may have a need to develop energy production facilities, and renewable energy tied to organics recycling can help meet that need. For example, with anaerobic digestion projects, players and stakeholders represented would include agriculture, electric utilities, organics recyclers and the environmental community.

2. Use a regional approach to make things happen

Focus on the need to work beyond political and county boundaries in order to achieve goals and reach the critical mass needed for composting and organics recycling projects to be viable. One strategy is to work within regions based on natural boundaries. Find models, such as the Fox River Valley project in Wisconsin that is based on boundaries created by a watershed. This integrated project involves residuals generators, processors and end users of products. It shares baseline goals of addressing issues related to the watershed. A Regional approach creates a structure to address a specific environmental issue such as TMDLs and an impacted/impaired water body. For example, no organization/stakeholder in a watershed may be able to apply any waste to land because the nutrient application limit may be zero. This creates a critical need for an alternative management option.

3. Develop flow charts and visual tools to illustrate connections and commonalities

Visual tools can help by taking inventory and creating a list that can be shared with others to ensure nothing is overlooked, stimulating brainstorming about where there may be common issues and goals, and identifying resources and sources of assistance. A visual map of regulations and agencies overseeing regulations should be developed and regulations with upcoming deadlines should be listed to indicate those that are accompanied with fines or other penalties should be identified. A schematic of agencies and groups with common issues should be created to show how the arrows connect and relate to each other.

4. Prioritize issues, needs and recommendations

This strategy involves taking all the issues, needs and recommendations of the subgroups and prioritizing and coordinating them. The purpose is to not just strategize intangibles (related to coordination), but also strategize what other groups are recommending. Specific items the task force will need must be identified to prioritize short-term or long-term projects or perhaps on most viable to least viable. Essentially, this strategy involves building processes and procedures to evaluate the needs and issues so that goal setting is sustainable and achievable. Policies and regulations that are scheduled to be published and enacted as rules should be identified to a working group of stakeholders to evaluate and provide comments before enacting or implementing as a rule (e.g., TMDLs, stormwater management requirements, nutrient management plan implementation).

5. Explore the possibility of creating financial incentives upfront

This could be a fund that would get financed through a user fee, landfill surcharge, or through the offering of tax incentives for those in the organics recycling industry.

6. Make inventory part of existing programs

Publications and guidance documents that are being developed or updated that encourage composting and organics recycling need to be showcased and made available in a single location. This would provide easy access to interested parties needing information about the organics industry. A case in point is the Food Processing Residuals Manual currently being revised. There are new sections being added, including animal mortality composting. These opportunities provide for comments from stakeholders and allow for policy change going through the regulatory change process. These are immediate steps that can be taken, and will help to create a precedent for how to incorporate supportive language into other state documents.

V. CONCLUSION

The Organics Recycling Task Force believes this report will help the organics recycling industry grow and become what we believe the potential is for the industry. This report also challenges the citizens and businesses of the Commonwealth to reach the Pennsylvania recycling goal of 35% by January 1, 2003. There were friendships and partnerships formed during this process that will remain and continue to develop ways to increase organics recycling and promote the industry. The Task Force intends to pursue becoming a subcommittee of SWAC and continue to expand the efforts that have been offered in this report.

Attachment A

Brownfields to Greenspaces

Prospectus for a Demonstration and Training Project

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Situation/problem

Professional soil scientists, landscape architects, environmental engineers, ecologists and others are increasingly voicing a demand for brownfields remediation and restoration training because their clients and constituents are demanding leading-edge expertise. Concurrently, professional licensing bodies and sponsoring agencies are recognizing the inherent value of continued, up-to-date learning in environmental technology and design. There is also a need for greater involvement and ownership of local citizenry both in planning and implementation of brownfield remediation projects. Such projects should be able to provide direct economic/employment benefits to local citizens, if there is a means to provide them with the necessary training. These forces are merging to heighten the demand for real-time, “dirty boot” field training that balances the practical with the somewhat less traditional, cutting edge ideals.

Three related factors related to brownfields projects and traditional short-term training programs make existing models for education and training unsuitable in the Brownfields context.

1. Brownfield projects typically do not include training and demonstration as part of their mandate. Thus it is very difficult to locate brownfields projects that demonstrate a sufficient *range* of treatment techniques for training purposes.
2. The short-term nature of the training programs is not compatible with the long-term nature of most alternative/innovative treatment and restoration technologies.
3. Few brownfields projects have been able to demonstrate creative integration of short-term remediation and long-term ecological restoration technologies.

The Vision

We believe an essential missing ingredient to addressing brownfield challenges is that of hands-on field experience across a range of possible solutions. We envision a *Brownfields to Greenspace* demonstration and training project that would provide those in need of training with access to brownfield sites where (1) alternative and innovative remediation technologies and ecological site regeneration approaches are demonstrated, and (2) where knowledgeable personnel provide training and hands-on experience for trainees in implementing, monitoring, and managing restoration progress. Such sites will also allow for repeat visits by trainees to observe and interact with remediation and regeneration initiatives over time.

Additionally, as suggested above, we anticipate that the *Brownfields to Greenspace* project will serve as an excellent base for the training needs of community groups involved in brownfields recycling, workshops and continuing education for brownfields and extension professionals, and ultimately, resident education in association with universities and colleges in the region.

Penn State Cooperative Extension and Outreach is fully capable of realizing this vision. Specifically, a collaborative venture between the Department of Crop and Soil Sciences and the Department of Landscape Architecture will provide a synergy of expertise in remediation and ecosystems-based regeneration of degraded sites and contaminated soils. Both principal investigators have experience in environmentally based short courses and extension training. Moreover, new delivery mechanisms and interdisciplinary programs are constantly being developed-Penn State's World Campus (web-based learning) and the recently created Environmental Consortium are major efforts that come to mind. Beyond Penn State lie a host of partnering opportunities, including teaming up with other institutions in the Mid-Atlantic and cooperating with programs offered by non-profits such as the Society for Ecological Restoration.

We propose that this project adopt a spirit of innovation, not for its own sake, but because the various brownfields professions are ready to embrace technologies and approaches that go beyond convention. Creative brownfields recovery can take several paths: through new ways of examining old problems, through re-combining current or old approaches via new recipes, and through the re-casting of "problems" so that they're seen as dynamic opportunities. We would strive to intertwine these paths so as to efficiently maximize applied learning.

The Solution

With the support of PA DEP, US EPA, and other partners, Penn State Cooperative Extension & Outreach will establish two demonstration and education sites within Pennsylvania, geographically located in eastern and western regions of the state. This will facilitate access from all parts of Pennsylvania and the broader Mid-Atlantic region. The purpose of these sites will be to provide:

- Ongoing demonstration of alternative/innovative technologies for treatment and remediation of contaminated soils and waters;
- Ongoing demonstration of alternative/innovative technologies for ecosystem regeneration and restoration; and
- Experience-based education for trainees in planning, implementing, monitoring, and maintaining these remediation and restoration technologies, as well as managing the brownfield to greenspace transitions adaptively and sustainable through time.

Demonstrations Sites

Demonstration sites will be chosen based on the following key conditions:

- appropriate geographical location (as noted above);
- Status as dedicated permanent sites that will allow ongoing, long-term demonstration of remediation and restoration progression;
- Non-critical, low-level contamination not requiring immediate remediation;
- drastically disturbed and degraded ecosystem (soil and vegetation).
- Accessibility both physically and visually ? to capitalize on their demonstrative potentials; and
- Compatibility between demonstration sites and their community contexts.

Physical and programmatic features of the sites would include:

- Installation of alternative/innovative treatment technologies at various locations at the site, depending on site characteristics. Such interventions could include phytoremediation (phytoextraction, phytovolatilization, phytostabilization), bioremediation, soil amendment/soil blending/sustainable handling, permeable reactive barriers, and constructed wetlands (rhizofiltration, bioretention).

- Alternative/innovative ecosystems restoration techniques, with select demonstrations to be integrated with remediation technologies. We envision establishing a linear progression through time of succession from intensively managed, high input remediation plots to self-sustaining ecosystems. Small plot areas will be used to demonstrate remediation technologies. When these technologies have achieved some level of soil ecosystem recovery, the plots would coalesce into larger ecosystem restoration units that are integrated into the landscape ecology of the sites and their contexts.
- Approaches to invasive species control.
- If sufficient space is available, a secondary program of productive interim (e.g. shelterwood forestation techniques) and sustained yields urban agri-forestry for food, fiber, and energy.
- Ongoing monitoring and sample analysis will be conducted to document the progress/success/failure of implemented technologies and approaches.
- Untreated areas for comparative and baseline purposes. Such areas would also allow later implementation of, and experimentation with, as yet unknown remediation/restoration approaches, while providing contingency space should unanticipated needs arise.
- Select examples of non-sustainable or ineffective remediation technologies and site management approaches (e.g. soil stockpiles, over-worked plots, inappropriate soil amendment, etc.). Demonstrations would include monitoring and test regimes highlighting both the dysfunction at work and their antidotes.
- Implementation of technologies that permits trainees to participate meaningfully in site assessment and site planning; establishment, monitoring and maintenance of the technologies and their ecosystems context; assessment of remediation/restoration “success”; and, finally, adaptive management responses.
- Portable classroom and simple laboratory facilities including computer/GIS/web access.
- Basic equipment storage, site maintenance, and plant propagation facilities.

Training Curriculum

Penn State CE&O faculty and other experts will develop training modules that utilize both classroom teaching and field experience at the site. At this early stage, we anticipate that training modules could address:

- Overviews on contextual brownfields recycling (programming, design, management)
- Basic soil science, including soil genesis
- Introduction to soil and aquatic chemistry
- Behavior of chemical pollutants in soil and water
- Environmental risk assessment
- Site assessment and soil and water sampling
- Site planning and design principles and techniques
- Alternative/innovative remediation technology approaches
- Terrestrial and aquatic ecological restoration
- Approaches to community relations and participation

Hurdles and Questions

- Locating suitable sites
- Securing long-term access to sites
- Liability
- Site security
- Start-up funding
- Long-term funding and agency commitments
- Level of industry/corporate involvement
- Community perceptions / level of involvement

NOTES

