TOARC

2012 Annual Report

since 1997

The Board of Directors

2012

Representing the Ontario Stone, Sand & Gravel Association (OSSGA)

Ken Lucyshyn | Chairman of the Board
Mark Zinn | Secretary/Treasurer
Bruce Semkowski
Greg Sweetnam

Representing the Conservation Council of Ontario (CCO)

Tony Jennings

Representing the Association of Municipalities of Ontario (AMO)

Ric McGee

Representing the Aggregate Industry at large (non OSSGA)

Gord Lavis

Representing the Ministry of Natural Resources (MNR) as an "Ex Officio Member"

Dan Marinigh

2013

Representing the Ontario Stone, Sand & Gravel Association (OSSGA)

Ken Lucyshyn | Chairman of the Board
Mark Zinn | Secretary/Treasurer
Bruce Semkowski
Greg Sweetnam

Representing the Nature Conservancy of Canada (NCC)

John Riley

Representing the Association of Municipalities of Ontario (AMO)

Marolyn Morrison

Representing the Aggregate Industry at large (non OSSGA)

Gord Lavis

Representing the Ministry of Natural Resources (MNR) as an "Ex Officio Member"

Dan Marinigh

June 29, 2013

Honourable David Orazietti
Minister of Natural Resources
Suite 6630, 6th Floor, Whitney Block
99 Wellesley Street West
Toronto, Ontario M7A 1W3

Minister Orazietti;

On behalf of the Board of Directors, I am pleased to submit the 2012 Annual Report of The Ontario Aggregate Resources Corporation.

This annual report includes audited financial statements for the Aggregate Resources Trust and The Ontario Aggregate Resources Corporation for the fiscal year ended December 31, 2012. Included within the financial statements for the Aggregate Resources Trust is a schedule of rehabilitation costs for projects completed by the Management of Abandoned Aggregate Properties (MAAP) program in 2012. The report also reviews a number of the many rehabilitation research and other initiatives being funded, as well as their application to creative rehabilitation solutions.

Yours truly,

Ken Lucyshyn
Chairman of the Board

2012 CHAIRMAN'S MESSAGE

AGGREGATE PRODUCTION FROM LICENCED SOURCES WAS DOWN MODESTLY IN 2011 (COMPARED TO 2010) BY APPROXIMATELY 8 MILLION TONNES.

This resulted in a reduction of approximately $0.8 million in licence fees being collected in 2012. The total of fees ($19.6 million compared to $20.4 million the prior year) was disbursed amongst designated recipients as follows:

	($Million)
Local municipalities	9.0
Counties & regions	2.2
MAAP program	.7
Province (from licence fees)	5.2
Province (royalties & permit fees)	2.5
Total	19.6

On the basis of an ongoing and extensive review of legacy pits and quarries across the Province, staff and the Board of directors have maintained a dialogue with the Minister and other MNR decision makers over this past year regarding the need to revisit the funding formula for the MAAP program. Funding for the Abandoned Pit & Quarry Rehabilitation program (now the MAAP program) was set in 1990 at the rate of $0.005/tonne and has remained unchanged since that time. From the above table, you can see that the $0.005/tonne generates approximately $700,000 per annum which must pay wages & benefits, rents, travel & field expenses, construction costs and research expenditures.

A review of the Consumer Price Index (CPI) over that same period shows that the purchasing power of a dollar has decreased by almost 45%. It is a great credit to staff for maintaining and increasing the number of rehabilitation projects completed throughout this period but it is obvious the funding model is not sustainable in light of inflationary pressures. More importantly, as I reported last year, the Board is of the opinion that the $0.005 per tonne is an insufficient commitment of resources to complete the rehabilitation of legacy pits and quarries in a meaningful time frame. The Board would like to see the backlog of legacy pits and quarries dealt with within a twenty year time frame, not the one hundred and thirty year time frame implicit in current funding levels.

I further reported last year that the work of re-evaluating the older inventories continues and as a result of another season of field work, MAAP staff are able to reclassify a number of properties and the disposition of our site inventories now looks as follows;

Developed	507
Licensed	187
No historical extraction	294*
Naturalized (to create new habitat)	1,220
Rehabilitated (by owner)	434
Situated on Crown Land	89
Landowner Not Interested	546
Rehabilitated by MAAP/MNR	405
Total Files Closed:	3,682

* Files where no disturbance could be found or where it was determined the site disturbance was not the result of aggregate extraction.

During the same time period, approximately 100 new files have been added to the total inventory of sites as a result of landowners reporting old pits on their property that were missed in the initial inventories. That brings the total inventory of legacy pits and quarries close to 8,000 (3,682 of which have been closed as per the above table). While there are still over 4,300 files that have not been formally disposed of, we know from our experience to date that many of them will be closed for the same sorts of reasons noted above. Accordingly, we remain confident with our estimate of approximately 3,000 sites requiring intervention with some sort of rehabilitation effort.

The conversion of all of our paper files to an electronic format (eMAAP) has proven to be an excellent productivity tool; especially now that inventories, photographs, maps, GPS coordinates and all records of other sorts are integrated into a retrieval system that can be accessed from any place with internet connectivity (including field sites). That same conversion has been completed for all files where licenses and permits have been revoked (eREVOKE) and similarly will assist with the management of these problematic sites and their eventual restoration.

In 2012, the MAAP program conducted work on 37 sites at a cost of over $463,000. The work consisted of 30 new sites clustered in Northumberland County and the District of Thunder Bay. The balance of the work mainly consisted of the completion of 2011 projects (primarily tree planting and seeding). The Northumberland and Thunder Bay projects necessitated a great deal of time away from home for our Construction Supervisor, Paul Hartnett, and I would like to thank Paul for his efforts in that regard.

Dr. Paul Richardson's work on creating biodiversity offsets to mitigate the impacts from extraction has been extended into 2015 thanks to support from the Mitacs Elevate Postdoctoral Fellowship program which supports recent PhD graduates to work on a joint industry-academia research project for two years. Fellows lead the collaboration and spend about half of their time at a university and half at the company. In addition, Mitacs provides the fellows with business skills training so they are well positioned to take on R&D leadership roles at the end of the program. Dr. Richardson will be working under the direction of Dr. Steven Murphy who is with the Centre for Ecosystem Resilience and Adaptation at the University of Waterloo. We thank Mitacs for working with TOARC as an industry partner and their financial support for this important work. The progress of Paul's work is reported on in greater depth elsewhere in this annual report.

Brian Ohsowski (PhD candidate) has completed his field trials designed to investigate the contribution various soil amendments have on the establishment of tallgrass prairie communities and is in the final stages of writing up his results (which look very promising) and completing his doctoral work. Progress on Brian's work is detailed elsewhere in this report.

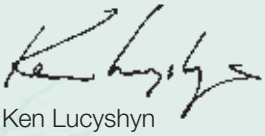
Because many good gravel deposits are often overlain by good agricultural land, the Board has determined that additional research should be carried out on ways and means of restoring former agricultural lands that have been disturbed by aggregate extraction. As a first step, leading to a number of more specific research projects, the MAAP program has hired Caroline Dykstra, BSc. to create a comprehensive data base of sites that were once agricultural, disturbed as the result of aggregate extraction and then rehabilitated to agricultural use again. This will include abandoned pits, former licensed pits and currently licensed pits that are undergoing progressive rehabilitation. This represents a big job for Caroline and those of you in the industry who have land restored to agricultural use are encouraged to contact her at csdykstra@toarc.com and share your experience.

Trust funds increased in value for the year ending 2012 to $17,311,924 from $16,559,474 at year end 2011. The portfolio continued to show significant swings in the 'unrealized changes in fair value portion' due to volatile investment markets; an increase of $1,718,450 over last year. On the other hand, realized investment income showed a decrease of $184,032 over the prior year. Trustee's expenses were up by $135,809 over the same period last year due in large part to the general costs of maintaining staff in the more remote parts of the Province (travel & communications), general staffing levels and costs associated with improvements to information technology.

As a final note, I would like to welcome two new members to our Board of Directors. Mayor Marolyn Morrison from the Town of Caledon takes over the position of AMO (Association of Municipalities of Ontario) representative from Mayor Ric McGee (Kawartha Lakes). We thank Ric for all his contributions and look forward to working with Mayor Morrison.

Mr. John Riley, chief science officer with the Nature Conservancy of Canada (NCC) is standing in to the position representing the environmental community on behalf of Tony Jennings who is currently dealing with some health issues. We wish Tony well in his recovery and know John will bring a balanced and insightful approach to board discussions.

Respectfully submitted,



Ken Lucyshyn
Chairman of the Board

2012 MAAP

Project Summary

Project Number	Landowner	Location	Rehabilitation End Use	Area (ha)	AVG Cost Per Site ($)
12-01	Smeekens Pit	Lambton County	Natural Area	3.00	2,620
12-02A	Thompson Pit	Huron County	Natural Area	0.11	1,994
12-02C	Pfeffer Pit	Huron County	Natural Area	0.15	265
12-03	Dufferin-Northern Peel Anglers' and Hunters' Association Pit	Dufferin County	Natural Area	1.50	5,512
12-04A	Schut Pit	Northumberland County	Natural Area	0.47	19,671
12-04B	Cook Pit	Northumberland County	Natural Area	0.60	11,131
12-04C	Linton Pit	Northumberland County	Natural Area	0.34	6,056
12-04D	Self Pit	Northumberland County	Meadow	0.70	10,847
12-04E	Scott Pit	Northumberland County	Prairie	0.47	8,645
12-05	Ward Pit	Northumberland County	Natural Area	1.73	59,540
12-06A	Moroz Pit	Northumberland County	Agriculture Crop	0.75	8,763
12-06B	Carlen Pit	Northumberland County	Agriculture Pasture	0.50	8,026
12-07	Shepphard Pit	Northumberland County	Meadow	1.74	24,387
12-08	Hutchinson Pit	Northumberland County	Agriculture Pasture	7.60	54,000
12-09A	England Pit	Northumberland County	Agriculture Pasture	2.30	11,787
12-09B	England Pit	Northumberland County	Agriculture Pasture	1.10	8,542
12-09C	McNichol Pit	Northumberland County	Meadow	0.50	4,309
12-10A	Ryan Pit	Northumberland County	Natural Area	1.20	6,819
12-10B	Walsh Pit	Northumberland County	Meadow	1.94	12,414
12-10C	Coyne Pit	Northumberland County	Agriculture Crop	1.50	16,065
12-11	Halton Conservation Authority Quarry	Regional Municipality Halton	Natural Area	0.80	15,500
12-12	Bruno Pit	District of Thunder Bay	Natural Area	3.60	19,600
12-13	Buchanan Pit	District of Thunder Bay	Natural Area	0.60	23,450
12-14A	Baziuk Quarry	District of Thunder Bay	Natural Area	0.64	12,200
12-14B	Baziuk Quarry	District of Thunder Bay	Natural Area	1.03	12,200
12-15A	Tabor Quarry	District of Thunder Bay	Natural Area	0.38	6,800
12-15B	Connor Quarry	District of Thunder Bay	Natural Area	0.37	6,800
12-16	Gallo Quarry	District of Thunder Bay	Natural Area	0.74	16,480
12-17	Mechis Quarry	District of Thunder Bay	Natural Area	1.10	32,820
12-18	Tabor Quarry	District of Thunder Bay	Natural Area	0.64	4,500
				38.10	431,743

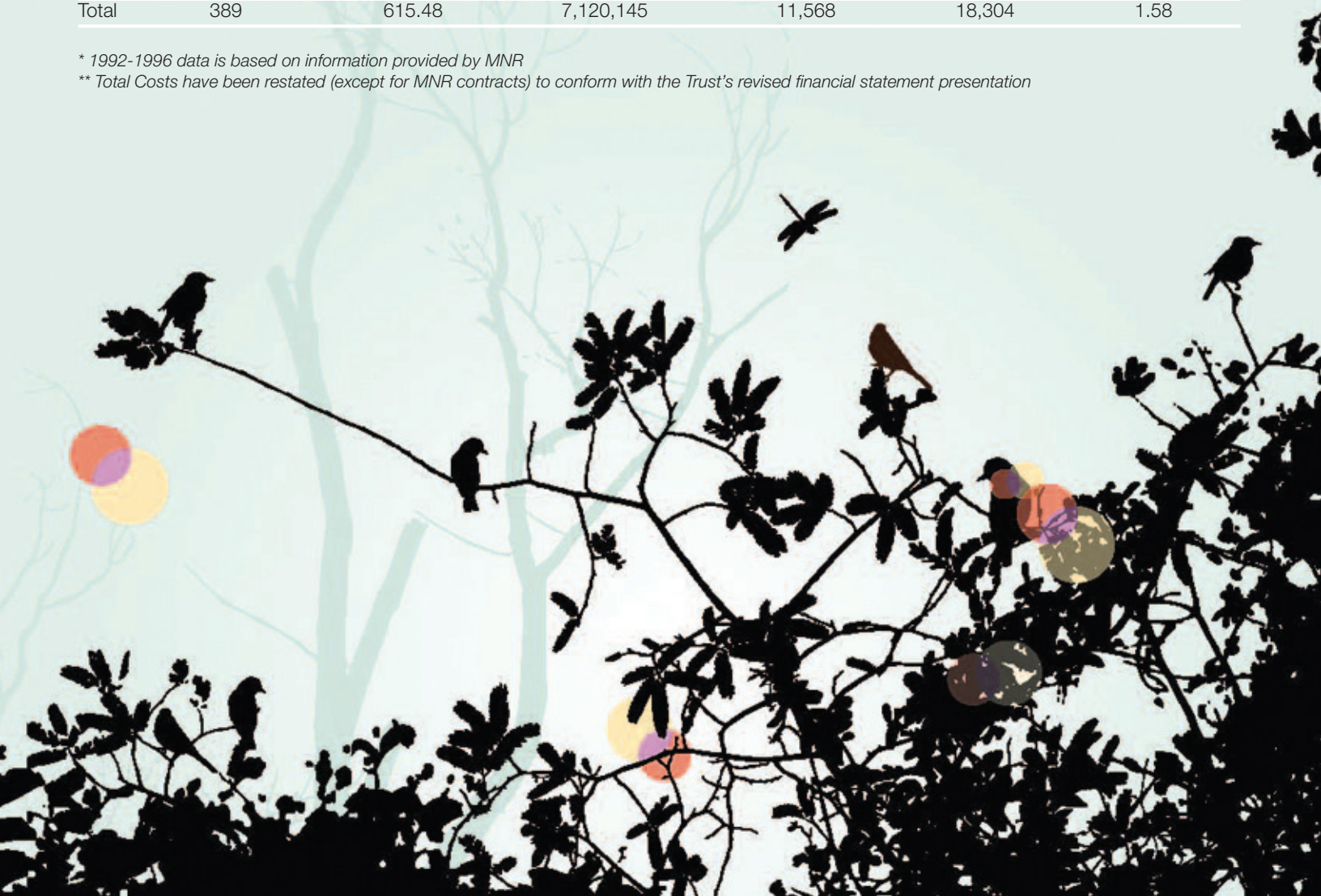
** Total project costs incurred for 2012 were $463,473. The difference between the $431,743 shown and the total was monies spent on 1 project carried over from 2008 and 6 projects carried over from 2011 (mainly seeding and tree planting).*

2012 MAAP

Summary of MAAP Rehabilitation Costs

Year	Number of New Sites	Area Rehabilitated (ha)	Total Costs ** ($)	Cost / (ha) ($)	AVG Cost Per Site ($)	Avg Area Rehabilitated (ha)
1992-96*	52	77.99	726,480	9,315	13,971	1.50
1997	15	22.40	497,973	22,231	33,198	1.49
1998	10	18.35	219,199	11,945	21,920	1.84
1999	16	30.45	366,636	12,041	22,915	1.90
2000	17	28.50	411,226	14,429	24,190	1.68
2001	21	25.50	320,337	12,562	15,254	1.21
2002	10	14.25	288,844	20,270	28,884	1.43
2003	19	46.39	342,897	7,392	18,047	2.44
2004	15	27.35	414,986	15,173	27,666	1.82
2005	28	75.45	498,819	6,611	17,815	2.69
2006	28	48.50	510,556	10,527	18,234	1.73
2007	23	39.11	740,796	18,941	32,209	1.70
2008	29	45.10	482,875	10,707	16,651	1.56
2009	19	22.29	298,699	13,401	15,721	1.17
2010	19	21.35	298,205	13,967	15,695	1.12
2011	38	34.40	269,874	7,845	7,102	0.91
2012	30	38.10	431,743	11,332	14,391	1.27
Total	389	615.48	7,120,145	11,568	18,304	1.58

** 1992-1996 data is based on information provided by MNR*
*** Total Costs have been restated (except for MNR contracts) to conform with the Trust's revised financial statement presentation*



The Aggregate - Agriculture Paradox

Ontario has much of the best farmland in Canada! While Ontario contains only 15.5% of all dependable agricultural land (Classes 1, 2 & 3) in Canada, it includes a whopping 56.3% of the Class 1 farmland according to the Canada Land Inventory. Juxtaposed to that is the fact that Ontario also has about one third of all the urban land in Canada. It is an axiom that when competing interests attempt to occupy the same space, conflict of some sort ensues. This is as true of land uses as it is of young males vying for the only bar stool next to a pretty girl.

The Ontario Farmland Trust (OFT) estimates that Ontario lost at least 600,000 acres of farmland between 1996 and 2006, including 18% of Ontario's Class 1 farmland. Melissa Watkins and Dr. Stewart Hilts concluded in a 2003 study (Protecting Southern Ontario's Farmland) that "The major threats to Ontario's farmland can be summarized as Urban Sprawl and Severances". Such a conclusion is obvious to anyone who drives the highways and byways of Southern Ontario. At the same time, urban expansion and lot creation has increased demand for mineral aggregates to both create and maintain the infrastructure that is intrinsic to both phenomena. In Southern Ontario, good agricultural land has often developed on post glacial outwash plains and terraces which are also prime sources of sand and gravel. Thus, agriculture and aggregate extraction have been led to the same fate as the two young men and the bar stool.

While urban sprawl and severances may be sins without redemption, aggregate extraction, in most instances, is not.

1

1. Legacy pit located in Huron County where high, steep slopes and intermixed soils were challenges in returning the site to pasture.

2

2. Lack of soils challenged the rehabilitation plans for a 3 hectare legacy pit in Huron County. Adjacent soils needed to be mixed with retained stockpiles to provide sufficient soils for agriculture.

The MAAP program aims to rehabilitate former extraction sites to provide a higher level of function over the prevailing condition of the site, always having regard to eliminating any safety concerns. Within our inventory of legacy pits, many sites were formerly agricultural land, although no systematic records of the agricultural quality of such land has been kept. Where it is obvious that the rehabilitation of a site to agriculture would fit in with the surrounding land use, and where the landowner is desirous to see the land returned to agriculture, it is a priority restoration goal for us. Very often, it is also one of our more challenging restoration targets given that for many of these oldest pits, rehabilitation objectives were not clearly enunciated and planned for.

Paul Hartnett, our construction supervisor, is often confronted with severely degraded site conditions including a lack of topsoil, steep slopes and drainage issues. What soils may have been left behind have often been intermixed (topsoil and subsoil) and exhibit a paucity of organic materials and nutrients. While Paul has found many creative ways of dealing with the past removal of topsoil from the site, it remains one of his more difficult obstacles to returning the site to a high quality agricultural use. For example, through careful examination of the soil conditions surrounding a site (by the careful excavating of test pits) it can be determined if there are sufficient soils from the surrounding field to "share" with the regraded extraction site. This strategy has produced some excellent results although it is limited to the rehabilitation of relatively small sites (approximately 2 hectares at the upper end). A second strategy, of course, would be the mixing of adjacent soils with stockpiles of soil that were retained when the aggregate was stripped for extraction. This often allows for the rehabilitation of larger sites, even though not all of the original soil has been retained. You can appreciate that the above strategies are very site specific and it is difficult to establish any hard parameters with respect to size of project and the further disturbance of adjacent lands. In addition to soil cover,

3. In 2010, MAAP rehabilitated 8 hectares of land back to agriculture in the City of Kawartha Lakes. The site was rehabilitated in the spring and growing soybeans the same year.

The Aggregate - Agriculture Paradox - Continued

"cut and fill" work also needs to be cognizant of establishing appropriate grades for agricultural equipment (generally 5:1 slopes for safe operation of a tractor). Some legacy pits also suffer from poor drainage as a result of excavating too close to the water table or from the removal of all free draining materials over impermeable soil layers (e.g. silt and clay). For a return to agricultural use, care must be taken to return enough subsoil to maintain a "root zone" above levels of permanent saturation. Landowners may even consider installing tile drains post rehabilitation.

To date, the MAAP program has had 141 projects (totaling close to 250 hectares) classified as agricultural restoration. Unfortunately, these sites have not been monitored over the years to record the cropping strategies used by the land owners, nor to record inputs and farm productivity. The inventory of legacy pits often require corrective measures that are not always needed in properties licensed under the Aggregate Resources Act (the ARA). For example, Operational Standards for licences stipulates the careful removal of topsoil and the separate storage of topsoil and overburden with a vegetative cover. Notwithstanding new operational standards however, many older pits (grandfathered under the ARA) still must deal with insufficient topsoil issues and issues related to topsoil degradation from long term storage.

TOARC and the MAAP program are now focussed upon addressing some of these problem areas through new research initiatives. As a first step in this process, Caroline Dykstra is undertaking the assembly of a database on former aggregate extraction sites, now returned to agricultural production. By reviewing, in a comprehensive and systematic way, as many examples of agricultural restoration as possible it is hoped to isolate those decisions and practices that lead to better results for this important restoration target. Caroline's database will include legacy pits rehabilitated by MAAP, formerly licensed pits now completed and returned to agriculture and lands within currently active pits that are being restored as part of a progressive rehabilitation program. In addition to basic information such as location and size, Caroline hopes to collect information on the techniques used to rehabilitate the site and the agricultural management practices employed post rehabilitation, to the greatest extent possible. Readers who know of sites that were formerly extracted and are now back into agricultural use can be extremely helpful to the process by contacting Caroline at **csdykstra@toarc.com** and sharing your information with her.

This project, and research to follow, will build upon the work conducted by E.E. Mackintosh and E.J. Mozuraitus in 1982 for the Ministry of Natural Resources (Agriculture and the Aggregate Industry: Rehabilitation of Extracted Sand and Gravel Lands to An Agricultural After-Use). That work is available on the TOARC web site at **www.toarc.com**. We are confident that the compilation of the above noted database will reveal some excellent examples of successful agricultural restoration and the further research that will flow from this project will provide further solutions to those matters that remain problematic. With careful planning, aggregate recovery and agriculture can sequentially share the same space. The two young males will have to learn to do the same with their single bar stool!

4. Legacy pit in Waterloo County shown in 2009 before rehabilitation and 4 years later planted in wheat.

Re-Vegetating Post-Extraction Sandpits: Plant Response to Arbuscular Mycorrhizal Inoculum and Soil Carbon Amendments

Research Team:
Brian Ohsowski, PhD Candidate[1] | Dr. Miranda Hart, Co-Advisor[2]
Dr. John Klironomos, Co-Advisor[1] | Dr. Kari Dunfield, Committee Member[2]
Gui Jun Wang, Visiting Scholar from Beijing, China[1]

1 University of British Columbia Okanagan, Kelowna, British Columbia, Canada
2 University of Guelph, Guelph, Ontario, Canada

Tallgrass prairies are treeless habitats dominated by native grasses and wildflowers. Ontario's highly diverse tallgrass prairies are a threatened habitat-type that only remains as isolated patches. It is estimated that tallgrass prairie habitat supports approximately 200 plant species in the Ontario range. Pre-settlement estimates of Ontario's native tallgrass prairies range from 800 - 2,000 km^2. Currently, southern Ontario's tallgrass prairies occupy less than three percent of their original coverage (Rodger, 1998). Habitat reduction threatens Ontario's unique prairie inhabitants, elevating the status of many grassland plants and animals to provincially endangered or rare.

Depleted aggregate sites are good candidates for prairie restoration projects due to their 'open' nature and adaptability to management scenarios. This potential has been recognized by TOARC and has led to the support of this research initiative. The results of this study can be directly translated into the industrial-scale restoration of native grassland plants in post-extraction areas. This research tests the efficacy of novel and easily applicable restoration techniques to facilitate native plant growth and sustainability using a large – scale field trial (0.5 hectares).

Research Synopsis:

The grassland restoration experiment is in its fourth year of active research. This research is testing the effect of soil supplements (municipal compost, biochar) and plant symbionts (commercially-available arbuscular mycorrhizal fungi (AMF)) on native prairie plant survival and growth. These treatments are anticipated to positively alter microbe-driven biogeochemical cycles, soil building processes, and plant-mycorrhizal symbioses. It is hypothesized that the combined use of soil amendments and mycorrhizal inoculation will be synergistic with respect to soil development and plant growth.

Research Goals:

This research will contribute significantly to the scientific fields of ecological restoration, mycorrhizal ecology, and soil ecology. Project goals include:

1) Describing potential plant-soil-microbe feedbacks;
2) Understanding the role of AMF and native plants in the restoration of degraded landscapes;
3) Determining soil supplement influence on native prairie plant survival and growth; and
4) Understanding biogeochemical soil development properties in amended post-extraction substrate.

The research will answer two practical questions related to industrial scale restoration:

1. Does mycorrhizal inoculation (a relatively inexpensive application) positively influence plant growth, thus adding value to the overall restoration scheme?
2. Does the addition of soil supplements (biochar & compost in various proportions significantly and cost effectively accelerate soil restoration thus promoting plant growth and survival?

Re-Vegetating Post-Extraction Sandpits - Continued

Research Site Establishment:

The Nature Conservancy of Canada (NCC) has graciously allowed the use of some of their land holdings near St. Williams, Ontario, for the establishment of the research site. The St. Williams, ON area is within the historic range of tallgrass prairie ecosystems in southern Ontario, making this location an ideal candidate for a tallgrass prairie restoration. The experimental site is set-up on a recently active sand pit (established summer 2010). The research team is conducting two field trials at the restoration site: a plant plug trial (Exp. #1) and a seed addition (Exp. #2). These experiments will test the efficacy of two planting strategies (See Figure #1).

Experiment #1 – Plant Plugs Trial:

This experiment used a fully-crossed factorial design. Factors were: (1) biochar (BC) and compost (CP) application rates per hectare (ha) [0, 5T ha-1 BC, 10T ha-1 BC, 20T ha-1 CP, 5T ha-1 BC + 20T ha-1 CP, 10T ha-1 BC + 20T ha-1 CP], and (2) plant plug inoculation [± mycorrhizal fungi (*Rhizophagus irregularis*)]. Plant plugs were grown with/without AMF in the greenhouse and transplanted to the field in June 2010. All field plot treatments were replicated (n=10) and each replicate unit comprised a 10.2 m^2 plot. Thirty plots without plant plugs were established as controls. A total of 150 plots were set-up in a fully randomized order.

Experiment #2 – Seed Application Trial:

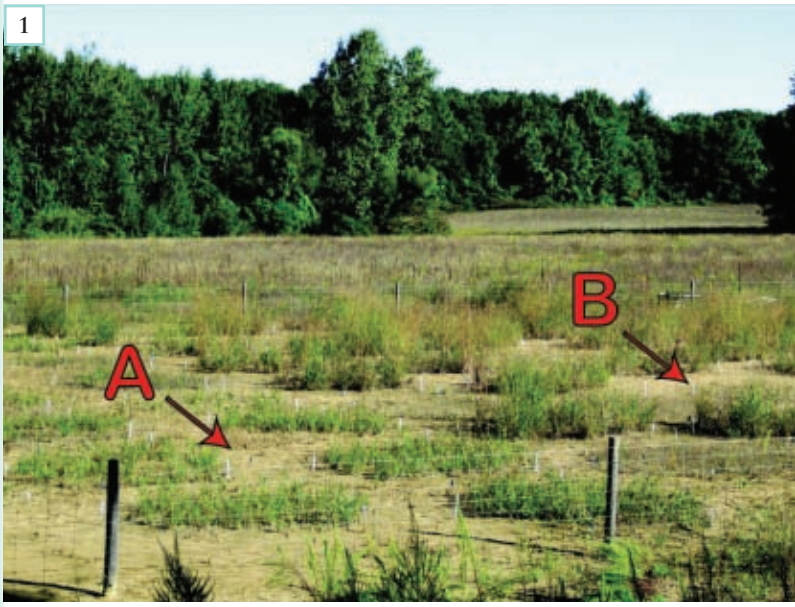
Exp. #2, adjacent to Exp. #1, used a fully-crossed experimental design. Exp. #2 is testing the effect of amendment application rate and *R. irregularis* inoculum on native seed establishment and growth. One ton of biochar, one ton of compost, and seeds of eight grassland species are utilized in Exp. #2. Each amendment combination was replicated (n=2) for a total of seventy-two 10.2 m^2 plots.

Biochar Application Rate	Compost Application Rate
0.0 T/ha	0.0 T/ha
2.5 T/ha	2.5 T/ha
5.0 T/ha	5.0 T/ha
10.0 T/ha	10.0 T/ha
20.0 T/ha	20.0 T/ha
40.0 T/ha	40.0 T/ha

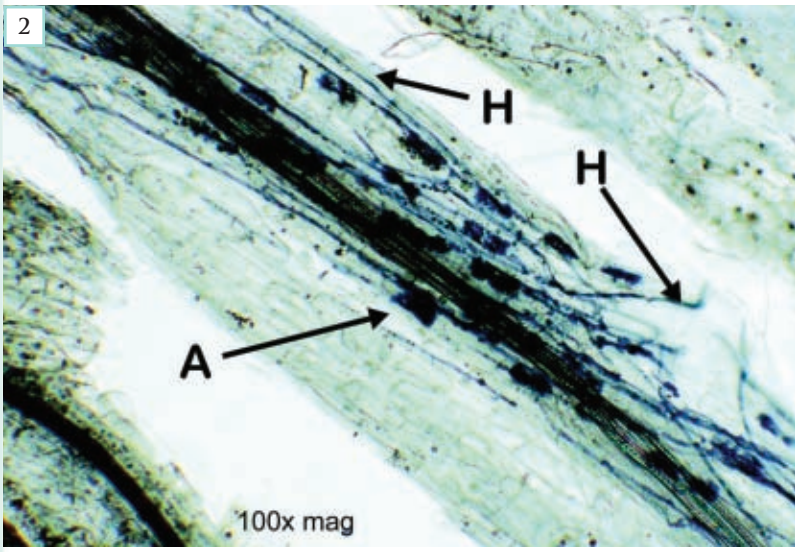
Table #1: Biochar and compost application rates for the seed application trial. Application rates are listed in tons / hectare (T/ha).

For specific details regarding the experimental design of the two research projects, please refer to the 2010 TOARC Annual Report found at www.toarc.com.

1

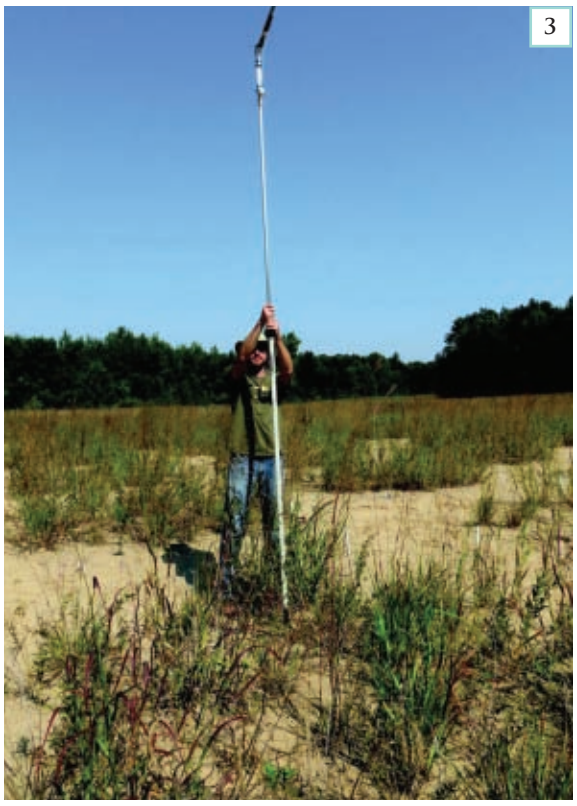


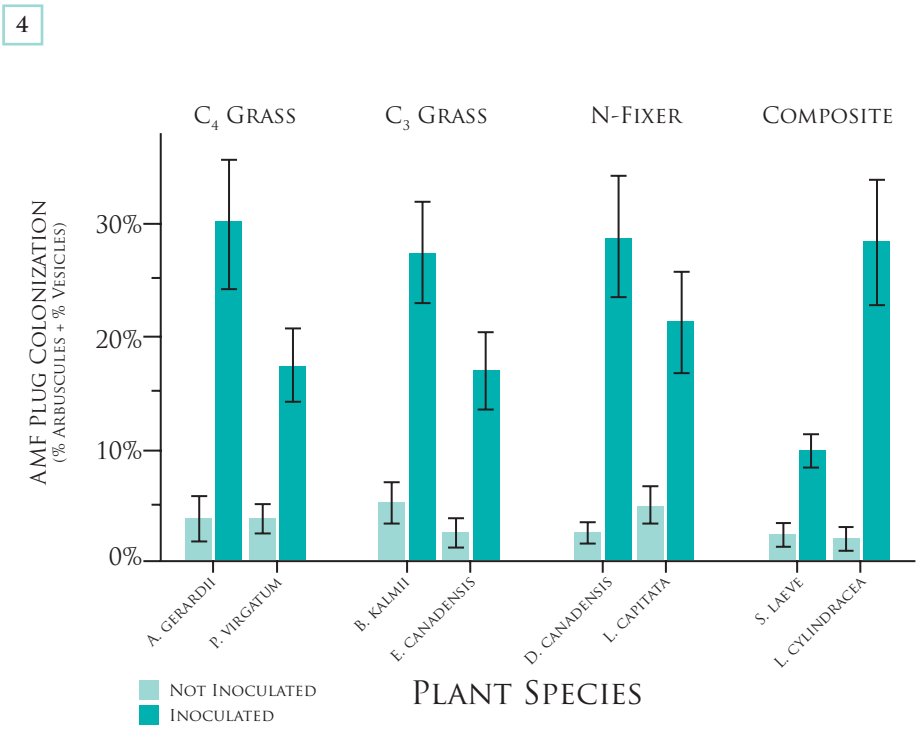
2



1. The seed experiment - one year and five months after seed application (A). Plants have established and invested their energy into sending deep roots into the soil. Plant biomass is anticipated to dramatically increase during the third growing season. Compare and contrast the biomass height from each experiment. Plant plug addition (B) during a restoration will yield faster and more dramatic results.

2. An example of roots colonized by arbuscular mycorrhizas. The mycorrhizas are visualized with a fungal specific stain. *Rhizophagus irregularis* (our inoculum) is pictured here growing in the roots of *Plantago lanceolata*. The dark blue patches are arbuscules (A). Arbuscules, growing within the plant's root cells, are the site for chemical exchange between the plant and the fungus. The dark blue lines are hyphae (H). Hyphae (main body of the fungus) are essentially tubes that connect arbuscules and explore the soil for nutrients. Magnification = 100x.

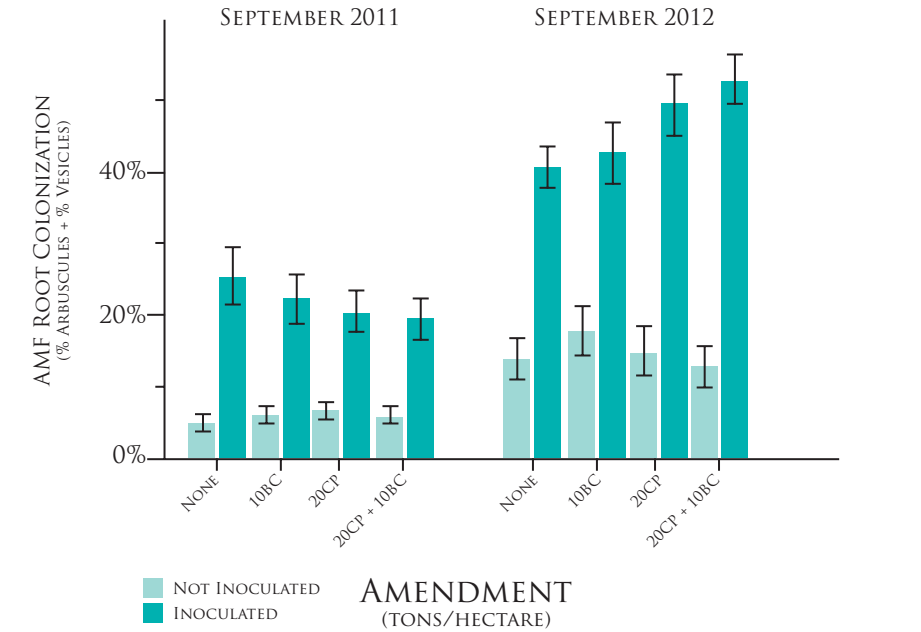




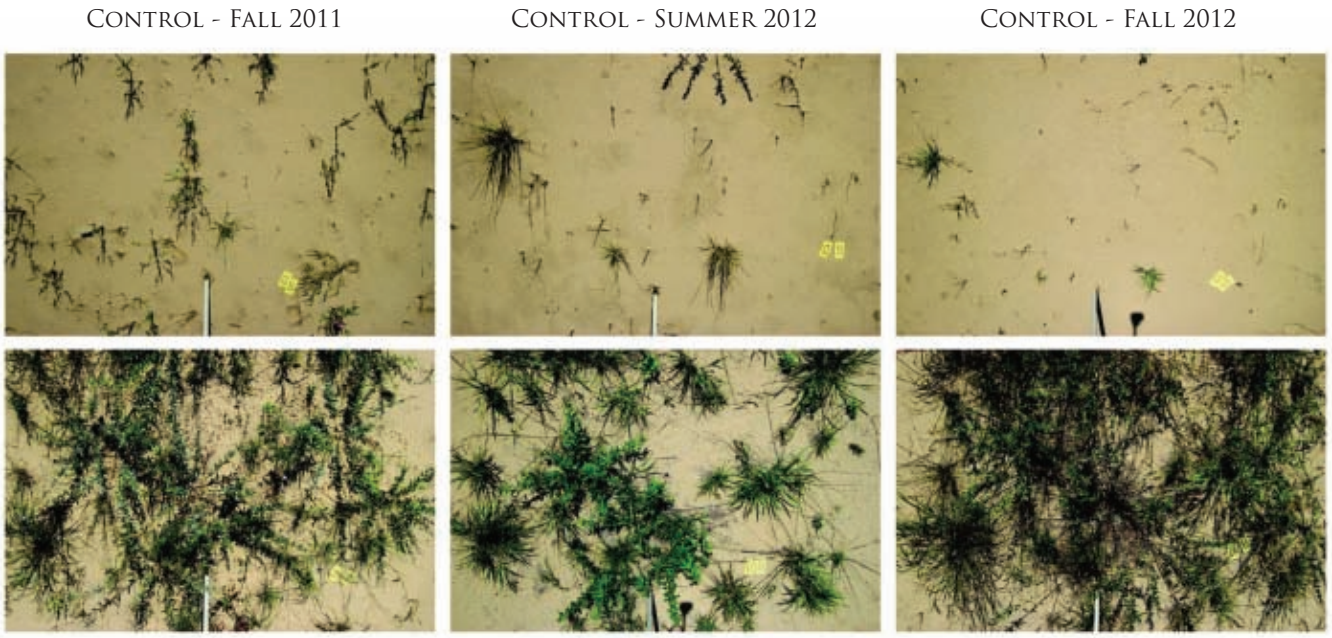
3. Collecting photographic data to analyze percent plant cover. We used innovative approaches to reduce the need to destructively harvest this long-term research site.

4. Total AMF colonization of the greenhouse grown plant plugs. After plant plug maturity, they were transplanted to the field site. The graph is binned by plant functional group. Each treatment is replicated ten times (n=10). Plant Species: C4 Grasses (*Andropogon gerardii, Panicum virgatum*), C3 Grasses (*Elymus canadensis, Bromus kalmii*), nitrogen-fixing legumes (*Lespedeza capitata, Desmodium canadense*), composite flowers (*Liatris cylindracea, Symphyotrichum laeve*). Error bars +/- 1 standard error.

5. Total AMF colonization of the grassland plant roots from Exp. #1. Collected soils were pooled at the time of sampling. This data represents AMF root colonization from a mixed community root sample. Samples were collected at the end of the first (2011) and second (2012) growing season. Each treatment is replicated nine times (n=9). On the x-axis: None = no amendment, 10BC = 10 tons / hectare biochar, 20CP = 20 tons / hectare compost, 20CP + 10 BC = 20 tons / hectare compost + 10 tons / hectare biochar. Error bars +/- 1 standard error.



6



Methods:

Arbuscular Mycorrhizal Inoculation:

To evaluate inoculum presence in the greenhouse, ten control and ten inoculated plugs from each plant species were randomly selected at the time of sowing in 2010. To count AMF structures, plant roots are dyed with a fungal specific stain and counted systematically under a microscope (Figure #4). Figure #2 is an example of stained fungi in roots.

To evaluate AMF inoculum presence in the field, soil cores were systematically collected and pooled at the plot level in September 2011 / September 2012 near designated plant plug locations (Figure #5). Approximately 1,500 soil cores were collected from the site during each field season.

Plant Growth Dynamics:

An important aspect of this project is to accurately measure plant growth. Ideally, plant biomass should be tracked over several years to best understand the plant community growth patterns. Furthermore, large-scale destructive harvests would negatively influence long-term data collection procedures. We needed to develop innovative methods to accurately determine plant biomass that minimized plant destruction within the plots. Three biomass assessment techniques were used for this experiment:

Technique #1 - Aboveground Photographs

Plant cover can be used to estimate the growth of the plant community. A photographic technique was implemented to estimate the percent cover of plant growth for each plot. This simple, non-destructive technique can be used repeatedly throughout the experiment to track plant growth patterns.

To accomplish this, an apparatus was constructed to take overhead pictures in each plot (Figure #3). Photos are analyzed for green pixel coverage to estimate the cover of photosynthetic (active) tissues using the computer program, SamplePoint. Percent cover measurements are based on the classification of 100 pixels per standardized photograph taken for both experiments. Plot-level percent cover data for Exp. #2 is presented in a 3-D graph (Figure #7). Contrasting Exp. #1 control plots (no plugs added) and experimental plots, Figure #6 tracks plant growth dynamics in a time series (1, 1.5, and 2 growing seasons). For Figure #6, the control plot has no soil amendments or plugs added. The experimental plot with plugs has no soil amendments or AMF inoculum.

Technique #2 – Plant Plug Survivorship

Plant survivorship was estimated for Exp. #1. Since the plant plug experiment was spatially mapped (See 2010 TOARC Annual Report, www.toarc.com), plant plug survivorship can be tracked. Thirty-six (36) plant plug locations in the center of each plot were analyzed for new growth each growing season.

Plant survivorship was determined for aboveground plant structures only. Survival of a plant plug was estimated by the presence of new, photosynthetically active leaf tissue for that growing season. Data was pooled to represent plant functional group (i.e. plants with similar growth strategies and traits). Survivorship data was collected for September 2010 / 2011/ 2012 and presented in Figure #9.

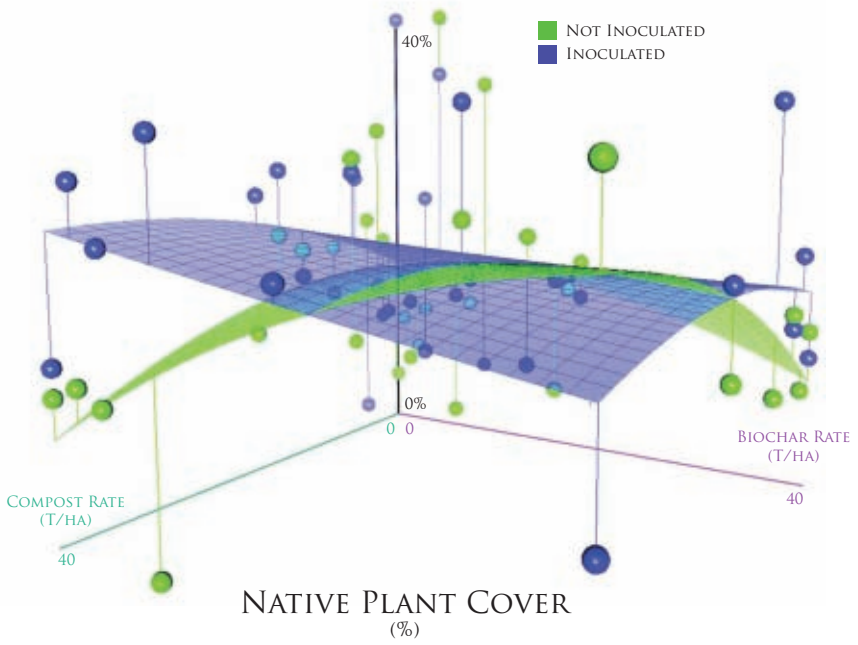
Technique # 3 - Plant Biomass Estimation for Individual Plant Plugs

We developed a statistical technique from the organic chemistry literature to non-destructively estimate plant biomass, using partial least squares regression (PLSR). This method incorporates a variable selection statistical method that selects the best predictor variables to estimate the response variable.

7

6. Photographic time series for two sets of plots in the plant plug experiment. The top set of pictures follows a control plot. Therefore, no plant plugs, soil amendments, or mycorrhizas were added. The lower set of plots follow a replicate with plant plugs addition only photos were taken after one year, one and a half years, and two years after plug installation. Note the lack of plant growth in the control plots.

7. Three-dimensional graph of native plant % cover for the seed experiment. Data was collected at the end of the second growing season (September 2012). The y-axis ranges from 0% - 40% coverage of green, native plant tissue. Compost and biochar application rates are listed in Table 1. The smoothed plane represented a best-fit representation of the data. AMF inoculated plots are represented by the purple curve. Non-inoculated plots are represented by the green curve. Data points are shown as spheres.



Related to this project, a subset of the plots had to be destructively harvested to create a PLSR standard curve. A suite of measurements, such as plant height, basal diameter, leaf number, stem height, were collected for each plant species in the project (36 replicates). These measurements are the predictor variables. Each plug location was harvested after predictor variable data was collected. Once harvested, the aboveground biomass was dried and weighed in the lab to determine dry weights. Plant dry mass is the response variable. The predictive PLSR standard curves were created from collected data. Once the best predictor variables have been selected, plant plugs in the remaining plots were measured non-destructively. Approximately 3,900 individuals were measured during each field season. Total predicted plot dry mass is presented in Figure #8.

Results and Discussion:

As the 5 T/ha biochar rates were not significantly different from the 10 T/ha biochar rates in Exp. #1, the 5 T/ha treatments were not included in this report to simplify the graphical presentation. Slight variations in topography were detected at the field site creating a potential gradient of water availability. After a covariate analysis was performed, the relationship of topography to plant biomass was not significant. No topography corrections were implemented in these analyses.

Mycorrhizal Colonization:

The presence of mycorrhizal inoculum was detected in the roots of inoculated plant plugs in Exp. #1. Investigation of the greenhouse grown plant plugs indicates that all species are receptive to mycorrhizas (Figure #4). Plant plug roots in the AMF inoculated treatment displayed a stark increase in colonization compared to the non-inoculated controls. Non-inoculated plant plugs had low mean colonization rates [> 5%]. This result is expected due to the non-sterile conditions of the commercial greenhouse setting. The inoculated treatment was "super saturated" with *R. irregularis* resulting in higher colonization rates compared to controls [mean ranges: ~10% - 30%] (Figure #4). These results indicate that an AMF inoculum treatment was established for the Exp. #1 field trial.

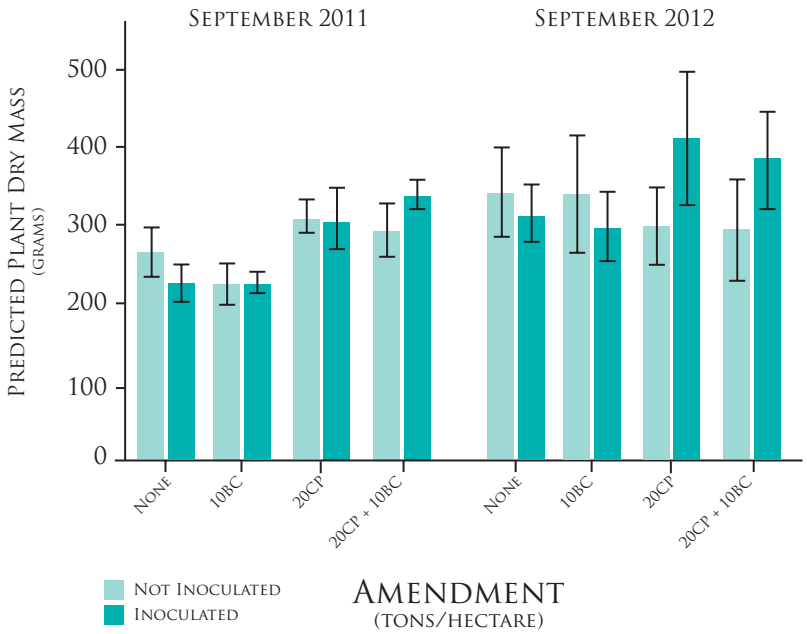
The persistence of the AMF inoculum in the field was tracked in Figure #5. AMF colonization rates for the mixed root samples indicate differences in the inoculated plots compared to control plots after one and two growing seasons. Low colonization rates were noted in the non-inoculated treatments. *R. irregularis* inoculum persists in the field, nearly doubling rate of root colonization between the first and second growing season. No soil amendment effect is indicated in first growing season for the inoculated / non-inoculated treatment. In the second growing season, the addition of compost elevates the root colonization level compared to the non-inoculated control (Figure #5). Treatments amended with biochar have little effect on root colonization in both growing seasons. Amending soils with compost may facilitate the propagation of *R. irregularis* inoculum in post-extraction sand substrate. Further investigation of the data is required to determine statistical differences and interactive treatment effects.

Plant Plug Survivorship:

At the time of planting, all native plant plugs were alive. No significant difference in mycorrhizal treatment was detected for plant plug survivorship. In this analysis, mycorrhizal and non-mycorrhizal data is pooled for simplicity. Plant plug survivorship is high during the first and second growing season, regardless of soil amendment application (Figure #9). When analyzed as a functional group, C4 grasses and nitrogen-fixing wildflowers had a consistently high survivorship across all growing seasons and treatments. The composites

Re-Vegetating Post-Extraction Sandpits - Continued

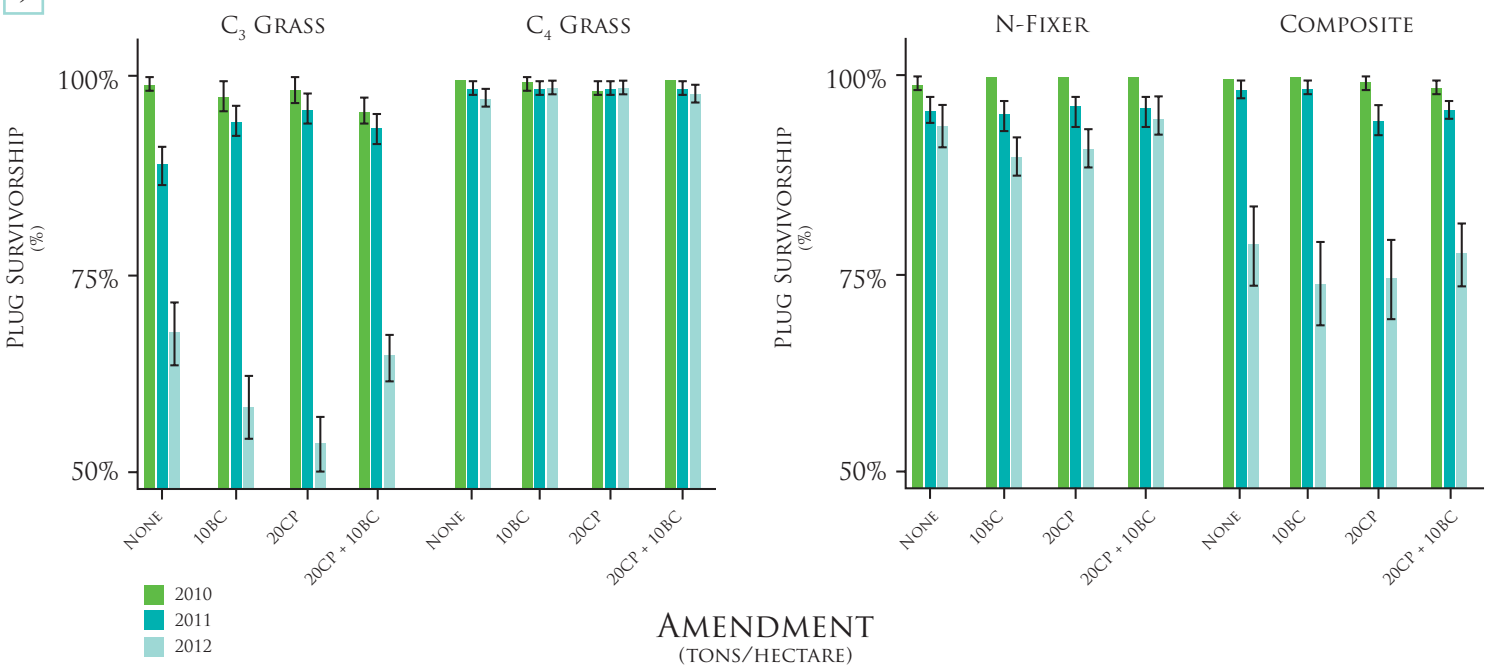
8



8. Predicted pooled plant dry mass (grams) from Exp. #1. The left panel represents the one growing season. The right panel represents the two growing seasons. On the x-axis: None = no amendment, 10BC = 10 tons / hectare biochar, 20CP = 20 tons / hectare compost, 20CP + 10 BC = 20 tons / hectare compost + 10 tons / hectare biochar. Error bars +/- 1 standard error.

9. Percent survivorship for three growing seasons in the plant plug experiment. Note the y-axis scale: range from 50% to 100% survivorship. Each graph represents the survivorship of the pooled plant functional groups. Plant Species: C4 Grasses (*Andropogon gerardii, Panicum virgatum*), C3 Grasses (*Elymus canadensis, Bromus kalmii*), nitrogen-fixing legumes (*Lespedeza capitata, Desmodium canadense*), composite flowers (*Liatris cylindracea, Symphyotrichum laeve*). Approximately 3,900 plant plug locations were evaluated for survivorship each growing season. On the x-axis: None = no amendment, 10BC = 10 tons / hectare biochar, 20CP = 20 tons / hectare compost, 20CP + 10 BC = 20 tons / hectare compost + 10 tons / hectare biochar. Mycorrhizal and non-mycorrhizal replicates are pooled for this dataset. Error bars +/- 1 standard error.

9



and C3 grasses experienced a sharp decline in survivorship during the 2012 growing season (Figure #9). Although drought tolerant, these native species typically have a higher water requirement in comparison to the C4 grasses and nitrogen-fixing plants. Reduced rainfall during the 2012 spring may have contributed to the decline in survivorship. These species may be dormant, not dead. Further tracking of the plant plug locations in subsequent years would be required.

Plant Growth Dynamics in the Plant Plug Trial:

When restoring post-extraction sand pits, the plant plug option is less cost effective when compared to distributing native seed. However, if the aggregate site needs to be restored quickly and efficiently, the results of Exp. #1 indicate that sowing native plants plugs is a viable option. The majority of the plants grown from plugs were producing seed after one year of growth. By year two, most plants had a high seed set, indicating that our restoration plots are self-replicating and self-sustaining. The use of plant plugs can have dramatic growth results even after only one full growing season (Figure #1). Quick plant establishment is anticipated to accelerate soil stabilization by binding substrate with native plant roots and reducing laminar flow wind energy. Further experiments need to be conducted to determine the most cost effective plant plug spacing while delivering the highest ecological benefit for the restoration project.

Although plant survivorship is generally high (Figure #9) across all treatments in Exp. #1, these results do not indicate plant community growth and performance. Preliminary results suggest significant increases in average plant dry weight when compost is incorporated into the substrate during the first growing season. Biochar and AMF inoculum addition did not significantly influence plant plug growth after one growing season when compared to control plots (Figure #8). After the second growing season, soil amendment rates show no difference among the non-inoculated plots. However, compost addition increased total plant biomass in the AMF inoculated plots compared to non-inoculated controls (Figure #8). Further investigation is required to determine statistical differences and interactive treatment effects in the data.

Plant Growth Dynamics in the Seed Application Trial:

Percent native plant cover for the seed application trial is visualized in Figure #7. Although the graph is complex, trends indicate that native plant cover increases as compost rates increase in the presence of AMF inoculum. Biochar addition is most effective at low application rates when paired with high rates of compost addition. As a preliminary result, the addition of AMF inoculum, high-levels of compost (20 T/ha – 40 T/ha) and low levels of biochar (0 T/ha – 10 T/ha) will achieve optimal native plant growth conditions in post-extraction sand pits. Further data analyses are required to investigate growth responses at previous time periods.

Conclusion:

These preliminary results suggest that the addition of municipal compost and mycorrhizal inoculum are affordable, easy to apply land management tools that improve plant performance in post-extraction aggregate sites. Our plant response results in plug and seed experiments are consistent. Both experiments benefit from the synergistic effect of compost addition and the AMF symbiosis, thus mitigating plant stress in post-extraction substrate.

The Afforested Environments Study

Can traditional plantation forestry produce woodlands that are ecologically equivalent to natural forests?

The Afforested Environments Study (AES) began in 2011 and has now reached an important milestone: the results are in! That is not to say the study has finished. In fact, a Mitacs Elevate Post-Doctoral Fellowship recently awarded to principle investigator Dr. Paul Richardson will allow the collaboration between TOARC and the University of Waterloo to continue for another two years. Rather, the initial phase of research is complete, and answers to the original research questions are at hand. Answering new questions brought to light by these findings will be the business of the next two years. In the meantime, we are excited to highlight some of the most interesting results, and the lessons they hold for managers of forest-creation ("afforestation") initiatives within the aggregates industry and beyond.

Research Goals

To date, the chief goal of the AES has been to evaluate from multiple ecological perspectives the extent to which conventional afforestation methods (i.e. those developed in the context of forestry rather than ecosystem restoration) successfully replicate on former farmlands mature natural hardwood forests. A number of agencies have vested interests in optimizing afforestation practices, from commercial lumber producers and managers of crown lands to industries that occasionally must remove existing forests and seek to compensate for this loss by creating equivalent woodlands at adjacent locations. Increasingly, government regulators of industries falling into this last category (e.g. mineral aggregates extraction!) are looking at the capacity for afforestation to mitigate negative ecological impacts of forest removal. Afforestation of equivalent or larger areas than those impacted by deforestation may become the standard that individual operators must hold to if they seek licensing for future operations. For such a system of ecosystem mitigation to actually work, however, created forests must over time come to closely resemble the removed forests with respect to valued features of natural-heritage hardwood ecosystems.

Afforestation efforts go back nearly a century in southern Ontario, and the vast majority of these have been guided by the principles of forestry with little consideration given in practice to the more recently emerging concepts of ecosystem restoration. Managers thus have relatively good control of factors related to tree growth and wood production but it is unclear how well conventional methods capture the entirety of goods (e.g. foods, fuels, fibres) and services (e.g. carbon sequestration, water filtration, nutrient cycling) produced by forests at the whole-ecosystem level. Because biodiversity is in one way or another indispensable to the functioning of forest ecosystems, perhaps the most important service of mature natural forests is provision of habitat for the rich and distinctive diversity of species requiring the specific balance of resources, stressors, and neighboring organisms found beneath hardwood canopies. The AES stands out from other afforestation research in part because it explicitly considers the diversity and composition of vegetation in both the canopy and the understorey while investigating the timespan and ecological conditions necessary for afforested farmlands to function equivalently to mature natural forests.

Understanding the relationship between planted and natural forests will hopefully help resolve a longstanding conflict between practitioners of forestry – a field developed to help managers derive optimal economic benefits from forests – and ecologists, who are seeking to understand natural processes driving the development and functioning of forests as ecosystems. On the one hand, ecologists suggest afforestation cannot hope to successfully capture appropriate biodiversity unless the "rules" of forest community assembly are worked with, rather than against. This has been translated to recommendations including incorporation of diverse mixtures of native hardwoods into tree-planting efforts, and minimizing post-planting interventions

such as tree felling/removal ('let nature take its course'). Forest managers, on the other hand, frequently contend that such measures are not only impractical or prohibitively expensive, they are unnecessary because conventional stand-thinning practices progressively removes the "unnatural" elements from the ecosystem (e.g. homogenous, low-diversity, often non-native tree crops) and leave behind hardwood forests consistent with natural woodlands. While there is certainly merit to exploring strategic departures from convention, the necessary first-step taken by the AES was to comprehensively assess just how successfully status-quo methods meet emerging goals of whole-ecosystem replication, and identify practical management interventions that may remedy areas where success is lacking, such as manipulating which types of trees are planted and how intensively developing forest stands are thinned.

Experimental Setup

To help resolve these issues, the AES was implemented as a large-scale comparative and experimental field study capable of measuring the degree to which plantation forests – experiencing different initial planting and subsequent stand-thinning regimes – are ecologically equivalent to mature natural hardwood forests. "Ecological equivalence" was approached broadly, with consideration given to multiple aspects of forest diversity falling under five main perspectives:

1) the biological, physical, and chemical composition of forest-floor soils;
2) the nature and distribution of substrates covering the forest floor above the soil;
3) properties of vegetation spontaneously occupying the understorey layer of the forest stands, including the diversity, cover and community composition sapling, shrub, grass, fern and wildflower species;
4) performance of two herbaceous indicator species characteristic of reference hardwood forests (wild ginger and wild leek), which were experimentally relocated to plantation forests under treatments designed to assess their reliance on living vs. non-living soil components present in natural forests but potentially lacking in plantation soils;
5) canopy-layer vegetation properties including tree density, basal area, and community diversity and composition. To determine how the degree of similarity from each of these perspectives changes over forest development time, plantations selected for study spanned an age gradient ranging from 30 to 90 years since afforestation.

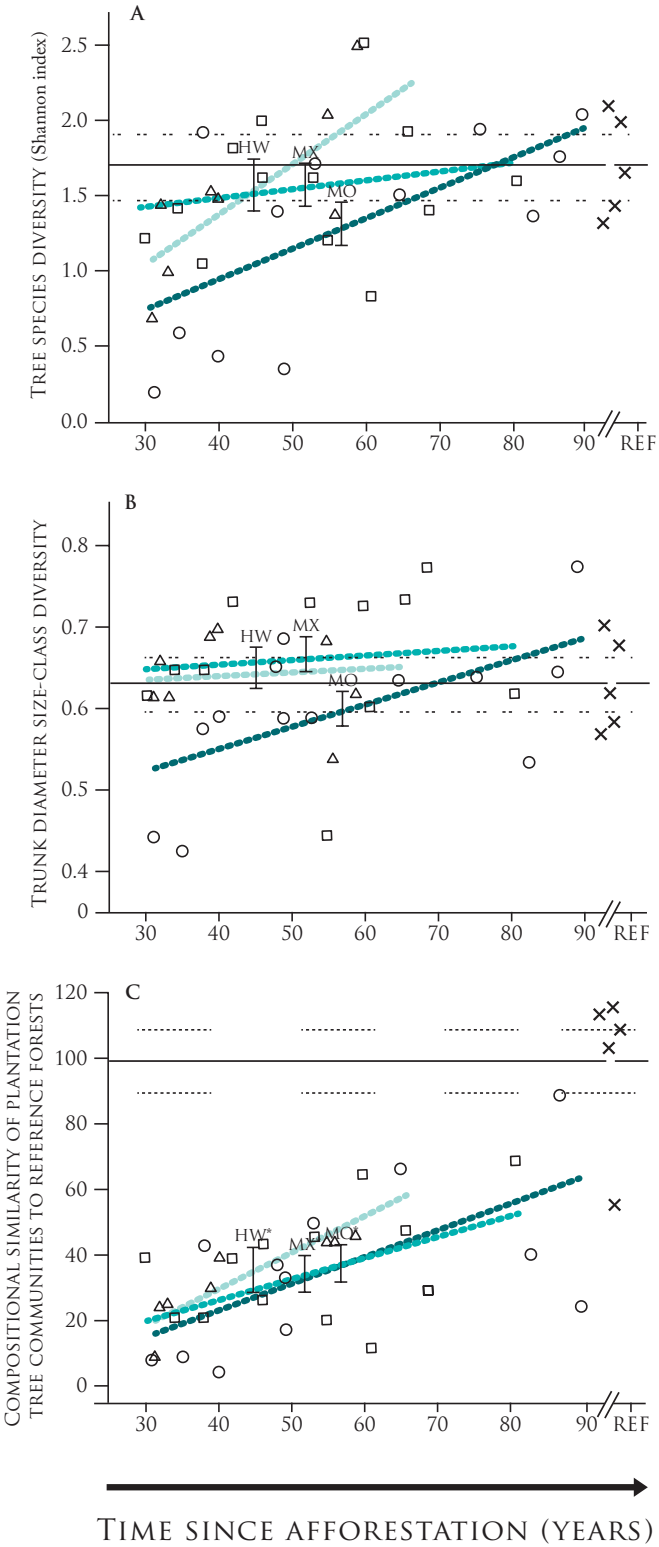
Results and Discussion

Analysis revealed that, from the perspective of the canopy -forming tree community, plantation forests can indeed closely resemble natural hardwood stands. Key properties associated with forest carbon sequestration – the total number of trees per hectare, the total ground area covered by living tree trunks, and the degree of canopy closure – were statistically indistinguishable among reference sites and plantations of all types. While tree species diversity in plantations was lower than in reference forests, it increased steadily over forest development time and converged with reference sites after 77 years within monoculture conifer plantations (Fig. 1A).

Convergence occurred much sooner in plantations where hardwood species were originally planted (50 years), and in mixed-conifer plantations tree diversity did not shift over time but on-average was equivalent to reference forests. Similarly, the diversity of trunk-diameter size-classes present per stand was higher in reference forests than in young monoculture plantations, but over 70 years this diversity increased to a

The Afforested Environments Study - Continued

1



1. Effects of forest development time on ecological distance between reference forests and plantations originally planted with different tree assemblages: response of canopy-layer properties.

Legend

- monoculture conifer plantation ("MO")
- mixed conifer plantation ("MX")
- mixed conifer-hardwood plantation ("HW")
- old-growth hardwood reference forest ("RF")

MO mean ± standard error for group "MO"
MX mean ± standard error for group "MX"
HW mean ± standard error for group "HW"
mean for RF (target value, not related to time)

66% confidence interval for RF mean
Effect of time on MO
Effect of time on MX
Effect of time on HW

Notes:
1. For regression lines:
solid=p<0.05; dashed=0.05<p<0.10; dotted=p>0.10.
2. For contrasts b/w RF and MO, MX, and HW:
*=p<0.05; ^=0.05<p<0.10.

point of equivalence with reference forests (Fig. 1B). In mixed-conifer and conifer-hardwood plantations, size-class diversity was unrelated to time but was on-average equal to that at reference sites. While the compositional similarity of plantation tree communities to reference forests was at best moderate – ~40% on-average – the rate of increase with time was fair to good, as convergence was predicted to occur after 136 years in monoculture conifer plantations and after 154 years in mixed conifer plantations (Fig. 1C). In conifer-hardwood plantations, predicted convergence was better still, expected 104 years after afforestation.

Unfortunately, from the perspective of the vegetative understory community, the prognosis was less positive. Although the total area of forest floor covered by living vegetation was more or less consistent everywhere (Fig. 2A), the diversity of species represented by this cover was ~30% lower in plantations than in reference forests, at both small-plot and whole-site scales. Moreover, understorey diversity showed no sign of increasing over forest development time. With respect to species composition, understorey communities inhabiting plantations were ~50% similar to those in reference forests (Fig. 2B). Community similarity increased significantly with time but the rate of increase was slow relative to the canopy community, requiring 190 years of spontaneous community assembly to achieve convergence with reference forests. This prediction should be treated with caution given that the timespan is more than twice as long as the studied age-gradient; managers should not ignore the possibility that under conventional management plantation understorey communities may never converge with reference forests. Importantly, a significant contribution to this dissimilarity comes from the relatively high proportion of non-native species in

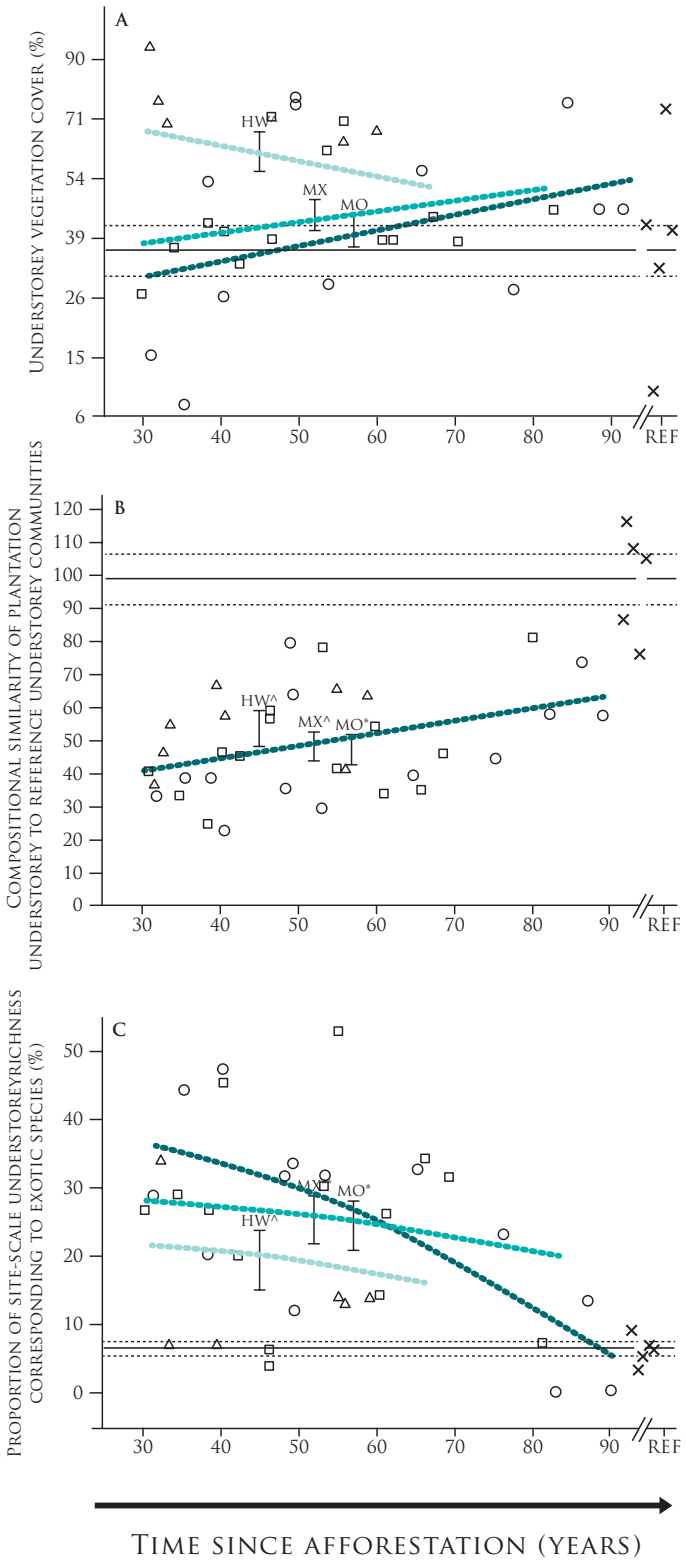
plantation forests (~25% of site richness) compared to in reference forests (8% of site richness; Fig. 2C). While this level of dominance by exotic vegetation remained consistent over time in the mixed-conifer and conifer-hardwood plantations, in the monoculture plantations the proportion of exotic species dropped steeply and reliably over time to converge with reference levels after 88 years of forest development.

Fortunately, results from the experimental herb relocation indicate plantations may become ripe for typical understorey communities of mature hardwood forests long before relevant species manage to establish on-site through natural processes. Wild ginger represented shade-tolerant, ground-covering herbs active throughout summer and fall. While this species exhibited moderate likelihood of survival (~25%) in reference forests, the likelihood was much lower (<5%) in the youngest conifer plantations. The odds of transplant survival increased significantly with forest development time, however, and was expected to converge with reference forests after 96 years in mixed-conifer plantations, 103 years in monoculture conifer plantations, and 177 years in conifer-hardwood plantations (Fig. 3A). Wild leek represented spring ephemeral herbs and exhibited a similar but more pronounced pattern: over forest development time, the odds of transplant survival increased significantly and equivalently so in all plantation types over forest development time, with plantation-reference convergence predicted to occur after ~80 years (Fig. 3D).

Insight into constraints on microhabitat convergence arising from non-living soil components was gained by comparing response patterns among transplants introduced as bare-root material only versus bare-roots alongside sterilized topsoil from the home environment. Sterilized soil did not improve transplant survival or accelerate plantation-reference convergence for either indicator species in any plantation group (Fig. 3B, 3E), with the exception of wild ginger in conifer-hardwood plantations (Fig. 3B). This suggests plantation soils are not strongly limited by physical or chemical differences from reference forests, except in conifer-hardwood plantations. In contrast, survival by wild leek transplants was substantially better in plots receiving unsterilized rather than sterilized home soil, regardless of planted tree composition (Fig. 3F), and the same was true for wild ginger within the monoculture conifer plantations (Fig. 3C). Overall, transplant survival at plantations converged with survival at reference sites ~20 years sooner where unsterilized soil was added compared to where sterilized soil was added, indicating that about one-fifth of the total time required for emergence of target microhabitat conditions corresponded to time needed for development of living soil components, such as helpful fungal and bacterial communities.

The analysis of soil and surface-cover variables may shed light on factors potentially constraining convergence of plantation with reference vegetation properties. While some of these variables exhibited increasing similarity of plantations to reference forests over forest development time (e.g. soil pH; organic litter; conifer needles), several others exhibited the opposite pattern:

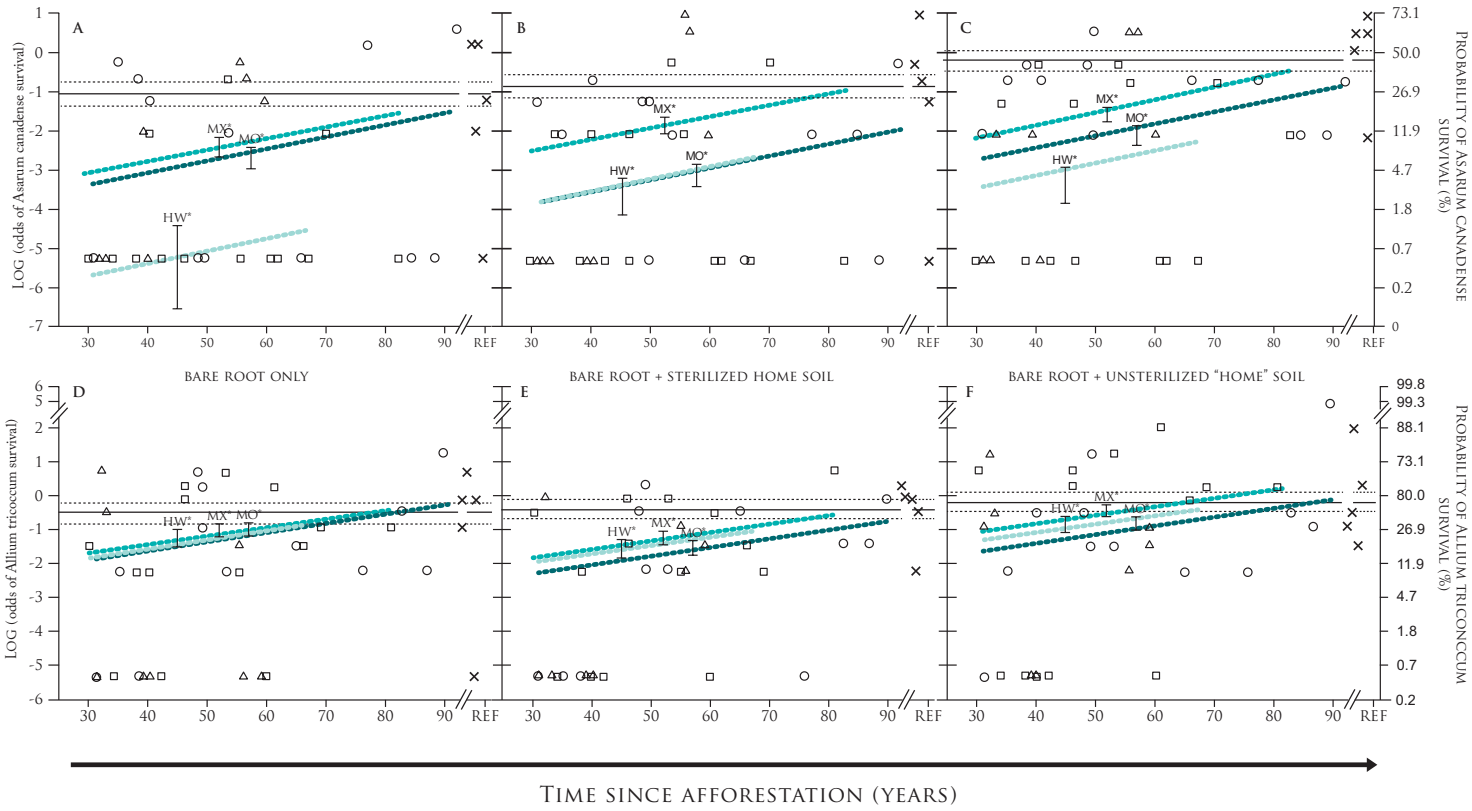
2



2. Effects of forest development time on ecological distance between reference forests and plantations originally planted with different tree assemblages: response of understorey-layer properties.

The Afforested Environments Study - Continued

3



3. Effects of forest development time on ecological distance between reference forests and plantations originally planted with different tree assemblages: response of relocated indicator herbs.

Legend

- monoculture conifer plantation ("MO")
- mixed conifer plantation ("MX")
- mixed conifer-hardwood plantation ("HW")
- old-growth hardwood reference forest ("RF")

MO mean ± standard error for group "MO"
MX mean ± standard error for group "MX"
HW mean ± standard error for group "HW"
mean for RF (target value, not related to time)

66% confidence interval for RF mean
Effect of time on MO
Effect of time on MX
Effect of time on HW

Notes:
1. For regression lines:
solid=p<0.05; dashed=0.05<p<0.10; dotted=p>0.10.
2. For contrasts b/w RF and MO, MX, and HW:
*=p<0.05; ^=0.05<p<0.10.

increasing dissimilarity over time (data not shown here). In particular, soil potassium, calcium and magnesium became depleted to levels well below those found in reference forests over plantation development, while soil aluminum content increased sharply to higher levels than found in reference forests. Soil moisture exhibited a trend of gradually dropping to below-reference levels over time while soil sandiness tended to rise above reference levels. In mixed conifer plantations moss cover dropped to below-reference levels over time, and both mixed conifer and conifer-hardwood plantations tended to exhibit an increase in surface cover by bare soil to above-reference levels over time. Further research is needed to determine whether any of these factors, alone or in combination, regulate the degree to which plantation communities resemble those of mature natural hardwood forests. If particular soil or microhabitat properties do in fact constrain the development of ecological similarity between plantation and natural forests then these also represent intriguing starting-points for experimental manipulations in emerging afforestation applications.

Relatively few forest parameters exhibited strong differences between regularly vs. rarely-thinned plantation sites, but the exceptions are notable. Surface cover by bare soil increased dramatically over time (to levels much higher than reference sites) in under-thinned plantations but not thinned ones. In contrast,

under-thinned plantations exhibited no change with time with respect to several variables that increased markedly with time (and approached/converged with reference conditions) in thinned plantations. These include tree species diversity, trunk-diameter size-class diversity, compositional similarity of the canopy-layer community in plantations to that in reference forests, and forest-floor cover by organic litter. Finally, the proportion of site richness corresponding to exotic species decreased predictably over time to meet reference levels in thinned plantations but showed no response to time in under-thinned plantations.

Conclusion

Collectively, these findings of the AES are rich and multifaceted; it will likely be some time before the best and most useful interpretations of these very recently discovered patterns emerge. Continued monitoring of transplant survival and collection of new data related to topographic heterogeneity may enrich the story further. In the meantime, the clearest story emerging from the data is that:

1. From the perspective of canopy-layer community properties, conventional afforestation practices including homogenous plantings of low-diversity tree species accompanied by regular stand-thinning can indeed produce new woodlands that come to resemble mature, naturally-occurring hardwood forests within about 100 years. Including hardwood species in initial tree-planting can lead to more rapid development of some target canopy properties, including tree diversity and trunk-diameter size-class diversity.

2. From the perspective of understorey-layer vegetation communities, the similarity to reference forests is substantially lower. Species diversity at plantations is 2/3 that of natural forests and the composition of the understorey community is only ~50% similar; convergence with reference communities may take up to 200 years, if it happens at all. Non-native species play a major role in the dissimilarity between plantation and reference understoreys, but intriguingly these diminish almost entirely in dominance over 90 years within conifer monoculture plantations.

3. Understorey habitat conditions supportive of herb species which represent characteristic hardwood forest communities reliably emerge in conventional plantation forests over 80-100 years, about half the time required for understorey community composition to converge. Therefore, helping target species and communities overcome immigration barriers to older plantation forests may represent a valuable and cost-effective means of rapidly accelerating the convergence of plantation community properties with those of reference forests.

4. Soil differences between plantations and reference forests including potassium, magnesium, calcium and aluminum content – as well as living soil components requiring further exploration – are consistent with limited capacity of plantations to support biodiversity typical of reference forests. It is possible that such capacity can thus be improved though management interventions that reduce these soil differences.

5. There is little evidence to suggest similarity to reference forests is strongly dependent on the selection of tree species initially planted. However, there were several differences among the planting groups investigated here which may be influential and which suggest potential trade-offs must be considered. Planting hardwood species, for example, may facilitate canopy-level convergence but inhibit convergence with respect to target microhabitat conditions. Such trade-offs should be explored alongside formulation and prioritization of specific afforestation goals early in the planning phase to avoid conflicts later.

INDEPENDENT AUDITOR'S REPORT

To the Trustee of Aggregate Resources Trust:

We have audited the accompanying financial statements of Aggregate Resources Trust (the "Trust"), which comprise the statement of financial position as at December 31, 2012, and the statements of revenues and expenses and changes in fund balances, and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Trust's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Trust's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of the Trust as at December 31, 2012 and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Comparative Information

Without modifying our opinion, we draw attention to Note 2 to the financial statements which describes that the Trust adopted Canadian accounting standards for not-for-profit organizations on January 1, 2012 with a transition date of January 1, 2011. These standards were applied retrospectively by management to the comparative information in these financial statements, including the statement of financial position as at December 31, 2011 and January 1, 2011 and the statements of revenues and expenses and changes in fund balances, and cash flows for the year ended December 31, 2011 and related disclosures. We were not engaged to report on the restated comparative information, and as such, it is unaudited.

BDO CANADA LLP

Chartered Accountants, Licensed Public Accountants

Burlington, Ontario
February 27, 2013

Aggregate Resources Trust

Statement of Financial Position

	December 31 2012 $	December 31 2011 $	January 1 2011 $
		(Unaudited)	(Unaudited)
ASSETS			
Current			
Cash	**1,232,573**	1,121,564	610,726
Short-term investments [note 3]	**100,275**	265,556	333,442
Due from Licensees and Permittees	**260,996**	161,365	199,244
HST recoverable	**31,402**	39,813	38,555
Due from the Ontario Stone, Sand & Gravel Association [note 6]	**5,085**	—	—
Interest and dividends declared receivable	**27,894**	31,274	35,610
Prepaid expenses	**16,945**	15,833	17,851
Total current assets	**1,675,170**	1,635,405	1,235,428
Investments [note 4]	**16,234,247**	15,770,303	16,299,413
Capital assets, net [note 5]	**100,565**	121,655	96,379
	18,009,982	17,527,363	17,631,220
LIABILITIES AND TRUST FUNDS			
Current			
Accounts payable and accrued liabilities	**173,321**	181,449	120,945
Due to the Ontario Stone, Sand & Gravel Association *[note 6]*	**277**	54,555	11,091
Wayside permit deposits	**21,880**	21,880	67,880
Deferred Aggregate Resources Charges	**71,969**	41,780	56,391
Deferred lease costs	**14,831**	23,306	31,781
Due to Governments	**415,780**	644,919	285,490
Total current liabilities	**698,058**	967,889	573,578
Trust Funds			
Rehabilitation Fund *[see schedules]*	**14,762,188**	13,837,603	14,084,899
Abandoned Pits and Quarries Rehabilitation Fund *[see schedules]*	**2,549,736**	2,721,871	2,972,743
Total Trust Funds	**17,311,924**	16,559,474	17,057,642
	18,009,982	17,527,363	17,631,220

See accompanying notes

On behalf of the Trust by The Ontario Aggregate Resources Corporation as Trustee:

Director

Director

Aggregate Resources Trust

Statement of Revenue and Expenses and Changes in Fund Balances

For the Year ended December 31	2012 $	2011 $
		(Unaudited)
REVENUE		
Investment income *[note 4]*	**822,955**	1,063,355
Unrealized changes in fair value	**1,100,820**	(617,630)
Publications	**2,529**	1,538
Gain on disposal of capital assets	**50**	300
	1,926,354	447,563
EXPENSES		
Trustee's expenses *[note 8]*	**1,115,825**	980,016
Amortization	**47,614**	46,280
Investment management fees	**120,854**	124,317
	1,284,293	1,150,613
Excess (deficiency) of revenue over expenses before the following	**642,061**	(703,050)
Aggregate Resources Charges	**19,304,236**	20,465,003
Allocated to the Governments	**(18,557,867)**	(19,682,102)
Allocated to the Crown	**(746,369)**	(782,901)
Expenditures incurred in meeting the Trust purposes *[see schedules]*	**(635,980)**	(578,019)
Excess (deficiency) of revenue over expenses for the year	**6,081**	(1,281,069)
Trust Funds, beginning of year *[note 2]*	**16,559,474**	17,057,642
Funds reinvested by the Crown	**746,369**	782,901
Trust Funds, end of year	**17,311,924**	16,559,474

See accompanying notes

Aggregate Resources Trust

Statement of Cash Flows

For the Year ended December 31	2012 $	2011 $
		(Unaudited)
CASH FLOWS FROM OPERATING ACTIVITIES		
Excess (deficiency) of revenue over expenses for the year	**6,081**	(1,281,069)
(Add) less items not involving cash		
Amortization	**47,614**	46,280
Unrealized changes in fair values	**(1,100,820)**	617,630
Gain on disposal of capital assets	**(50)**	(300)
	(1,047,175)	(617,459)
Net change in non-cash working capital balances related to operations		
Due from Licensees and Permittees	**(99,631)**	37,879
HST recoverable	**8,411**	(1,258)
Due from Ontario Stone, Sand & Gravel Association	**(5,085)**	—
Interest and dividends declared receivable	**3,380**	4,336
Prepaid expenses	**(1,112)**	2,018
Accounts payable and accrued liabilities	**(8,128)**	60,504
Due to Ontario Stone, Sand & Gravel Association	**(54,278)**	43,464
Wayside permit deposits	**—**	(46,000)
Deferred Aggregate Resources Charges	**30,189**	(14,611)
Deferred lease costs	**(8,475)**	(8,475)
Due to Governments	**(229,139)**	359,429
Cash provided by (used in) operating activities	**(1,411,043)**	(180,173)
CASH FLOWS FROM INVESTING ACTIVITIES		
Purchase of capital assets	**(26,523)**	(71,556)
Proceeds on disposal of capital assets	**50**	300
Purchase of short-term investments	**(17,617,911)**	(20,268,282)
Sale of short-term investments	**17,783,192**	20,335,803
Purchase of investments	**(776,105)**	(4,857,267)
Sale of investments	**1,412,980**	4,769,112
Cash provided by (used in) investing activities	**775,683**	(91,890)
CASH FLOWS FROM FINANCING ACTIVITY		
Funds reinvested by the Crown	**746,369**	782,901
Cash provided by financing activity	**746,369**	782,901
Net increase in cash during the year	**111,009**	510,838
Cash, beginning of year	**1,121,564**	610,726
Cash, end of year	**1,232,573**	1,121,564

SUPPLEMENTAL CASH FLOW INFORMATION

For the Year ended December 31	2012 $	2011 $
		(Unaudited)
Cash received from interest	**385,358**	443,901

See accompanying notes

Aggregate Resources Trust

Schedules of Statement of Revenue and Expenses and Changes in Fund Balances for the Aggregate Resources Fund, Rehabilitation Fund and Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31

2012

	Aggregate Resources Fund $	Rehabilitation Fund $	Abandoned Pits and Quarries Rehabilitation Fund $	Total $
REVENUE				
Investment income *[note 4]*	—	711,521	111,434	822,955
Unrealized changes in fair value	—	927,771	173,049	1,100,820
Publications	—	361	2,168	2,529
Gain on disposal of capital assets	—	50	—	50
	—	1,639,703	286,651	1,926,354
EXPENSES				
Trustee's expenses *[note 8]*	—	515,018	600,807	1,115,825
Amortization	—	12,440	35,174	47,614
Investment management fees	—	100,906	19,948	120,854
	—	628,364	655,929	1,284,293
Excess (deficiency) of revenue over expenses before the following	—	1,011,339	(369,278)	642,061
Aggregate Resources Charges	19,304,236	—	—	19,304,236
Allocated to the Governments	(18,557,867)	—	—	(18,557,867)
Allocated to the Crown	(746,369)	—	—	(746,369)
Expenditures incurred in meeting the Trust purposes [see schedules]	—	(86,754)	(549,226)	(635,980)
Excess (deficiency) of revenue over expenses for the year	—	924,585	(918,504)	6,081
Trust Funds, beginning of year	—	13,837,603	2,721,871	16,559,474
Funds reinvested by the Crown	746,369	—	—	746,369
Interfund transfer	(746,369)	—	746,369	—
Trust Funds, end of year	—	14,762,188	2,549,736	17,311,924

See accompanying notes

Aggregate Resources Trust

Schedules of Statement of Revenue and Expenses and Changes in Fund Balances for the Aggregate Resources Fund, Rehabilitation Fund and Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31

2011

(Unaudited)

	Aggregate Resources Fund $	Rehabilitation Fund $	Abandoned Pits and Quarries Rehabilitation Fund $	Total $
REVENUE				
Investment income *[note 4]*	—	907,557	155,798	1,063,355
Unrealized changes in fair value	—	(500,053)	(117,577)	(617,630)
Publications	—	203	1,335	1,538
Gain on disposal of capital assets	—	300	—	300
	—	408,007	39,556	447,563
EXPENSES				
Trustee's expenses *[note 8]*	—	441,632	538,384	980,016
Amortization	—	21,047	25,233	46,280
Investment management fees	—	102,390	21,927	124,317
	—	565,069	585,544	1,150,613
Deficiency of revenue over expenses before the following	—	(157,062)	(545,988)	(703,050)
Aggregate Resources Charges	20,465,003	—	—	20,465,003
Allocated to the Governments	(19,682,102)	—	—	(19,682,102)
Allocated to the Crown	(782,901)	—	—	(782,901)
Expenditures incurred in meeting the Trust purposes *[see schedules]*	—	(90,234)	(487,785)	(578,019)
Deficiency of revenue over expenses for the year	—	(247,296)	(1,033,773)	(1,281,069)
Trust Funds, beginning of year *[note 2]*	—	14,084,899	2,972,743	17,057,642
Funds reinvested by the Crown	782,901	—	—	782,901
Interfund transfer	(782,901)	—	782,901	—
Trust Funds, end of year	—	13,837,603	2,721,871	16,559,474

See accompanying notes

Aggregate Resources Trust

Schedules of Rehabilitation Costs for the Rehabilitation Fund

For the Year ended December 31 — 2012

Project Number	Project Name	Paid or Payable $
12-001A	McBride Pit, Renfrew County	**39,240**
12-001B	Stone Pit, Renfrew County	**27,852**
13-001	Levesque Pit, District of Timiskaming	**1,332**
	Education	
	Student Rehabilitation Design Competition	**12,000**
	Rehabilitation Tour County of Brant & surrounding area	**2,685**
	Tendering, consulting and other	**3,645**
		86,754

See accompanying notes

For the Year ended December 31 — 2011

(Unaudited)

Project Number	Project Name	Paid or Payable $
11-02	Douglas Pit, Renfrew County	65,485
	Education	
	Rehabilitation Manual	7,419
	Student Rehabilitation Design Competition	10,257
	Rehabilitation Tour Kitchener-Waterloo & surrounding area	1,000
	Tendering, consulting and other	6,073
		90,234

See accompanying notes

Aggregate Resources Trust

Schedule of Rehabilitation Costs for the Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31 — 2012

Project number	Project name	Paid or Payable / (Recovered) $
08-24	Maree Pit, Grey County	**2,000**
11-07A	Halbert Pit, Dufferin County	**10,740**
11-08	Myles Pit, Bruce County	**1,088**
11-09	Molto Pit, Huron County	**1,200**
11-11B	Hallman Pit, Huron County	**255**
11-12B	Papple Pit, Huron County	**7,730**
11-13A	Ryan Pit, Huron County	**8,718**
12-01	Smeekens Pit, Lambton County	**2,620**
12-02A	Thompson Pit, Huron County	**1,994**
12-02C	Pfeffer Pit, Huron County	**265**
12-03	Dufferin-Northern Peel Anglers' & Hunters' Association Pit, Huron County	**5,512**
12-04A	Schut Pit, Northumberland County	**19,671**
12-04B	Cook Pit, Northumberland County	**11,131**
12-04C	Linton Pit, Northumberland County	**6,056**
12-04D	Self Pit, Northumberland County	**10,848**
12-04E	Scott Pit, Northumberland County	**8,645**
12-05	Ward Pit, Northumberland County	**59,540**
12-06A	Moroz Pit, Northumberland County	**8,763**
12-06B	Carlen Pit, Northumberland County	**8,026**
12-07	Sheppard Pit, Northumberland County	**24,387**
12-08	Hutchinson Pit, Northumberland County	**54,000**
12-09A	England Pit, Northumberland County	**11,787**
12-09B	England Pit, Northumberland County	**8,542**
12-09C	McNichol Pit, Northumberland County	**4,309**
12-10A	Ryan Pit, Northumberland County	**6,819**
12-10B	Walsh Pit, Northumberland County	**12,414**
12-10C	Coyne Pit, Northumberland County	**16,065**
12-11	Halton Conservation Authority Quarry, Region Municipality of Halton	**15,500**
12-12	Bruno Pit, The District of Thunder Bay	**19,600**
12-13	Buchanan Pit, The District of Thunder Bay	**23,450**
12-14A	Baziuk Quarry, The District of Thunder Bay	**12,200**
12-14B	Baziuk Quarry, The District of Thunder Bay	**12,200**
12-15A	Tabor Quarry, The District of Thunder Bay	**6,800**
12-15B	Connor Quarry, The District of Thunder Bay	**6,800**
12-16	Gallo Quarry, The District of Thunder Bay	**16,480**
12-17	Mechis Quarry, The District of Thunder Bay	**32,820**
12-18	Tabor Quarry, The District of Thunder Bay	**4,500**

Aggregate Resources Trust

Schedule of Rehabilitation Costs for the Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31

2012

Project number	Project name	Paid or Payable / (Recovered) $
	Research costs	
	Bryophyta Technologies – Establishing Alvar mosses on Quarry floors	7,262
	Dr. Klironomos – Fungal & Soil Ecology - Native prairie plant response to mycorrhizal inoculation and soil carbon amendments	13,750
	Dr. Richardson – Determining the time span and ecological conditions necessary for afforested environments to support older-growth understory communities	92,627
	Recoveries NSERC & Centre for Ecosystem Resilience & Adaptation	(30,000)
	Tendering, consulting and other	2,112
		549,226

See accompanying notes

Aggregate Resources Trust

Schedule of Rehabilitation Costs for the Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31

2011

(Unaudited)

Project number	Project name	Paid or Payable / (Recovered) $
09-11	Smith (Hunter) Pit, Wellington County	619
09-15	Kroes Pit, Perth County	4,356
10-01	Sullivan Pit, Peterborough County	370
10-02	Buck Pit, City of Kawartha Lakes	7,925
10-03A	Barrett Pit, City of Kawartha Lakes	62
10-03B	Keenan Pit, City of Kawartha Lakes	62
10-04	McQuaid Pit, City of Kawartha Lakes	62
10-05	Cook Pit, City of Kawartha Lakes	62
10-06	Carroll Pit, City of Kawartha Lakes	678
10-07	Carnaghan Pit, City of Kawartha Lakes	370
10-09	Hoddenbagh Pit, City of Kawartha Lakes	2,156
10-10	Dancey Pit, City of Kawartha Lakes	616
10-15	Dow Pit, Perth County	2,200
10-17A	Ackerblade Pit, Haliburton County	16,930
10-17B	Ackerblade Pit, Haliburton County	7,347
10-18	Park-Kent Pit, Haliburton County	3,582
10-19	Boice Pit, Haliburton County	239
10-20A	Smith Pit, Haliburton County	8,945
10-20B	Smith Pit, Haliburton County	2,197
10-22	Beahre Pit, Haliburton County	16,063
10-23	Ewaschuk Pit, Haliburton County	6,852
10-25	Thomas Pit, Haliburton County	5,168
11-01A	Swain Pit, Haliburton County	479
11-01B	Mulroy Pit, Haliburton County	958
11-01C	Bolton Pit, Haliburton County	958
11-01D	Wilson Pit, Haliburton County	958
11-01E	Thomas-Medhurst Pit, Haliburton County	718
11-02	Walter Pit, Peterborough County	2,296
11-03	Kentelbey Pit, Dufferin County	3,373
11-04	Bakker Pit, Dufferin County	1,960
11-05A	Skjonsky Pit, Dufferin County	8,112
11-05B	Alexander Pit, Dufferin County	11,553
11-05C	Corlett Pit, Dufferin County	9,113
11-06A	Milley Pit, Dufferin County	10,000
11-06B	Lindrop Pit, Dufferin County	10,627
11-06C	Rutledge Pit, Dufferin County	21,938
11-07A	Halbert Pit, Dufferin County	17,900
11-07B	McAuslane Pit, Dufferin County	13,058
11-07C	Fernandes Pit, Dufferin County	18,605
11-07D	Rhodes Pit, Dufferin County	6,616
11-08	Myles Pit, Bruce County	2,175
11-09	Molto Pit, Huron County	8,813
11-10A	Thompson Pit, Huron County	4,678
11-10B	Scott Pit, Huron County	4,488
11-10C	Siertsema Pit, Huron County	4,650
11-10D	Lapp Pit, Huron County	6,840

Aggregate Resources Trust

Schedule of Rehabilitation Costs for the Abandoned Pits and Quarries Rehabilitation Fund

For the Year ended December 31

2011

(Unaudited)

Project number	Project name	Paid or Payable / (Recovered) $
11-11A	Shetler Pit, Huron County	12,788
11-11B	Hallman Pit, Huron County	2,193
11-12A	Murray Pit, Huron County	24,375
11-12B	Papple Pit, Huron County	3,223
11-13A	Ryan Pit, Huron County	11,336
11-13B	Poppe Pit, Huron County	15,362
	Research costs	
	Dr. Klironomos – Fungal & Soil Ecology - Native prairie plant response to mycorrhizal inoculation and soil carbon amendments	14,000
	Dr. Richardson – Determining the time span and ecological conditions necessary for afforested environments to support older-growth understory communities	66,209
	Recoveries NSERC & Centre for Ecosystem Resilience & Adaptation	(20,645)
	Deloitte & Touche LLP – Ontario Aggregate Forum	99,790
	Tendering, consulting and other	1,427
		487,785

See accompanying notes

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

1. NATURE OF OPERATIONS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Formation and Nature of Trust

Aggregate Resources Trust [the "Trust"] was settled by Her Majesty the Queen in Right of the Province of Ontario [the "Crown"] as represented by the Minister of Natural Resources [the "Minister"] for the Province of Ontario pursuant to Section 6.1(1) of the Aggregate Resources Act, R.S.O. 1990, Chap. A.8 as amended [the "Act"]. The Minister entered into a Trust Indenture dated June 27, 1997 [the "Trust Indenture"] with The Ontario Aggregate Resources Corporation ["TOARC"] appointing TOARC as Trustee of the Trust.

The Trust's goals are:

[a] the rehabilitation of land for which a Licence or Permit has been revoked and for which final rehabilitation has not been completed; [b] the rehabilitation of abandoned pits and quarries, including surveys and studies respecting their location and condition; [c] research on aggregate resource management, including rehabilitation; [d] making payments to the Crown and to regional municipalities, counties and local municipalities in accordance with regulations made pursuant to the Act; [e] the management of the Abandoned Pits and Quarries Rehabilitation Fund; and [f] such other purposes as may be provided for by or pursuant to Section 6.1(2)5 of the Act.

In 1999 the Trust's purposes were expanded by amendment to the Trust Indenture to include:

[a] " the education and training of persons engaged in or interested in the management of the aggregate resources of Ontario, the operation of pits or quarries, or the rehabilitation of land from which aggregate has been excavated; and

[b] the gathering, publishing and dissemination of information relating to the management of the aggregate resources of Ontario, the control and regulation of aggregate operations and the rehabilitation of land from which aggregate has been excavated."

In accordance with the Trust Indenture, TOARC administers the Trust which consists of three funds: the Aggregate Resources Fund, the Rehabilitation Fund and the Abandoned Pits and Quarries Rehabilitation Fund. TOARC is a mere custodian of the assets of the Trust and all expenditures made by TOARC are expenditures of the Trust.

Prior to the creation of the Trust, the Trust's goals were pursued by the Minister and, separately, the Ontario Stone, Sand & Gravel Association [the "OSSGA"] formerly The Aggregate Producers' Association of Ontario [the "APAO"]. Upon the creation of the Trust, rehabilitation security deposits held by the Crown, as represented by the Minister, were to be transferred to the Trust. In addition, the Crown directed the OSSGA to transfer, on behalf of the Crown, the Abandoned Pits and Quarries Rehabilitation Fund to the Trust. By December 31, 1999, the Minister and the OSSGA had transferred $59,793,446 and $933,485, respectively, to the Trust.

Pursuant to the Trust Indenture, TOARC "shall pay and discharge expenses properly incurred by it in carrying out and fulfilling the Trust purposes and the administration of the Trust . . ." [Section 7.02].

The Aggregate Resources Fund is for the collection of the annual licence and permit fees, royalties, and wayside permit fees [aggregate resources charges] collected on behalf of the Minister. Effective for the 2007 production year the annual licence fee increased from $0.06 per tonne to $0.115 per tonne. The licence fees are due by March 15 of the following year, and are disbursed within six months of receipt. The fees are disbursed as follows: [a] $0.06 to the lower tier municipality, [b] $0.015 to the upper tier municipality, [c] $0.035 to the Crown, collectively [the "Governments"] and [d] $0.005 to the Trust. Minimum annual fees were increased effective for the 2007 production year:

- a Class A licence from $200 to $400 or $0.115 per tonne whichever is greater;
- a Class B licence from $100 to $200 or $0.115 per tonne whichever is greater;
- the minimum wayside fee from $100 to $400 or $0.115 per tonne whichever is greater;
- the annual aggregate permit fee from $100 to $200; and
- the minimum royalty rate for aggregate extracted on Crown land from $0.25 to $0.50 per tonne.

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

1. Nature of Operations and Summary of Significant Accounting Policies (Continued)

For production prior to 2007 all aggregate resources charges remain at the old fee schedule with the $0.06 licence fee being disbursed as follows: [a] $0.04 to the lower tier municipality, [b] $0.005 to the upper tier municipality, [c] $0.01 to the Crown, collectively [the "Governments"] and [d] $0.005 to the Trust.

The funds reinvested by the Crown to the Trust from the Aggregate Resources Fund will be transferred within the Trust and used for the Rehabilitation Fund and the Abandoned Pits and Quarries Rehabilitation Fund. In addition, the Trust collects the royalty payments and annual fees related to aggregate permits and also disburses the funds to the Crown within six months of receipt.

The Rehabilitation Fund represents the rehabilitation security deposits, contributed by Licensees and Permittees, held by the Crown and, in accordance with the Trust Indenture, transferred to the Trust. TOARC has been directed by the Minister to refund approximately 3,000 individual licensee and permittee accounts based on the formula of retaining $500 per hectare disbursed on licenses and 20% of the deposit amount for aggregate permits. As a result, the Trust has refunded approximately $48.6 million as per the Crown's directions. The balance of funds will be used to ensure the rehabilitation of land where licenses and/or permits have been revoked and final rehabilitation has not been completed.

The Abandoned Pits and Quarries Rehabilitation Fund is for the rehabilitation of abandoned sites and related research. Abandoned sites are pits and quarries for which a licence or permit was never in force at any time after December 31, 1989.

The Trust's expenses [or Trustee's expenses] are the amounts paid pursuant to Article 7.02 of the Trust Indenture.

Pursuant to Section 4.01 of the Trust Indenture, the Trust's assets and the income and gains derived therefrom are property belonging to the Province of Ontario within the meaning of Section 125 of the Constitution Act, 1867 and, by reason of Section 7.01 of the Trust Indenture, the amounts paid by the Trustee pursuant to Article 7 are paid to or for the benefit of the Crown.

Basis of Accounting

The financial statements of the Trust have been prepared in accordance with Canadian accounting standards for not-for-profit organizations.

Use of Estimates

The preparation of financial statements in accordance with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Actual results could differ from management's best estimates as additional information becomes available in the future. The financial statements have, in management's opinion, been properly prepared using careful judgment within reasonable limits of materiality and within the framework of the accounting policies of the Trust.

Aggregate Resources Charges

Aggregate resources charges collected on behalf of the Minister are recorded upon receipt of a tonnage report from Licensees and Permittees. Aggregate resources charges are based on the tonnage produced in the preceding period by the Licensees and Permittees as reported by the Licensees and Permittees. If there is no production in the preceding period, an annual fee is recognized for Permittees.

Deferred Aggregate Resources Charges represents prepayments and overpayments of fees charged to Licensees and Permittees.

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

1. Nature of Operations and Summary of Significant Accounting Policies (Continued)

Capital Assets

Capital assets are recorded at cost less accumulated amortization. Amortization is recorded to write off the cost of capital assets over their estimated useful lives on a straight-line basis as follows:

Computer equipment and software	3 to 5 years
Furniture and fixtures	5 years
Leasehold improvements	5 years
Vehicles	3 years

Deferred Lease Costs

Deferred lease costs represent leasehold improvements that are being reimbursed by the landlord and are being amortized over the term of the lease.

Financial Instruments

Financial instruments are recorded at fair value when acquired or issued. In subsequent periods, equities and pooled funds traded in an active market are reported at fair value, with realized gains and losses and unrealized changes in fair values of investments recorded in the Statement of Revenue and Expenses and Changes in Fund Balances under investment income and unrealized changes in fair value respectively. In addition, all bonds have been designated to be in the fair value category, with realized gains and losses and unrealized changes in fair values of investments recorded in the Statement of Revenue and Expenses and Changes in Fund Balances under investment income and unrealized changes in fair value respectively. All other financial instruments are reported at cost or amortized cost less impairment, if applicable. Financial assets are tested for impairment when changes in circumstances indicate the asset could be impaired. Transaction costs on the acquisition, sale or issue of financial instruments are included in the Statement of Revenue and Expenses and Changes in Fund Balances under investment income for those items remeasured at fair value at each statement of financial position date.

Revenue Recognition

Investment income is recognized in the period in which it is earned.

Foreign Currency Translation

Foreign currency accounts are translated into Canadian dollars as follows:

Foreign currency assets and liabilities are translated into Canadian dollars by the use of the exchange rate prevailing at the yearend date for monetary items and at exchange rates prevailing at the transaction date for non-monetary items. The resulting foreign exchange gains and losses are included in investment income in the current period.

2. Adoption of Canadian Accounting Standards for Not-for-Profit Organizations

Effective January 1, 2012, the Trust adopted the requirements of the new accounting framework, Canadian accounting standards for not-for-profit organizations (ASNPO) or Part III of the requirements of the Canadian Institute of Chartered Accountants (CICA) Handbook - Accounting. These are the Trust's first financial statements prepared in accordance with this framework and the transitional provisions of Section 1501, First-time Adoption have been applied. Section 1501 requires retrospective application of the accounting standards with certain elective exemptions and mandatory exceptions. The accounting policies set out in Note 1 have been applied in preparing the financial statements for the year ended December 31, 2012, the comparative information presented in these financial statements for the year ended December 31, 2011 and in the preparation of an opening ASNPO statement of financial position at the date of transition of January 1, 2011.

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

2. ADOPTION OF CANADIAN ACCOUNTING STANDARDS FOR NOT-FOR-PROFIT ORGANIZATIONS (Continued)

The Trust issued financial statements for the year ended December 31, 2011 using Canadian generally accepted accounting principles prescribed by the CICA Handbook - Accounting Part V - Pre - Changeover Accounting Standards. The adoption of ASNPO resulted in no adjustments to the previously reported assets, liabilities, trust funds, excess (deficiency) of revenue over expenses and cash flows of the Trust.

During the year it was determined that expenditures incurred in meeting the Trust purposes should be reclassified from the changes in trust fund balances to expenses of the Trust as follows:

	2011 $
	(Unaudited)
Deficiency of revenue over expenses, Pre-changeover Accounting Standards	(703,050)
Reclassification on expenditures incurred in meeting the Trust purposes	(578,019)
Deficiency of revenue over expenses, ASNPO	(1,281,069)

The following exemption was used at the date of transition to Canadian accounting standards for not-for-profit organizations:

Financial Instruments
The Trust has elected to designate bonds in the fair value category with gains and losses reported in revenues.

3. SHORT-TERM INVESTMENTS

Short-term investments consist of:

	2012 $	2011 $
		(Unaudited)
Province of Nova Scotia bond, bears interest at 4.50% per annum, matures June 1, 2013	50,691	—
Province of Quebec real return bond, bears interest at 3.30% per annum, matures December 31, 2013	49,584	—
Province of Quebec promissory note, bears interest at 0.90% per annum, matured January 19, 2012	—	114,358
Province of Ontario T-Bill, bears interest at 0.90% per Annum, matured January 25, 2012	—	99,764
Enbridge Properties bond, bears interest at 4.46% per Annum, matured December 17, 2012	—	51,434
	100,275	265,556

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

4. INVESTMENTS

Investments consist of the following:

	2012		2011 (Unaudited)	
	Fair Value $	Cost $	Fair Value $	Cost $
Bonds				
Government of Canada and Agencies	**2,173,396**	**2,047,104**	2,263,836	2,103,848
Crown Corporations	**260,184**	**257,103**	260,493	257,103
Corporate	**408,072**	**385,099**	403,927	380,723
Convertible Debenture	**—**	**—**	1,836	2,116
Canadian Equities	**1,517,014**	**1,196,071**	1,351,885	1,194,200
Foreign Equities	**3,695,942**	**4,214,869**	3,587,281	4,563,474
Pooled Funds	**8,179,639**	**7,327,693**	7,901,045	7,564,406
	16,234,247	**15,427,939**	15,770,303	16,065,870

The Government of Canada and Agencies bonds bear interest at rates ranging from 1.409% to 10.95% per annum [2011 – 1.389% to 7.785%] with maturity dates ranging from March 8, 2014 to December 15, 2025.
The Crown Corporations bonds bear interest at rates ranging from 1.439% to 4.640% per annum [2011 – 1.409% to 4.640%] with maturity dates ranging from February 11, 2015 to March 3, 2016.
The Corporate bonds bear interest at rates ranging from 2.861% to 6.650% per annum [2011 – 4.38% to 6.65%] with maturity dates ranging from February 26, 2014 to November 16, 2020.

Investment income is broken down as follows:

	2012 $	2011 $
		(Unaudited)
Interest income	**382,758**	436,852
Dividends	**272,929**	270,034
Realized capital gains *[net]*	**174,420**	358,452
Foreign exchange losses *[net]*	**(7,192)**	(2,023)
Other income	**40**	40
	822,955	1,063,355

Investment income of the Rehabilitation Fund includes interest earned on Aggregate Resources Charges collected on behalf of the Minister of $147,937 [2011 - $148,209].

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

5. CAPITAL ASSETS

Capital assets consist of the following:

	2012			2011 (Unaudited)		
	Cost $	Accumulated amortization $	Net book value $	Cost $	Accumulated amortization $	Net book value $
Computer equipment and software	**241,815**	**177,371**	**64,444**	219,887	160,957	58,930
Furniture and fixtures	**117,519**	**102,258**	**15,261**	119,750	98,630	21,120
Leasehold improvements	**46,700**	**33,443**	**13,257**	46,700	24,103	22,597
Vehicles	**81,770**	**74,167**	**7,603**	81,770	62,762	19,008
	487,804	**387,239**	**100,565**	468,107	346,452	121,655

6. DUE FROM/TO THE ONTARIO STONE, SAND & GRAVEL ASSOCIATION

Amounts due from/to the Association are unsecured, non-interest bearing and are due on demand. These transactions are in the normal course of operations and are measured at the exchange value (the amount of consideration established and agreed to by the related parties).

7. COMMITMENTS

The Trust has entered into a number of Research Funding Agreements. The future annual payments, in total and over the next two years, are as follows:

	$
2013	180,405
2014	41,633
	222,038

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

8. TRUSTEE'S EXPENSES

For the Year ended December 31

	2012		
	Rehabilitation Fund $	Abandoned Pits and Quarries Rehabilitation Fund $	Total $
EXPENSES			
Salaries and employee benefits	**303,015**	**424,829**	**727,844**
Board expenses	**2,917**	**2,917**	**5,834**
Professional fees	**84,196**	**24,806**	**109,002**
Data processing	**10,798**	**25,331**	**36,129**
Travel	**29,520**	**64,925**	**94,445**
Communication	**28,701**	**26,540**	**55,241**
Office	**14,278**	**7,596**	**21,874**
Office lease, taxes and maintenance	**38,467**	**22,302**	**60,769**
Insurance	**3,126**	**1,561**	**4,687**
Trustee Expenses	**515,018**	**600,807**	**1,115,825**

For the Year ended December 31

	2011 (Unaudited)		
	Rehabilitation Fund $	Abandoned Pits and Quarries Rehabilitation Fund $	Total $
EXPENSES			
Salaries and employee benefits	266,467	409,777	676,244
Board expenses	4,999	4,998	9,997
Professional fees	58,054	20,854	78,908
Data processing	8,998	7,024	16,022
Travel	24,362	41,755	66,117
Communication	22,804	23,143	45,947
Office	13,784	6,861	20,645
Office lease, taxes and maintenance	37,725	21,752	59,477
Insurance	4,439	2,220	6,659
Trustee Expenses	441,632	538,384	980,016

Aggregate Resources Trust

Notes to Financial Statements

December 31, 2012

9. LEASE COMMITMENTS

The future minimum annual lease payments, in total and over the next two years, are as follows:

	$
2013	70,145
2014	52,610
	122,755

10. FINANCIAL INSTRUMENTS RISK

Credit risk is the risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation. The Trust is exposed to credit risk resulting from the possibility that a customer or counterparty to a financial instrument defaults on their financial obligations. The Trust is subject to credit risk through its due from Licensees and Permittees, due from the Ontario, Stone, Sand & Gravel Association and interest and dividends declared receivable. This risk has not changed from the prior year.

Interest Rate Risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. The Trust is exposed to interest rate risk arising from the possibility that changes in interest rates will affect the value of fixed income denominated investments. This risk has not changed from the prior year.

Liquidity Risk

Liquidity risk is the risk that the Trust encounters difficulty in meeting its obligations associated with its financial liabilities. Liquidity risk includes the risk that, as a result of operational liquidity requirements, the Trust will not have sufficient funds to settle a transaction on the due date; will be forced to sell financial assets at a value, which is less than what they are worth; or may be unable to settle or recover a financial asset. Liquidity risk arises from the Trust's accounts payable and accrued liabilities and due to the Ontario, Stone, Sand & Gravel Association. This risk has not changed from the prior year.

Market Risk

The Trust is subject to market risk with respect to its investments. The values of these investments will fluctuate as a result of changes in market prices or other factors affecting the value of the investments. This risk has not changed from the prior year.

INDEPENDENT AUDITOR'S REPORT

To the Shareholder of The Ontario Aggregate Resources Corporation:

We have audited the accompanying financial statements of The Ontario Aggregate Resources Corporation (the "Corporation"), which comprise the balance sheet as at December 31, 2012 and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for private enterprises, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Corporation's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Corporation's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of The Ontario Aggregate Resources Corporation as at December 31, 2012 in accordance with Canadian accounting standards for private enterprises.

BDO CANADA LLP

Chartered Accountants, Licensed Public Accountants

Burlington, Ontario
February 27, 2013

The Ontario Aggregate Resources Corporation

Balance Sheet

December 31	2012 $	2011 $
ASSET		
Cash	**1**	1
SHAREHOLDER'S EQUITY		
Share capital		
Authorized and issued, 1 common share	**1**	1
Retained earnings	**—**	—
Total shareholder's equity	**1**	1

See accompanying notes

On behalf of the Board:

Director

Director

The Ontario Aggregate Resources Corporation

Note to Financial Statements

December 31, 2012

1. Nature of Operations and Summary of Significant Accounting Policies

The Ontario Aggregate Resources Corporation [the "Corporation"] was incorporated on February 20, 1997. The Corporation's sole shareholder is the Ontario Stone, Sand & Gravel Association [the "OSSGA"] (formerly The Aggregate Producers' Association of Ontario [the "APAO"]), a not-for-profit organization. The Corporation's sole purpose is to act as Trustee of the Aggregate Resources Trust [the "Trust"]. On June 27, 1997, the Corporation and Her Majesty the Queen in Right of the Province of Ontario [the "Crown"], as represented by the Minister of Natural Resources [the "Minister"], entered into a Trust Indenture, appointing the Corporation as Trustee of the Trust.

In accordance with the Indenture Agreement, the Corporation manages the administrative expenses as Trustee of the Trust which consists of three funds: the Aggregate Resources Fund, the Rehabilitation Fund and the Abandoned Pits and Quarries Rehabilitation Fund.

The Trust's assets managed by the Corporation, amounting to approximately $17.3 million, are not included in the accompanying balance sheet. The beneficial owner of the Trust's assets is the Crown.

The financial statements do not include an income statement or statement of cash flows as there is no activity in the Corporation.

Basis of Accounting

The financial statements of the Corporation have been prepared in accordance with Canadian accounting standards for private enterprises.

Production Reporting – Audit Program

TOARC, on behalf of the Trust, initiated an audit program in 2000 to monitor the completeness and accuracy of production reports submitted by licensees and permittees. The program is designed to educate licence and permit holders with respect to their obligations for record keeping under the Aggregate Resources Act in addition to assuring that aggregate production is being reported properly.

Since the inception of the program, TOARC has audited 563 clients covering 1,791 licences and permits resulting in an additional $836,745 of net aggregate resource fees collected.

Revoked Licences and Permits

Under Subsection (v) (i) of the Trust Indenture, TOARC has the responsibility for "the rehabilitation of land for which a Licence or Permit has been revoked and for which final rehabilitation has not been completed". Since inception of the Trust, 91 licences and 205 permits have been revoked. In the case of licences, 64 have been rehabilitated or the files have been closed for other reasons. In the case of permits, 108 have been rehabilitated or closed for other reasons. To date the Trust has expended $736,443 in net direct costs for rehabilitation of revoked sites.

Professional Assistance

Banking Institution
Scotiabank®

Investment Advisors
T.E. Investment Counsel Inc.

Investment Managers
Burgundy Asset Management Ltd.
Letko Brosseau & Associates Inc.

Auditors
BDO Canada LLP

Legal Counsel
Blake, Cassels & Graydon LLP

Shareholder
Ontario Stone, Sand & Gravel Association

TOARC.COM