

Integrated Plan 2011-2016

Effective: 12 December 2011

Last updated: 12 December 2011



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school of environmental sciences

School of Environmental Sciences – Integrated/Strategic Plan

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Background

This plan represents the School of Environmental Sciences’ aspirational goals for the next five years. Due to the constantly shifting nature of our available resources, in some ways this ‘plan’ is really more of a strategy. Our goal is to position ourselves for success given our available resources, and to perform well on the metrics used by the University to allocate resources, so that we either avoid further cuts, or so that we are allotted a larger slice of the resources in the future.

The School of Environmental Sciences was formed in August 2009. This document represents our first integrated and strategic plan. In the context of this document, Strategic Planning constitutes the vision of the School for the next five years, what we wish to accomplish, what we must accomplish and how we prioritize these goals.

Integrated planning is the process used by the University to join up the strategic plans of academic and non-academic units, throughout the university, and to prioritize these plans and allocate resources to achieve them. Integrated Planning necessarily involves both top-down and bottom-up forces simultaneously. The university administration and Senate articulate goals for the university as a whole, colleges articulate their own goals, and simultaneously departments and schools articulate their goals. There must be some give and take, some compromise and some negotiations in reconciling what will sometimes be conflicting goals. At the level of the department/school, integrated planning and strategic planning largely mean the same thing.

The process for developing this integrated plan was as follows. The Dean and Dean's Council developed goals for the college that supported those articulated by the Provost and Senate and integrated the views of the various academic units. The School of Environmental Sciences then held a faculty retreat in which we considered the college goals, added some of our own, and then discussed strategies for achieving those goals. Following this, the school committees on undergraduate education, graduate education and the Director's advisory committee fleshed out the ideas generated in the faculty retreat. These ideas were further discussed in faculty meetings and integrated into this document.

Integral to understanding the School of Environmental Sciences' plan is an understanding of our financial position. In 2008 the University found itself in serious financial difficulties; this resulted in a six-year financial plan to cut approximately \$3.6M in structural deficit from the School of Environmental Sciences. This necessitated the loss of seven faculty and five staff positions to-date, with the possibilities of a further 2-5 faculty losses over the next three years. The University demanded far larger reductions from the OAC than from any other college, largely as a result of our weaker participation in the delivery of undergraduate education. Of necessity then, one of the college's, and hence the school's major goals is to position ourselves so that we do not suffer any further cuts as a result of our performance in undergraduate teaching.

Goals

The Dean and Dean's Council set a major goal for the next five years to be performing at or above the other 'science based colleges' on a number of teaching and research metrics discussed below. We view our comparator colleges to be the College of Biological Sciences and the College of Engineering and Physical Sciences.

Teaching

Undergraduate Teaching

As of the 2009-2010 academic year, OAC has a teaching intensity, per FTE of MTCU funded faculty, of approximately 175. Our comparator colleges sat at 220 (CBS) and 240

(CPES). OAC has improved significantly in this metric. Since the 2005-2006 academic year, OAC teaching intensity has increased by 66% (to 175) whereas our comparator colleges have shown little change. The School of Environmental Sciences teaching intensity is currently (as of 2010-2011) below the overall college intensity figure, at approximately 130 per MTCU-funded FTE. If the college is going to meet its goal, the School of Environmental Sciences is going to have to show significant improvement in this metric over the next five years. The school's mean undergraduate *class size* has changed little over the past six years, while the median value was gone from about 40 to about 48.

The school has already taken substantial action to address the teaching intensity and related metrics. During the 2010-2011 academic year, the school deleted three previous majors within the BSc-ENV program, and received approval for one omnibus major that encompasses all of the previous majors. In addition, the new major offers students considerably more flexibility and choice so we are hopeful this more attractive major will increase our overall enrollment. We made similar changes to our environmental management major in the BBRM and to our organic agriculture major in the BSc-AGR degree. Increased enrollment in our majors will generally lead to increased students in our individual courses, but we need to be thinking about other ways to increase this number.

To reflect the college goal, our five-year goal is to achieve a teaching intensity per MTCU-funded FTE of 220.

Graduate Training

As of the 2009-2010 academic year, OAC has about 3 domestic eligible graduate students per faculty FTE (all sources of funding). Our comparator colleges have 1.9 (CBS) and 2.2 (CPES) respectively. OAC has improved significantly in this metric. Since the 2005-2006 academic year, OAC graduate intensity has increased by about 20%, CBS has shown little change and CPES has increased about 10%. Nevertheless, much of the OAC success is due to successful course-based graduate programs in SEDRD and in Food Sciences. The School of Environmental Sciences graduate teaching intensity was a little over 2.0, in-line with the other science based colleges.

Unlike undergraduate teaching, the training of domestic eligible graduate students generates a direct revenue stream for the school. This revenue is significant and vital for the school. Under the Provost's Resource Allocation Guidelines #2 document, the school receives \$1,125/yr/domestic eligible MSc and \$3,350/yr/domestic eligible PhD.

As with our undergraduate programs, we had already begun to address means of maintaining our graduate training metrics with new graduate degrees and a graduate diploma, and a new funding model for PhD students. There are two metrics of importance here. The first is *per capita* intensity, the second is the overall number of graduate students. Both are important, the first for maintaining the overall character of the School, the second for the income it generates toward our bottom line.

Our goals for the next five years are to increase our graduate teaching intensity for domestic eligible students to approximately 2.5, to hold our current total domestic eligible numbers steady at approximately 60, and to reverse our current 2:1 ratio of MSc to PhD students to a 1:2 ratio.

Research

As of the 2009-2010 academic year, OAC had an annual research income of \$58M, up 20% from 2005-2006. Our comparator colleges had research incomes of approximately \$24M (CBS) and \$18M (CPES). The OAC figure includes approximately \$28M per annum of OMAFRA partnership funding. On a per total FTE basis, for the 2009-2010 year, the School of Environmental Sciences faculty had average annual research incomes of approximately \$300K, and a total research income of about \$11M, including approximately \$3M in OMAFRA partnership funding.

With the loss of many faculty lines, it will be exceedingly difficult for the School of Environmental Sciences to maintain its total research income at that level, but prospects are good for maintaining our per capita levels of research income.

Our goal for the next five years is to maintain per capita research income at approximately \$300,000.

Integral to any research enterprise is the need to maintain and enhance our research facilities. For the most part, individual faculty members maintain and equip their own labs, but the school maintains a number of central research facilities including:

1. Analytical analysis laboratory
2. The soil analysis laboratory
3. The insect collection
4. Growth chambers
5. Autoclaves
6. Controlled Environment Systems Research Facility

Our goal for the next five years is to rationalize our current suite of centrally supported research facilities, refurbish our growth chamber facilities, and aim for targeted growth in a few key areas. We will establish this prioritized list no later than 1 April 2012.

Finally, maintaining our credibility as a school of environmental sciences will require some strategic faculty replacements once the opportunity arises. While there are personnel needs in many areas of the school we have prioritized four areas for targeted faculty hires.

Within the next five years, our goal is to hire one faculty member in each of the following areas (listed in alphabetical order): atmospheric sciences/meteorology, biogeochemistry, ecotoxicology, and environmental chemistry.

Service

Service remains an important component of the work of faculty in the School of Environmental Sciences. Many faculty are in high demand as consultants, due to their expertise and/or specialized research capabilities. Some faculty use their rights to work for external remuneration for up to 25 days a year, but many do not. Impediments to such external work include: ban on using university space, equipment and personnel; the requirement to hold your own omissions and errors insurance; administrative overhead; and so on. The School of Environmental Sciences sees a services institute as a means of alleviating these impediments and opening our services up to a broader audience on a 'fee for service' basis. In so doing, we may be able to create some short-term buy-out opportunities to help the School with its financial difficulties. Faculty participation would, of course, be voluntary.

Our goal for the next five years is to re-launch the Guelph Institute for the Environment as a services institute and knowledge broker. We aim for the GIE to break even financially by 2013, and to generate income by 2015.

Strategies for Reaching Our Goals

Teaching

Undergraduate Teaching Intensity

Our strategy for reaching our undergraduate teaching intensity goals will be three pronged, in addition to the changes that we have already made in our undergraduate curricula.

First, we will develop three large service courses aimed at satisfying the science requirements for the BA students. These courses have the potential to be as large as 600 students (e.g. NUTR*1010) if they are popular. We have met with the Associate Dean Academic for the College of Arts and the BA Program Counselor. We have also surveyed the BA students to judge their interests and we have settled on developing these courses (tentative titles):

1. Eating Sustainably in Ontario
2. Impacts of Climate Change
3. The Human Environment

The second prong in our strategy will be to eliminate small courses, particularly where those courses do not serve our majors (e.g. they cater to majors from other departments and/or colleges). As of the 2010-2011 academic year, the School of Environmental Sciences mounted 41 classes with class sizes less than 40 students. Shifting the instructors and other resources from some of those classes to courses that

attract larger numbers will significantly improve our teaching intensity. The subject matter from some of these smaller courses may be blended into other related courses so as not to be lost all together. Nevertheless, the School cannot continue to teach everything it has historically taught. This will inevitably mean less choice for the students and less opportunity for our faculty to teach very small specialty courses.

Our third prong in our strategy will be to convert some or all of our fourth year courses to 1.0 credit courses, thereby doubling the 'value' of each student in our teaching intensity calculation. It is important to note that such 'curriculum intensification' is not meant to increase faculty contact time. A 3-3 course taught at the 0.5 credit level would require the same contact time as a 3-3 course taught at the 1.0 credit level. The difference would be in the amount of work that faculty may reasonably expect students to do outside of class.

Graduate Training Intensity

We have launched two new 'course-based' graduate programs, the Masters of Environmental Sciences and the Graduate Diploma in Environmental Sciences. As far as the Province is concerned, students in these programs count the same as thesis based students. With the loss of 6-8 faculty members, maintaining our overall graduate numbers would be difficult without such programs. At approximately 3 domestic eligible graduate students per faculty member, we need approximately 24 students per year going through both of these programs to maintain our numbers. Once these programs are established, we expect to be able to draw approximately 20 students to *each* program, and therefore we have modest hopes of growing our overall numbers.

As far as reversing our ratio of masters to PhD students, we have implemented a new funding model to make our PhD program more attractive. To do this we are utilizing the Provost's Resource Allocation Guidance #1 money to create supplemental scholarships for domestic eligible students (see appendix A). We will also create an internal program, to fund bridging opportunities to help faculty and the school manage the risk associated with committing to fund a three-year PhD student without having three years of money in hand.

Research

Research Income

Key to maintaining research income is maintaining faculty DOE's at 40% research. With the decline in faculty numbers and no reprieve on the teaching commitments of our legacy curricula, there is temptation on the part of at least some faculty to volunteer to teach more courses. Reliance on sessional instructors is problematic from a financial perspective, but the credibility of a graduate training and research enterprise relies on a core cadre of research active faculty. This is not to say that the School of Environmental

Sciences does not have a place for faculty who choose a more teaching-centric career path, but the choice of such a path should indeed reflect a career choice and not simply a desire to help out on our current cash flow problems. Our strategy to address this will be for the Director and the Dean to do all that is possible to protect the research DOEs of faculty, always understanding that there will be times when operational necessity has to override this consideration on a short-term basis.

A second key to maintaining, or indeed *increasing* our *per capita* research income is to do a better job of helping faculty leverage industrial support. There are many federal and provincial programs to support the leveraging of industrial funds (e.g. MITACS, OCE, MaRS, NSERC, etc.). The School is generating a lot of research income from industry, and failing to leverage that money means that we are leaving research opportunities on the table. To address this issue, the School will develop a handbook/SOP on leveraging procedures and opportunities. This handbook will be provided to all faculty and adjunct faculty, and will be updated from time to time.

Central Research Facilities

It seems unlikely that we will be able to continue to provide the same level of centrally supported research facilities as we have in the past. Some equipment is getting to the point where it is no longer economically repairable, and loss of technicians to maintain the facilities means that even where the equipment is still in useable condition, it can no longer be maintained by the School. We therefore need to rationalize our services. Some equipment, particularly where it supports only one or a few researchers, will be donated to those researchers, who will then operate and maintain the equipment amongst themselves.

Another reason to rationalize our central research facilities is in the face of changing provision of central research facilities elsewhere on campus. For example, the Advanced Analytical Lab in the Science Complex offers some of the same services that we maintain centrally (e.g. x-ray diffractometry, growth rooms are available on a user fee basis in Plant Ag and the Phytotron facility, etc.). Where we can rent facilities elsewhere, these are good candidates for rationalization.

One issue that becomes obvious below is that all of our centrally maintained facilities are operated on different financial models. Some (Analytical Lab, Growth Chambers) are operated on a 'fee for use' basis, some (soil lab, insect collection) are centrally funded, the autoclaves are, generally speaking, a cost-share model, and the Controlled Environment Systems Research Facility operates on its own budget generated through a special deal on overhead returns. These various funding models will be reviewed to determine whether a harmonized financial model would be more cost-effective than the current differentiated financial model.

Analytical Lab/Soil Lab

These have been separate labs in the past, but with the loss of technical support over the past few years, we will amalgamate these two labs. The amalgamated lab is run by

Peter Smith, a ‘trust fund technician’. It is run on a cost recovery basis, with user fees charged for service and access to the equipment. The School has conducted a review of this operation with a view toward expanding the outside services it provides, to help ensure its long-term financial solvency. The School will strike a steering committee to update the business plan for this facility, rationalize its capabilities, and consider the long-term future of the operation.

Growth Room Facilities

These facilities are generally in poor shape and in desperate need of a serious overhaul and financial reinvestment. We will take the following actions. First, we will identify those chambers that are worth refurbishing. We will assign a faculty member, as a service activity, to oversee this work. We will apply for a grant from the campus energy conservation committee. The school will also invest \$35K per year toward chamber refurbishment. Second, the school will, in conjunction with CBS, apply for funds for new chambers through the CFI-LEF/NIF programs.

Insect Collection

The school’s insect collection began as part of the Entomological Society of Ontario, founded in 1863. It is the oldest insect collection in Canada. At 2+ million specimens the collection is relatively small by world standards, but remains North America’s most important collection of heritage insects, and is the best collection of Ontario insects, including many irreplaceable specimens of extirpated species. The collection benefitted from a \$600k investment through a CFI-LEF/NIF application in conjunction with the Biodiversity Institute of Ontario. This allowed for significant mechanical upgrades to allow the collection better storage facilities. Nevertheless, the collection has struggled in recent years under the strain of having no dedicated curatorial support. The School has no ability currently to allocate funds to support this collection. We will take two actions to address the collection’s needs for the short and medium terms. In the short term, we will temporarily assign an additional 20% of Steve Marshall’s DOE to service, to allow him to dedicate time to curatorial activities. In the medium term, the Director, the curator, and the School’s external relations committee will work with the OAC Associate Dean for External Relations and the University’s Alumni Affairs and Development office to fundraise to support a fulltime curatorial position. This position was identified by the school as a priority for the current campaign (The Better Planet Project) but it has been our experience that unless the school provides people to champion such activities, they are unlikely to occur.

Autoclaves

The school has three centrally supported autoclaves and these support a number of different research groups. Their maintenance represents a significant cost to the school, although the school does not charge user fees, as we do for other centrally maintained facilities. The school recently purchased a new autoclave for use in the Bovey building under the model that the school paid half the equipment cost and the users paid the other half (total cost was around \$30K). The Alexander Hall autoclave is also reasonably new and expected to last for some years to come. This leaves one remaining autoclave

in the Bovey building, which is coming to the end of its economically viable service. The school will replace this autoclave, on the same cost-share basis as the recent purchase, within the next five years.

The Controlled Environment System Research Facility

The CESRF is operated on yet another financial model. Since its establishment, the CESRF has operated on a 'special deal' on overhead returns. The facility gets back 50% of the overhead generated by grants and contracts associated with the use of the facility, and the facility returns 15% of those overheads to the School. The School contributes 20% of Mike Dixon's time to the directorship of the facility. Further continued investment in the maintenance, or indeed growth, of this facility in the future depends critically on whether there is foreseeable growth in faculty use of this facility.

Aspirational Goals for Serendipitous Funding for New Facilities

Funding opportunities for infrastructure can be difficult to predict. A major source of such funds is the Canadian Foundation for Innovation, but this is a very competitive selection process and in addition, there is an internal selection process within the University that often requires significant compromises to keep with the University's Strategic Research Plan, and the process by which the University chooses to 'share the wealth'. Nevertheless, it can be useful to have already agreed on a set of priorities within the School so that the Director can react quickly, as and when opportunities present themselves.

The School will take part in an identification and prioritization exercise to develop a list of aspirational acquisitions. This exercise will be completed by April 2012.

In addition to facilities identified through the above exercise, the school is fortunate to be co-applicants with the Department of Integrative Biology on a new CFI-LEF/NIF application on climate change. This application arises from an exercise dating back to 2008, before the formation of the School. It has been in the works since then and was recently identified by the University as a priority project for funding. The \$3.7M proposal is requesting the following infrastructure, all of which School members would have access to:

1. Upgrades to the phytotron facility to purchase 10 new growth cabinets, new lighting and cooling systems and new pest control facilities.
2. Renovations to microbiology and geomicrobiology laboratory facilities in Alexander Hall, the purchase of a new LaChat system for nitrogen analysis, and purchase of a new field vehicle.
3. Construction of a field-scale soil mesocosm research facility at Elora, and the purchase of new tunable diode laser systems for measuring greenhouse gas emissions.
4. Upgrades to the limnotron facility to provide new heating and cooling controls, water chemistry analysis and equipment for measuring full limnotron metabolic rates.

5. Finally, this proposal would fund a next generation sequencer for the genomics facility.

Faculty Renewal

At a faculty retreat, the school identified the following positions (listed in alphabetical order) as priority hires for the future. Given the financial state of the college and the school, it seems likely that whatever faculty replacement we can achieve will be accomplished through fundraising activities rather than allocations from central administration. Nevertheless, we have some modest hope for one or possibly two faculty replacements within the next two years.

Atmospheric Scientist/ Meteorologist

The School has lost significant capacity, particularly teaching capacity, in atmospheric sciences. For some years now, we have only been able to meet our significant teaching responsibilities in this area by calling on the services of Terry Gillespie (Professor Emeritus). Therefore, we have prioritized replacing the atmospheric sciences capacity at as soon as possible. This position will be our top priority for replacement from positions funded centrally, once that opportunity arises.

Biogeochemist

This significant gap in our research and teaching enterprise exists due to the recent loss of Christian Blodau, our junior Canada Research Chair. Our goal for replacing this position is to bid for this CRC to remain in the school. We expect a response from the University CRC allocation committee in early winter. If we are successful, then our goal would be to identify a candidate and complete the approval process by autumn 2013.

Ecotoxicology

Environmental toxicology was once a significant strength of the school, but through attrition we have been reduced to a single faculty member working in this area, and his research time is actually split between toxicology and other areas of environmental sciences research. Because this area is seen as vital to the long-term teaching and research missions of the school, we have prioritized this area. Our goal will be to refill this area through fundraising. We have included an endowed senior ecotoxicology line as part of a fund raising initiative for a Centre for Beneficial Insect Health. In addition to the ecotoxicology position, this proposal also includes funding for a junior faculty line in pollination biology in agroecosystems. While not a priority position for refilling, this line would serve an important role in fulfilling the mission of the school and is important to the overall attractiveness of the centre as a fundraising project. Cynthia Scott-Dupree as chair of the external relations committee is championing this activity.

Environmental Chemistry

With the retirement of Les Evans and Keith Solomon, the loss of Christian Blodau, the secondment of Bev Hale to the post of Associate Dean, and the not too distant future retirement of Chris Hall, the school is in dire need to invest in this research and teaching

area. Our strategy will be to fundraise to support some level of endowed chair in this area. Chris Hall has agreed to champion this activity.

Other Faculty Renewal

While the four areas identified above remain our priorities for faculty renewal, sometimes renewal comes in unexpected forms and we want to capitalize on this serendipity wherever possible. In the next five years, we expect that the following positions will become available.

Position 1. Tenure-tracked faculty member in renewable energy. This position might arise from the conversion of a contractually limited faculty position at Ridgetown (currently held by Rob Nicol). This position is funded by Ridgetown, and the school would support the conversion of this position if that fits with the plans for Ridgetown.

Position 2. Tenure-tracked faculty member in aboriginal resource management. This position might arise from a conversion of the contractually limited faculty position located at the Guelph campus (currently held by Neil Rooney). This position might arise through a university initiative to develop an aboriginal resource management major or option within the BBRM degree.

Position 3. Tenure-tracked faculty member in pollination biology in agroecosystems. This position might arise through fundraising for the Centre for Beneficial Insect Health discussed above under 'ecotoxicologist'.

Position 4. Contractually limited faculty position in green roof horticulture. This position might arise through the university's commitment to the Vineland Research and Innovation Centre.

Service

The school needs to find ways of 'buying out' part of the time of current faculty to avoid losing further lines due to our structural budget deficit. One strategy we will pursue is the establishment of a services institute. The basic plan is that the institute will be empowered to handle service contracts on behalf of faculty. Because these would be service contracts and not research contracts, there would be no contribution of overhead returns to the central university. Contracts would involve the temporary purchase of some fraction of faculty member's time (in lieu of a reduction in teaching or service), involve some overhead to fund the institute itself, and provide some incentives to faculty who participate in the form of graduate student stipends or postdoc salary.

Over the course of the next 12 months the school will obtain final institutional approval for its business plan and conduct background market research (through dedicating 20% of a faculty member's time to this enterprise) to develop a client database. We will use the services of Richard Puntis in the Business Development Office to help us formalize and operationalize our plans. Then, in approximately September 2012, the newly reconstituted Guelph Institute for the Environment will hire a managing director and internally appoint an executive director. We will give the operation 18 months to show

that it can at least break even or start to show an operating profit. If it can generate an operating profit, we would use it to address our structural deficit. If it cannot generate a profit in that time frame (i.e. by summer 2014) we will cease operations or scale back the scope of operations to something much more modest, depending on the perceived need at the time.

This project will take an initial cash investment on the part of the school. This is a risk prone strategy on our part but it seems necessary to save the loss of further faculty lines needed to address our structural deficit.

Summary

The School of Environmental Sciences continues to face significant financial challenges, but there are actions that we can take to address these challenges and to position ourselves to fare better in future budget allocation decisions than we did in 2008. We have set strategic goals in the areas of teaching intensity (undergraduate and graduate), research income, infrastructure and personnel, and in the area of services in terms of a service institute. We have identified strategies for meeting these goals, strategies that are largely within our control and capabilities, and that, for the most part, rely very little on luck (although we will be prepared to take advantage of serendipitous opportunities).

In five years time our new undergraduate majors (in the BSc-ENV, BBRM and BSc-AGR) should be flourishing, and we will have increased our teaching intensity (per MTCU-funded FTE) substantially through the development and implementation of service teaching, teaching efficiencies and popular courses and majors. We will have maintained our thesis graduate student training intensity, shifted that training to a more PhD-centric program, and our new Masters of Environmental Sciences and Graduate Diploma in Environmental Sciences will allow use to maintain or exceed our current total number of graduate students.

By the end of this planning cycle, we will have maintained our per capita research funding, significantly increased our use of leveraging for industry funded work, streamlined our centrally maintained research facilities and put in place a plan to sustain those activities. We will also have made faculty hires in all of our four areas of priority areas for strategic faculty renewal.

Finally, by 2016 the Guelph Institute for the Environment will be a successful services institute, allowing those faculty who wish to participate in contract service work that will both help the environmental sector in Ontario, and help the school's current financial difficulties.

Appendix A. PhD Funding Model

In 2009 the School adopted a new funding model to attempt to stimulate growth in our domestic eligible PhD population. Prior to the adoption of this policy, our funding model was that faculty must pay a minimum of \$17,500 p.a. for a PhD student stipend, \$16,500 p.a. for an MSc student stipend. NSERC Scholars received an additional \$5,000 p.a. 'top-up' from the University. In 2009, we adopted the following changes:

- Domestic eligible PhD students would receive, in addition to the minimum stipend of \$17,500 p.a., a minimum ½ GTA position and \$3,000 p.a. from the School.
- NSERC PhD scholars would receive a \$5,000 p.a. top-up from their research supervisor, in addition to the \$5,000 top-up from the University.
- NSERC MSc scholars would receive a \$2,500 p.a. top-up from their research supervisor, in addition to the \$5,000 top-up from the University.