

Sustainability, Smart Growth, and Landscape Architecture

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Aditya Pal is a landscape architect in Monterey with a focus on public and institutional landscapes. He received his Master in Landscape Architecture from the University of Pennsylvania and started his design career in Philadelphia. Subsequently, he practiced in New Delhi, where he was also a visiting faculty in the departments of Landscape Architecture and Urban Design at the School of Planning and Architecture, his undergraduate alma mater for a degree in Architecture. This course prospectus was developed during his position as the 2004-05 Lawrence Halprin Fellow at the Landscape Architecture Department, Cornell University. He is interested in the convergence between concepts of sustainability and landscape conservation, as a method to create a workable paradigm of development for working landscapes that addresses issues of culture, conservation, and economics.

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I. COURSE OVERVIEW

Smart Growth and Sustainability in Landscape Architecture

The discourse between Smart Growth and Sustainability in Landscape Architecture can be seen as a set of embedded relationships. Broadly speaking, Smart Growth is a subset of the idea of Sustainability, which can be viewed as a larger systemic philosophy dealing with not just development, but resources, cultural attitudes, and ways of life. At the same time several sustainable strategies in landscape architecture can be seen as a subset of Smart Growth initiatives. The course itself explores the relationship between sustainability and landscape architecture from the broadest scale down to the level of detail. Therefore classes at the beginning of course structure address issues larger than Smart Growth itself, while those towards the end address specific issues implicit within, but not necessarily stated as part of Smart Growth.

Since landscape architects are increasingly called upon today to act within multi-disciplinary planning teams, the intention of this course on sustainability and landscape architecture is to create informed students who can bring issues of sustainability related to environment and land planning into discussions and projects dealing with Smart Growth. The course as such will benefit communities and local governments not directly but through informed landscape architects that can work with them.

Genesis of the Course

With sustainability becoming a buzzword in the USA for conservation and management strategies based on first principles, students of landscape architecture are more often than not unclear as to how this focus might apply at a practical level. While the phrases ‘green architecture’ and ‘green building’ have become part of the current architectural lexicon, many landscape architects and landscape architecture academics are unsure of how the definition of ‘green’ in sustainability terms might apply to their discipline. Most landscape work is incorrectly considered as inherently “green” because in the minds of the public, and even other professional design disciplines it generally involves plants and ‘soft’ materials, rather than hard surfaces. For instance, at the time of writing this course description, the Google Business directory had no separate listing for sustainable landscape architects, while it does have one for sustainable architects.

The other related issue is that ‘green’ in the building industry has come to mean strategies focused primarily on energy efficiency, improved environmental quality through the use of non-toxic materials, and a reduction of the development ecological footprint through land, material, and resource conservation.

This in turn has removed from consideration a more holistic approach to the role of landscape design that benefits human health and psychological well being, in green building considerations. For example, if one examines the LEED™ rating system, it is entirely possible for a building to get a Platinum accreditation without introducing any plants or soft landscape.

At present several departments of landscape architecture in the US list sustainability as one of their concentrations and/or foci, and given the rate of land and resource consumption in the US, it is only a matter of time before the rest do as well. But given the ambivalence or ignorance of the profession / academia mentioned above, courses that deal specifically with landscape and sustainability are rare. Courses that try to take an overall grasp of the subject are close to impossible to find. Hence it was in an attempt to address this shortcoming, that this course was conceived and designed.

Goals and Objectives

This seminar course is set up as an overview course for landscape architecture students who are interested in issues of sustainability in landscape architecture and also how these might apply to Smart Growth principles in urban, suburban, and rural development. It is not a primer course and it is preferable if students have a basic familiarity with concepts of sustainability at the start of the course. The broad questions it is designed to address are as follows:

- What does ‘Sustainability’ and ‘Sustainable Development’ imply for landscape architecture?
- What is the relationship between ‘Smart Growth’ and sustainable landscape development?
- What are the processes critical to sustainable landscape architecture?
- What are the technologies and products available that support sustainable landscapes?
- What is the state of ‘sustainable design’ consulting in the landscape architecture profession (who/what/where) today?

II. COURSE MANAGEMENT

Faculty and Students

Though the syllabus is extremely broad-based, a single instructor can teach the course, and bring in resource persons for special lectures as required. The course is seminar-based because it requires a fair amount of reading, and no one individual can know enough about all issues concerning sustainability in depth to teach it as a purely lecture-based course. The other reason for designing it as a seminar course is

that sustainability is such a broad and all encompassing field, that research done by a group of students, rather than one individual, always results in a more interesting discussion and revealing of issues.

Logistics

The course consists of two parts – **Module -I & Module -II** separated by a Term Break. The first module deals with broader sustainability principles that also apply to planning and design disciplines other than landscape architecture such as urban design, architecture and city planning. The split structure allows the course to be modified for these other disciplines by changing the content of the second, more detailed module. In this course structure, the second module is focused on sustainability strategies specific to landscape architecture. The course is structured around two 1 ½ hour sessions per week - each week is therefore divided into two parts in the course outline. Most of the classes are discussions based on readings, but a few classes consist of individual presentations and discussions oriented to create greater student involvement, and to lighten the reading load.

Class communications on topics of discussion, book readings, related websites and requirements can be posted in individual student mailboxes as hard copy or by email, and ideally posted on a class e-bulletin board where it can be updated if need be. Web links are preferable in emails or e-bulletins since they can be accessed directly by clicking on the reference without having to type in the URL.

- Reading requirements of students should ideally be posted at the start of the term, or a minimum of two weeks before each class. The latter option is feasible since given student work loads it is unlikely that any student is going to address required readings in advance of that time. It also gives the instructor the option to modify the class readings as the course progresses.
- Individual presentation requirements of students should be worked out within the first week of classes based on student interest and individual academic schedules.
- Mid-term paper requirements (topics, due date for abstract and paper) of students should be posted at the start of term.
- Final-term paper / project requirements (due date for abstract and paper / presentation) should be posted at the start of term. Since most students develop an idea for a final paper / project as the course proceeds, topics can be discussed with the course instructor over the first module, and decided by the end of the mid-term break.

Book & web resources

The bibliography has been compiled from the extensive library system at Cornell University. Recognizing that smaller universities and colleges may not have access to the same level of resources, multiple choices

for book readings have been provided wherever possible. Alternatively, a course reader can be produced with selected readings.

The bibliography consists of two parts – general readings dealing with larger philosophies and ideas behind sustainability, and readings specific to each class, divided across the two modules. Since several of the books have multiple readings across the length of the course, a system using just the author reference has been used in the course outline, with which the student can refer to the bibliography to find out the full book reference.

Module specific web resources have been culled from a larger list, to include only those ones with a relatively compact URL, i.e. that can be keyed in without difficulty. A list of general web resources has been included at the end of the course outline. Web resources given are those of organizations and institutions (some of whom may provide consulting services), while company/product websites have been excluded. Effort has been made to re-verify the URL integrity of websites. It is certain, however that many URL's will change in which case the definition will have to be searched for again on the web. Also, effort has been made to identify the correct ownership and/or authorship of websites / URL's and any errors in this regard are that of the author.

Student Activities: General requirements

1. Weekly discussions on readings. The quantity of reading has been designed to increase to a steady load of about 50-70 book pages per week, less if there are web resources to be read as well. It would be useful to discuss, if possible, most of the terms / definitions given for each class in the course outline. In general the terms / definitions are listed in order of importance to that topic. At the end of each class it would help to discuss the connections between sustainable landscapes and Smart Growth, if applicable to that class, with the aid of the code-based references provided in the course outline.
2. One half-class (about 30-45 minutes) is to be coordinated, i.e. the student will be the discussion leader, as well as make a 10-15 minute illustrated introduction / overview of the topic. The subject of choice is to be chosen from the course outline at the start of term, based on the student's individual interests and capabilities.

Student Activities: Module-specific requirements

1. **Module -I / Week 04:** Individual student presentations on historical / traditional practices that incorporate concepts of sustainability: 5-minute (max) illustrated presentation in PowerPoint (about 5-10 slides).
2. **Module -I / Week 05:** Individual student presentations on contemporary planning approaches / new urbanism that incorporate smart growth and sustainability: 5-minute (max) illustrated presentation in PowerPoint (about 5-10 slides).
3. **Module -I / Week 07:** Short mid-term paper (4-5 pages) on the relationship between sustainability philosophy (i.e. writings of Henry David Thoreau, Masanobu Fukuoka, or others) and landscape architecture OR the relationship between the thinking / work / writings of an ecological / 'green' thinker (i.e Ian McHarg, William McDonough, or others) and landscape architecture. Paper is due by the end of the first module. A 50-100 word abstract of the paper is required to be submitted half-way through the first module for the course instructors review.
4. **Module -II / Week 12:** Discussion of individual student contributions as given below:
 - a) A single-sentence definition of the ecological footprint of a designed landscape. The term 'ecological footprint' has been applied to societies and nations. Positing that it can be applied to projects as well, the purpose of the definition (the simpler the better) is to review the ability of the student to synthesize a complex idea in simple terms.
 - b) A monochrome diagram of the designed landscape seen as a 'systems' diagram. The diagram can get into specifics, i.e. raw materials, energy, fertilizer, water, labour input, transportation, stone, etc. The purpose of the diagram is two-fold. It is to understand what the student's visualization of the 'footprint' of a designed landscape is / can be, and secondly if the student is able to, draw out the sustainability connections (through arrows etc) between the components.
5. **Module -II / Week 14:** Individual student presentations on one office / practice in the field of green consulting OR Review of one 'green' project / case study – landscape planning / landscape architecture: 5-minute (max) illustrated presentation in PowerPoint (about 5-10 slides).
6. **Module -II / Week 14:** Final project – term paper (10-15 pages) OR a 'green' design project. 10-minute (max) presentation in either case. Term paper / Abstract of project/paper to be submitted and discussed by the end of the first module with the course instructor.

III. COURSE STRUCTURE

Smart Growth Principles Reference Table

The table below identifies the basic relationships between broadly accepted principles of Smart Growth¹, and sustainable landscape development strategies. Since several of these principles and strategies are relevant to more than one class, a system of code-based reference has been used, to allow multiple references back to this table. Since students of landscape architecture may not be familiar with the concepts behind Smart Growth, the topic should be introduced to them in the first class with aid of a handout describing the principles, along with the table below.

Code	Smart Growth Principle	Related Sustainable Landscape Planning and Development Strategies
SGP1	<ul style="list-style-type: none"> Create Range of Housing Opportunities and Choices 	<ul style="list-style-type: none"> Create a range of open space types and thus recreational opportunities
SGP2	<ul style="list-style-type: none"> Create Walkable Neighborhoods 	<ul style="list-style-type: none"> Create a viable open space network with safe walking routes Create a road network that disadvantages vehicular travel with traffic calming devices.
SGP3	<ul style="list-style-type: none"> Encourage Community and Stakeholder Collaboration 	<ul style="list-style-type: none"> Encourage community participation in and ownership of the ecological planning process.
SGP4	<ul style="list-style-type: none"> Foster Distinctive, Attractive Communities with a Strong Sense of Place 	<ul style="list-style-type: none"> Preserve the essential ecological and cultural characteristics of regions and sites. Create open spaces that reflect community interests and that support community interaction.
SGP5	<ul style="list-style-type: none"> Make Development Decisions Predictable, Fair and Cost Effective 	<ul style="list-style-type: none"> Apply cost-benefit analysis to the ecological planning process.
SGP6	<ul style="list-style-type: none"> Mix Land Uses 	<ul style="list-style-type: none"> Learn from traditional mixed-use settlement patterns and open space networks. Create multi-use open spaces that encourage vitality and security
SGP7	<ul style="list-style-type: none"> Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas 	<ul style="list-style-type: none"> Enhance recreational and habitat opportunities by preserving ecological networks and resources Protect watersheds, aquifer recharge areas and fresh water sources. Carry out opportunities & constraints analysis for all areas earmarked for development.
SGP8	<ul style="list-style-type: none"> Provide a Variety of Transportation Choices 	<ul style="list-style-type: none"> Create a viable pedestrian & bicycle network.
SGP9	<ul style="list-style-type: none"> Strengthen and Direct Development Towards Existing Communities 	<ul style="list-style-type: none"> Preserve and/or upgrade existing open space structures.
SGP10	<ul style="list-style-type: none"> Take Advantage of Compact Building Design 	<ul style="list-style-type: none"> Treat ecologically and aesthetically important land as a resource to be protected. Provide greater amounts of open space for recreation and natural drainage

¹ Source: Smart Growth Online <http://www.smartgrowth.org/about/principles/default.asp>

Module-I: Course Outline (7 Weeks)

Guide to Readings / References

1. A page number indicates a specific reference. No page number indicates a general book reference, and is an optional reading depending on individual student interest
2. An asterisk indicates a main reading. No asterisk indicates a supplemental reading.

Week	Topic / Code	Terms / Definitions / Discussions	Readings / References
Introduction to Sustainability			
01-A	Introduction	<ul style="list-style-type: none"> • Discussion on course objectives, resources, requirements • Brundtland Commission's definition of Sustainable Development • Smart Growth Principles 	<ul style="list-style-type: none"> • See Web Resources 01-A
01-B	Philosophical basis of sustainability	<ul style="list-style-type: none"> • Value of nature • Attitudes towards nature • Topophilia, Technophilia & Technophobia (R.Thayer) • The Gaia Hypothesis (J. Lovelock) 	<ul style="list-style-type: none"> • Charles J. Kilbert Ed. (Stephen Kellert) pgs 39-50 * • Robert L. Thayer [1], pgs 80-100 *, 3-79 • See Web Resources 01-B
02-A	Resource conservation	<ul style="list-style-type: none"> • Ecological Footprints • Carrying Capacity • Your Fair Earthshare • Living Planet Index • Systems principles 	<ul style="list-style-type: none"> • Williams E. Rees & Mathis Wackernagel pgs 7-60 *, 61-124 • Howard T. Odum & Elisabeth C. Odum pgs 61-75, 107-121 • E. F. Schumacher • See Web Resources 02-A
02-B	Sustainability concepts & models	<ul style="list-style-type: none"> • Sustainability Indicators • Discussion on sustainability definitions 	<ul style="list-style-type: none"> • Robert L. Thayer [1], pgs 235-247 * • Williams E. Rees & Mathis Wackernagel pgs 125-147 * • See Web Resources 02-B
Sustainability and Planning			
03-A	Landscape ecology SGP7	<ul style="list-style-type: none"> • Ecoregions, ecotones • Ecological Mosaics • Patches / matrices / networks / edges / corridors 	<ul style="list-style-type: none"> • Robert G. Bailey pgs 33-57 * • Richard T. T. Forman, Michel Godron pgs 3-31 * • Wenche E. Dramstad, James D. Olson, Richard T.T. Forman pgs 9-16 *, 19-46 * • Richard T. T. Forman • See Web Resources 03-A
03-B	Ecological planning SGP7 SGP9	<ul style="list-style-type: none"> • Opportunities & Constraints • Math Algebra (D. Tomlin) 	<ul style="list-style-type: none"> • Ian L. McHarg pgs 7-17, 31-41, 79-93, 103-115 (all *) • John F. Benson & Maggie H. Roe, Eds. (Sue Kidd) pgs 111-128 * • Frederick R. Steiner & George F. Thompson, Eds. (Forster Ndubisi) Pgs 9-39 • Frederick R. Steiner pgs 41-159 • Tomlin, C. Dana • Ian L. McHarg and Frederick R. Steiner Eds.

Week	Topic / Code	Terms / Definitions / Discussions	Readings / References
04-A	Communities - historical / traditional SGP6	<ul style="list-style-type: none"> • Ecological history of cities • Eco-villages • Class presentations on historical / traditional examples of sustainable communities 	<ul style="list-style-type: none"> • James Wines pgs 35-61 * • Richard Register pgs 81-105 * • Victor Papanek pgs 113-138 * • Thom Hartmann • Clive Ponting • See Web Resources 04-A
04-B	Regions, cities, and sustainability SGP1 SGP2 SGP9	<ul style="list-style-type: none"> • Garden City (E. Howard) • Bioregionalism (R. Thayer) • Biourbanism (D. Williams) • Sustainable New Towns (E. Lowe) • Regional Cities (P. Calthorpe) • UN Sustainable Cities Program • Eco-cities 	<ul style="list-style-type: none"> • Michael Hough pgs 5-25 *, 219-263 * • Howard T. Odum & Elisabeth C. Odum pgs 209-221 * • Robert L. Thayer [2] pgs 1-9, 144-181 • Charles J. Kilbert Ed. (Daniel Williams) pgs 219-231, (Ernest Lowe) 310-339 • Frederick R. Steiner & George F. Thompson, Eds. (Clair Reiniger) Pgs 185-199 • Peter Calthorpe & William Fulton, pgs 1-60 • John F. Benson & Maggie H. Roe, Eds. (Helen Armstrong & others) pgs 157-178 • Andres Duany, Elizabeth Plater-Zyberk & Jeff Speck pgs 135-152 • John A. Dutton pgs 15-27 • Ebenezer Howard • Lewis Mumford • See Web Resources 04-B
05-A	Cities, urbanism, and sustainability SGP1 SGP2 SGP4 SGP6 SGP8 SGP9	<ul style="list-style-type: none"> • New Urbanism (A. Duany, P. Calthorpe Et. al) • Rurbanism • Conservation design for subdivisions (R. Arendt) 	<ul style="list-style-type: none"> • Howard T. Odum & Elisabeth C. Odum pgs 235-249 * • Richard Register pgs 172-200 *, 229-258 * • Randall G. Arendt pgs 5-16, 27-54 • See Web Resources 05-A
05-B	SGP2 SGP6 SGP10	<ul style="list-style-type: none"> • Class presentations on case studies of sustainable regional and urban strategies 	<ul style="list-style-type: none"> • Peter Katz pgs xi to xlii (4 articles) • Andres Duany, Elizabeth Plater-Zyberk & Jeff Speck pgs 183-214, 245-252 • Sim Van Der Ryn & Peter Calthorpe pgs 54-106 • Peter Calthorpe pgs 34-44, 54-59 • John A. Dutton pgs 29-47, 150-171 • Judy Corbett, Michael Corbett, & Robert L. Thayer • Patrick M. Condon • See Web Resources 05-B

Week	Topic / Code	Terms / Definitions / Discussions	Readings / References
C. Sustainability and Design			
06-A	Sustainable landscape planning SGP4	<ul style="list-style-type: none"> • Sustainability and sense of place • Nature in ecology and design 	<ul style="list-style-type: none"> • Robert L. Thayer [1], pgs 235-271 *, 307-329 * • Bart R. Johnson and Kristina Hill (Spirn) pgs 29-43* • Robert G. Bailey pgs 59-74* • Charles J. Kilbert Ed. (Randall Arendt) pgs 232-258
06-B	Green Architecture, Green Building Systems SGP10	<ul style="list-style-type: none"> • History of green building • Sustainable building strategies • Natural Building Systems & Hybrid systems • Green structural / envelope concepts 	<ul style="list-style-type: none"> • James Wines pgs 16-32 *, 64-68 * • David Gissen, Ed., pgs 10-17 * • David Gissen, Ed., (Serlin) pgs 144-153 * • See Web Resources 06-B
07-A	Energy conservation & Renewable Energy SGP10	<ul style="list-style-type: none"> • Energy conservation in site and landscape design • Active solar energy systems • Passive solar energy systems 	<ul style="list-style-type: none"> • Charles J. Kilbert Ed. (Stephen Strong) pgs 89-116 * • Gary O. Robinette & Charles McClenon, Eds. Pgs 75-78, 99-102, 131-136, 142-146 (all *) • Gary O. Robinette • See Web Resources 07-A
07-B	Green Rating Systems SGP2 SGP7 SGP8 SGP10	<ul style="list-style-type: none"> • Green rating systems • LEED (USA) • Green Star (Australia) – Change in Ecology Credit Calculator 	<ul style="list-style-type: none"> • See Web Resources 07-B
Mid-term paper due			

Module-I: Web Resources

Note: An asterisk indicates a significant reference, and no asterisk indicates a supplemental reference.

Week		Website (Web Page / PDF) URL
01-A	* *	<ul style="list-style-type: none"> • The Brundtland Report http://www.are.admin.ch/are/en/nachhaltig/definition/index.html • Smart Growth Online http://www.smartgrowth.org/about/principles/default.asp
01-B		<ul style="list-style-type: none"> • The Gaia Hypothesis http://www.oceansonline.com/gaiaho.htm
02-A		<ul style="list-style-type: none"> • Personal Ecological Footprint http://www.ecofoot.org/ • The Nemesis Effect (C. Bright) http://www.worldwatch.org/pubs/mag/1999/123/ • Living Planet Index www.unep-wcmc.org/forest/living_planet.htm
02-B		<ul style="list-style-type: none"> • Sustainability Indicators http://www.sustainablemeasures.com/Indicators/ • Three Circles Model of Sustainability http://www.eeeee.net/what_is_sd.htm
03-A	* *	<ul style="list-style-type: none"> • US Ecoregions http://www.fs.fed.us/land/ecosysmgmt/ecoreg1_home.html • US Ecoregions http://www.sierraclub.org/ecoregions/ • World Ecoregions http://www.worldwildlife.org/science/ecoregions.cfm
04-A	*	<ul style="list-style-type: none"> • Global Ecovillage Network http://gen.ecovillage.org/
04-B		<ul style="list-style-type: none"> • UN Sustainable Cities Program http://www.unhabitat.org/programmes/sustainablecities/
05-A		<ul style="list-style-type: none"> • Florida Sustainable Communities Center http://sustainable.state.fl.us/ • World Changing http://www.worldchanging.com/
05-B		<ul style="list-style-type: none"> • Village Homes, Davis CA http://www.villagehomesdavis.org/
06-B	*	<ul style="list-style-type: none"> • California Integrated Waste Management Board (Green Building Basics) http://www.ciwmb.ca.gov/GreenBuilding/Basics.htm • Green Home Building http://www.greenhomebuilding.com
07-A	* *	<ul style="list-style-type: none"> • US Dept. of Energy (Landscaping & Climate) http://www.eere.energy.gov/consumer/your_home/landscaping/index.cfm/mytopic=11920 • University of Florida IFAS Extension (R.J. Black - Landscape Trees for Energy Conservation) http://edis.ifas.ufl.edu/EP018
07-B	* *	<ul style="list-style-type: none"> • USBGC (LEED NC) http://www.usgbc.org/leed/nc • GBC Australia (Green Star) http://www.gbcaus.org/greenstar/

Module-II: Course Outline (7 Weeks)

Guide to Readings / References

1. A page number indicates a specific reference. No page number indicates a general book reference, and is an optional reading depending on individual student interest
2. An asterisk indicates a main reading. No asterisk indicates a supplemental reading.

Week	Topic / Code	Terms / Definitions / Discussions	Readings / References
Abstract of final term paper / project due			
09-A	Sustainable site planning SGP3 SGP5 SGP7	<ul style="list-style-type: none"> • Community participation & the planning process • Sustainable site planning methods • Greenway design 	<ul style="list-style-type: none"> • Frederick R. Steiner pgs 3-20 *, 173-188 * • Daniel S. Smith & Paul Cawood Hellmund, Eds. (Daniel Smith) pgs 1-21 *, (James Thorne) pgs 23-42 • Rocky Mountain Institute, (et al.), pgs 124-155
09-B	Sustainable site & landscape design	<ul style="list-style-type: none"> • Sustainable building and site strategies • Regenerative Design (Lyle) • Cradle to Cradle Design (W. McDonough / M. Braungart) • Signature-based landscape design (J. Woodward) • Discussion on sustainable development and landscape architecture 	<ul style="list-style-type: none"> • Charles J. Kilbert Ed. (John Tillman Lyle) pgs 151-175 * • William McDonough & Michael Braungart, pgs 118-156 * • Frederick R. Steiner & George F. Thompson, Eds. (Carol Franklin) pgs 263-275 *, (Joan Woodward) pgs 201-223 • John Tillman Lyle, pgs 10-48 • Sim Van Der Ryn & Stuart Cowan • See Web Resources 09-B
2A. Water			
10-A	Water Conservation & Management I SGP7 SGP10	<ul style="list-style-type: none"> • Best Management Practice • Zero runoff technologies & ordinances • Total Stormwater Management • Rainwater harvesting • Permeable Paving / Pervious concrete 	<ul style="list-style-type: none"> • Michael Hough pgs 69-85 * • Howard T. Odum & Elisabeth C. Odum pgs 223-234 * • Thomas R. Schueler * pgs 1.1-2.21 * • Bruce Ferguson • American Society Of Civil Engineers • See Web Resources 10-A
10-B	Water Conservation & Management II	<ul style="list-style-type: none"> • Plant selection / drought tolerance • Evapo-transpiration / mulching • Water efficient sprinkler systems • Drip Irrigation • Xeriscape 	<ul style="list-style-type: none"> • Dasberg & Or • Gary O. Robinette • See Web Resources 10-B
11-A	Water Conservation & Management III SGP10	<ul style="list-style-type: none"> • Aerobic vs. Anaerobic aquaculture / Clarifier technology • Restorer technology -The Living Machine (J. Todd) • Constructed Wetlands • Reed-bed Technology • Effective Micro-organisms 	<ul style="list-style-type: none"> • Charles J. Kilbert Ed. (John Todd) pgs 131-150 * • Nancy Jack Todd & John Todd • See Web Resources 11-A

Week	Topic / Code	Terms / Definitions / Discussions	Readings / References
2B. Plants			
11-B	Sustainable Agriculture / Horticulture SGP4 SGP6	<ul style="list-style-type: none"> • Permaculture (B. Mollison) • Biodynamic /French Intensive Agriculture (A. Chadwick / R. Steiner) • Natural Systems Agriculture / Perennial Polyculture (W. Jackson / The Land Institute) • Hydroponics & Aquaculture (J. Reid) 	<ul style="list-style-type: none"> • Michael Hough pgs 86-128 * • Sim Van Der Ryn & Peter Calthorpe (David Katz) pgs 148-166 * • Andre Viljoen (Katrin Bohn & Andre Viljoen) pgs 10-16 * (Herbert Giradet) pgs 32-39 * • Bill C. Mollison • See Web Resources 11-B
12-A	Designed Landscape & Health	<ul style="list-style-type: none"> • Skyscraper gardens • Phytoremediation • Building Biology 	<ul style="list-style-type: none"> • Bart R. Johnson and Kristina Hill (Hill) pgs 203-212 * • David Gissen, Ed., (Battle) pgs 36-45 *, (Wines) pgs 78-87 * • Victor Papanek pgs 75-104 • Ilya Raskin & Burt D. Ensley (Eds) • See Web Resources 12-A
2C. Materials			
12-B	Sustainable building materials and processes	<ul style="list-style-type: none"> • Ecological Footprints • Life-cycle analysis • Waste stream management • Manufactured 'Green' systems • Recycled 'green' systems • Discussion on ecological footprint definitions & diagrams 	<ul style="list-style-type: none"> • John F. Benson & Maggie H. Roe, Eds. (Nigel Dunnett & Andy Clayton) pgs 179-201 * • Charles J. Kilbert Ed. (Nadav Malin) pgs 117-130 *, (Peter Yost) 176-191 • Victor Papanek pgs 29-48 * • William McDonough & Michael Braungart, pgs 92-117 • David Gissen, Ed., (Braungart) pgs 114-125 • See Web Resources 12-B
13-A	Green Information	<ul style="list-style-type: none"> • Green Certification Bodies • Accessing information on green technologies and products • Specifying green materials and products 	<ul style="list-style-type: none"> • Ross Spiegel & Dru Meadows pgs 81-96 * • GreenSpec Directory pgs xvii-xxii * • Tom Woolley and others • See Web Resources 13-A
2D. Practice			
13-B	Sustainable Landscape Practice	<ul style="list-style-type: none"> • Consulting & collaborating with other disciplines / code officials • Educating clients • Community partnerships • Changing attitudes 	<ul style="list-style-type: none"> • Victor Papanek pgs 235-246 * • Richard Register pgs 259-283 * • Frederick R. Steiner & George F. Thompson, Eds. (Sally Schauman) pgs 239-261 *
14-A	Sustainable Projects	<ul style="list-style-type: none"> • Class presentations and discussion on 'green' consulting practices / projects 	<ul style="list-style-type: none"> • Daniel S. Smith & Paul Cawood Hellmund, Eds. Pgs 196-202 • John F. Benson & Maggie H. Roe, Eds. (Michael Herrmann & others) pgs 202-234 • Ian L. McHarg and Frederick R. Steiner Eds. Pgs 325-340 • Frederick R. Steiner & George F. Thompson, Eds. (Carol Franklin) pgs 276-291 • Peter Calthorpe & William Fulton pgs 107-171

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			• See Web Resources 14-A
14-B		• Class presentations of final term papers / projects	

Module-II: Web Resources

Note: An asterisk indicates a significant reference, and no asterisk indicates a supplemental reference.

Week		Website (Web Page / PDF) URL
09-B	*	<ul style="list-style-type: none"> • U.S. National Park Service (Denver Service Center / Sustainable Site Design / Chapter 5) http://www.nps.gov/dsc/d_publications/d_1_gpsd.htm
10-A		<ul style="list-style-type: none"> • U.S. EPA (Wetlands, Oceans, Watersheds) http://www.epa.gov/owow/
10-B	*	<ul style="list-style-type: none"> • California Integrated Waste Management Board (Xeriscaping) http://www.ciwmb.ca.gov/Organics/Xeriscaping/
	*	<ul style="list-style-type: none"> • University of Florida IFAS Extension (G.W. Knox - Landscape Design for Water Conservation) http://edis.ifas.ufl.edu/MG027
		<ul style="list-style-type: none"> • University of Florida IFAS Extension (D.Z. Haman & A.G. Smajstrla, Design Tips for Drip Irrigation of Vegetables) http://edis.ifas.ufl.edu/AE093
11-A	*	<ul style="list-style-type: none"> • U.S. EPA (Constructed Wetlands) http://www.epa.gov/owow/wetlands/watersheds/cwetlands.html
	*	<ul style="list-style-type: none"> • Lagoon Systems in Maine (Reed Beds) http://www.lagoononline.com/reedbeds.htm
		<ul style="list-style-type: none"> • Oceans ESU (Reed bed Treatment Systems) http://www.oceans-esu.com/solutions/aboutreed.cfm
		<ul style="list-style-type: none"> • Ocean Arks International (J. Todd) http://www.oceanarks.org/
		<ul style="list-style-type: none"> • Living Technologies Ltd. http://www.ltluk.com/
11-B	*	<ul style="list-style-type: none"> • The Permaculture Activist http://www.permacultureactivist.net/intro/PcIntro.htm
	*	<ul style="list-style-type: none"> • ATTRA (Biodynamic (Farming & Compost Preparation)) http://www.attra.org/attra-pub/biodynamic.html
12-A	*	<ul style="list-style-type: none"> • USDA / ARS (Phytoremediation) http://www.ars.usda.gov/is/AR/archive/jun00/soil0600.htm
		<ul style="list-style-type: none"> • J.W. Cross (Phytoremediation Review Articles) http://www.mobot.org/jwccross/phytoremediation/
12-B	*	<ul style="list-style-type: none"> • Minnesota Office of Environmental Assistance (Sustainable Building Products and Materials) http://www.moea.state.mn.us/greenbuilding/products.cfm
	*	<ul style="list-style-type: none"> • California Integrated Waste Management Board (Waste Reduction in Landscape Industry) http://www.ciwmb.ca.gov/BizWaste/FactSheets/Landscape.htm
	*	<ul style="list-style-type: none"> • California Integrated Waste Management Board (Green Building Materials) http://www.ciwmb.ca.gov/GreenBuilding/Materials/
		<ul style="list-style-type: none"> • MBDC (McDonough / Braungart C2C Benchmarking) http://www.mbdc.com/index.htm
13-A	*	<ul style="list-style-type: none"> • Sustainable Forestry Board (Sustainable Forestry Initiative) http://www.aboutsfi.org/core.asp
	*	<ul style="list-style-type: none"> • U.S. Forest Stewardship Council http://www.fscus.org/
	*	<ul style="list-style-type: none"> • The National Environmental Education and Training Foundation / GreenBiz.com (Greener Buildings) http://www.greenerbuildings.com/

14-A	<ul style="list-style-type: none"> • Google Sustainable Architects Listing http://directory.google.com/Top/Business/Construction_and_Maintenance/Design/Architects/Sustainable/ • See Sustainable Design Practices List
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General Web Resources

A. Sustainable Design (Planning & Landscape Architecture) Practices

A significant proportion of landscape architects in the US view their work as intrinsically being 'green' and/or sustainable. The list below however is based on the author's selection with reference to usefulness in this course and includes those offices, which work explicitly with sustainable practices. The alphabetically ordered lists are restricted to US-based firms, and are to be considered by no means complete.

Landscape Architecture / Ecological Planning & Design

- **Andropogon Associates** (Philadelphia, PA) <http://www.andropogon.com/>
- **Kerr+Boron Associates** (Brecksville, OH) <http://www.kerrboron.com/home.html>
- **Kestrel Design Group** (Edina, MN) <http://www.kestrel-designgroup.com/>
- **Rolf Sauer Associates** (Philadelphia, PA)
- **Steve Martino & Associates** (Phoenix, AZ)

Landscape Restoration & Environmental Management

- **The Bioengineering Group Inc.** (Salem, MA) <http://www.bioengineering.com/>
- **Biohabitats ISM** (Timonium, MD) <http://www.biohabitats.com/>
- **Environmental Restoration and Management Inc.** (Timonium, MD) <http://www.er-m.com/>

Planning, Urban Design, & Architecture (Excludes Architecture-Only Firms)

- **Calthorpe Associates** (Berkeley, CA) <http://www.calthorpe.com/>
- **Farr Associates** (Chicago, IL) <http://www.farrside.com/>
- **William McDonough + Partners** (Charlottesville, VA) <http://www.mcdonoughpartners.com/>
- **Van der Ryn Architects** (Sausalito, CA) <http://www.vanderryn.com/>

B. United States Government Agencies

- **U.S. Department Of Energy** (Energy Efficiency and Renewable Energy) <http://www.eere.energy.gov/>
- **U.S. Department of Agriculture Forest Service** <http://www.fs.fed.us/>
- **U.S. Department of Agriculture National Resources Conservation Service** <http://policy.nrcs.usda.gov/>
- **U.S. Department of the Interior National Park Service** <http://www.nps.gov/>
- **U.S. Environmental Protection Agency** <http://www.epa.gov/>

C. Non-governmental Organizations

- **Biodynamic Farming and Gardening Association, Inc.** <http://www.biodynamics.com/>
- **The Buckminster Fuller Institute** <http://www.bfi.org/>
- **Building Green, Inc.** <http://www.buildinggreen.com/>
- **Building Research Establishment UK** <http://www.breeam.org/index.html>
- **Ecological Design Institute** <http://www.ecodesign.org/edi/index.html>
- **The E.F. Schumacher Society** <http://www.schumachersociety.org/>
- **Green Building Council Australia** <http://www.gbcaus.org/>
- **National Center for Appropriate Technology (NCAT)** <http://www.ncat.org/>
- **National Sustainable Agriculture Information Service** <http://www.attra.org/>
- **Rocky Mountain Institute** <http://www.rmi.org>
- **Smart Growth Network** <http://www.smartgrowth.org/>
- **Sustainable Architecture, Building, & Culture** <http://www.sustainableabc.com/>
- **Sustainable Communities Network** <http://www.sustainable.org/>
- **U.S. Environmental Resource Centre** http://www.us-erc.org/about_tab.php
- **U.S. Green Building Council** <http://www.usgbc.org>
- **World Resources Institute** <http://about.wri.org/>
- **Worldwatch Institute** <http://www.worldwatch.org/>

D. Universities

- **University of Florida IFAS Extension** (Electronic Data Information Source) <http://edis.ifas.ufl.edu>
- **University of Minnesota** (Minnesota Sustainable Design Guide) <http://www.sustainabledesignguide.umn.edu/>

E. One-line Journals

- **Ecotecture** (Ecological Design) <http://www.ecotecture.com/>
- **In Business** <http://www.jgpress.com/inbusine.htm>
- **In Context** <http://www.context.org/>
- **New Urban News** <http://www.newurbannews.com/index.html>
- **Smart Growth Online** <http://www.smartgrowth.org/>
- **Stormwater** (Surface Water Quality) <http://www.stormh2o.com/sw.html>

IV. COURSE BIBLIOGRAPHY

General Readings

Required Readings

1. **Fukuoka , Masanobu**, The One-Straw Revolution: An Introduction to Natural Farming, ©1978, Rodale Press
2. **Thoreau, Henry David**, Walden; Or, Life in the Woods, ©1995 (Reprint Ed.), Dover

Optional Readings

1. **Hartmann, Thom**, The Last Hours of Ancient Sunlight, ©2004 (Revised Ed.), Three Rivers Press
2. **Lovelock, James**, The Ages of Gaia: A Biography of Our Living Earth, ©1995 (1st Ed. 1989), W. W. Norton & Company
3. **Ponting, Clive**, A Green History of the World, ©1993, Penguin
4. **Schumacher , E. F.**, Small Is Beautiful: Economics As If People Mattered, ©1989 (Reprint Ed.), Perennial

Supplemental Readings (Regional Planning Students)

1. **Forman , Richard T. T.**, Land Mosaics: The Ecology of Landscapes and Regions, ©1995, Cambridge University Press
2. **McHarg , Ian L., and Frederick R. Steiner Ed.** - To Heal The Earth: Selected writings of Ian L. McHarg, ©1998, Island Press

Supplemental Readings (City Planning / Urban Design Students)

1. **Howard, Ebenezer**, Garden Cities of Tomorrow, ©1965 (1st Ed. 1902), The MIT Press
2. **Jacobs, Jane**, The Death and Life of Great American Cities, ©1992 (Reissue Ed.), Vintage
3. **Mumford, Lewis**, The City in History: Its Origins, Its Transformations, and Its Prospects, ©1961, Harvest/HBJ Book

Module-I Readings

1. **Arendt , Randall G.**, Conservation Design for Subdivisions: A Practical Guide to Creating Open Space Networks, ©1996, Island Press
2. **Bailey, Robert G. ,** Ecoregion-Based Design for Sustainability, ©2002, Springer-Verlag
3. **Benson, John F., & Maggie H. Roe, Eds.**, Landscape and Sustainability, ©2001, Taylor & Francis Group
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11. Forman , Richard T. T., & Michel Godron , Landscape Ecology, ©1986, Wiley, New York
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13. Hough, Michael , Cities and Natural Process: A Basis for Sustainability, ©2004 (2 nd Ed.), Routledge
14. Johnson , Bart R., & Kristina Hill , Ecology and Design, Frameworks for Learning, ©2001, Island Press, 2001
15. Katz, Peter , The New Urbanism: Toward an Architecture of Community, ©1993, McGraw-Hill Professional
16. Kibert , Charles J. , Reshaping the Built Environment: Ecology, Ethics, and Economics, ©1999, Island Press
17. Kunstler, James H. , Geography Of Nowhere: The Rise And Decline of America's Man-Made Landscape, ©1994 (Reprint Ed.), Free Press
18. McHarg , Ian L. , Design with Nature, ©1995, John Wiley & Sons Inc.
19. Odum , Howard T. & Elisabeth C. Odum , A Prosperous Way Down: Principles and Policies, ©2001, University Press of Colorado
20. Papanek, Victor , The Green Imperative: Natural Design for the Real World, ©1995, Thames & Hudson
21. Rees , Williams E. & Mathis Wackernagel , Our Ecological Footprint: Reducing Human Impact on the Earth, ©1995, New Society Publishers
22. Register, Richard , Ecocities: building cities in balance with nature, ©2001, Berkeley Hills Books
23. Robinette, Gary O., & Charles McClenon, Eds. , Landscape Planning for Energy Conservation, ©1983, Van Nostrand Reinhold, New York
24. Robinette, Gary O. , Energy Efficient Site Design, ©1983, Van Nostrand Reinhold, New York
25. Steiner , Frederick R. , The Living Landscape: An Ecological Approach to Landscape Planning, ©2000 (2 nd Ed.), McGraw-Hill Professional
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27. Thayer, Robert L. , [2] LifePlace: Bioregional Thought and Practice, ©2003, University of California Press
28. Thompson, George F., & Frederick R. Steiner , Eds. , Ecological Design and Planning, ©1997, Wiley
29. Tomlin, C. Dana , Geographic Information Systems and Cartographic Modeling, ©1990, Prentice Hall College Div
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4. Ferguson, Bruce K. , Introduction to Stormwater: Concept, Purpose, Design, ©1998, Wiley, New York
5. Lyle, John Tillman , Regenerative Design for Sustainable Development, ©1994, Wiley
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11. Schueler, Thomas R. , Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, ©1987, Metropolitan Water Resources Planning Board, Washington D.C.
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16. Viljoen , Andre , Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities, ©2005, Architectural Press
17. Woolley, Tom, [et al.] , Green Building Handbook: A Guide to Building Products and Their Impact on the Environment, ©1999, Routledge

Conclusions

The course as run was successful to the point where it has introduced students to a broad range of sustainability concepts at different scales. Some lessons learned over the course were:

1. All the books were put on course reserve and the intention was for the students to go to the library and read not only the specified chapters, but get an idea of what each book was about, i.e. broaden their horizons. In reality, logistical problems resulted in copies being made of all the readings, as a result of which only students who had the time / inclination to peruse the books in the library did so.
2. The course was restricted to seniors and graduate students. Even so, students had varying levels of familiarity with sustainability, which at times created uneven discussions. As pointed out earlier, this is not an introductory course and requires students to be conceptually in tune with ideas of sustainability in the first place.
3. The importance of regular discussions to round off topics and draw the links to Smart Growth cannot be understated given the amount of information to be absorbed.

The strength of this course, and therefore its applicability as a model for other faculty to use and modify, is that it creates a comprehensive framework for teaching sustainability issues to landscape architecture students. The course can be made lighter by removing some of the readings – there are multiple readings for most sections. In addition all the terms / definitions do not need to be discussed, and instead the links to Smart Growth can be emphasized.

As pointed out earlier, the second (six-week) detailed module can be adapted to any other focus other than landscape architecture, and used in conjunction with the first module. For example this allows the course to be modified to apply to students of urban design, city planning, as well as architecture – by changing the content of the second module. In this document, the second module deals specifically with strategies that landscape architects are likely to encounter.

As an alternative, the second module may also be converted into an applied module, with students working with a local community or local government, in a workshop-format on sustainability planning issues. However, the course probably cannot directly incorporate practical hands-on projects – such as allowing landscape architecture students to physically modify/construct existing/new environments along with communities. Such a strategy would require, say a summer session directly following the course, because both modules described above would need to be taught so that students would understand the larger context as well as the theory behind detail applications.