Organic Landscape Management: Birds and Bugs Working at Seattle University

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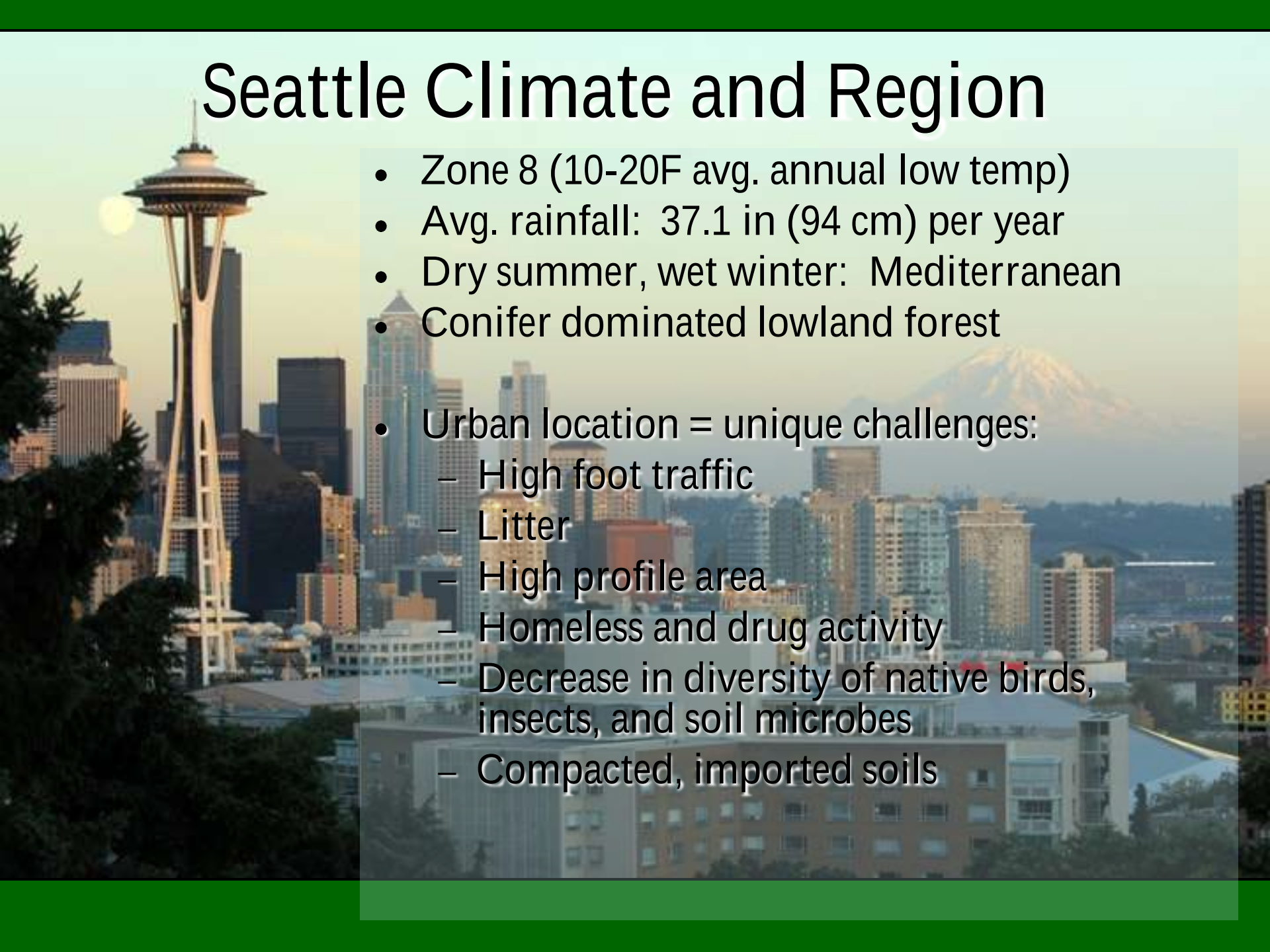
Seattle Climate and Region



- Zone 8 (10-20F avg. annual low temp)
- Avg. rainfall: 37.1 in (94 cm) per year
- Dry summer, wet winter: Mediterranean
- Conifer dominated lowland forest

- Urban location = unique challenges:
  - High foot traffic
  - Litter
  - High profile area
  - Homeless and drug activity
  - Decrease in diversity of native birds, insects, and soil microbes
  - Compacted, imported soils

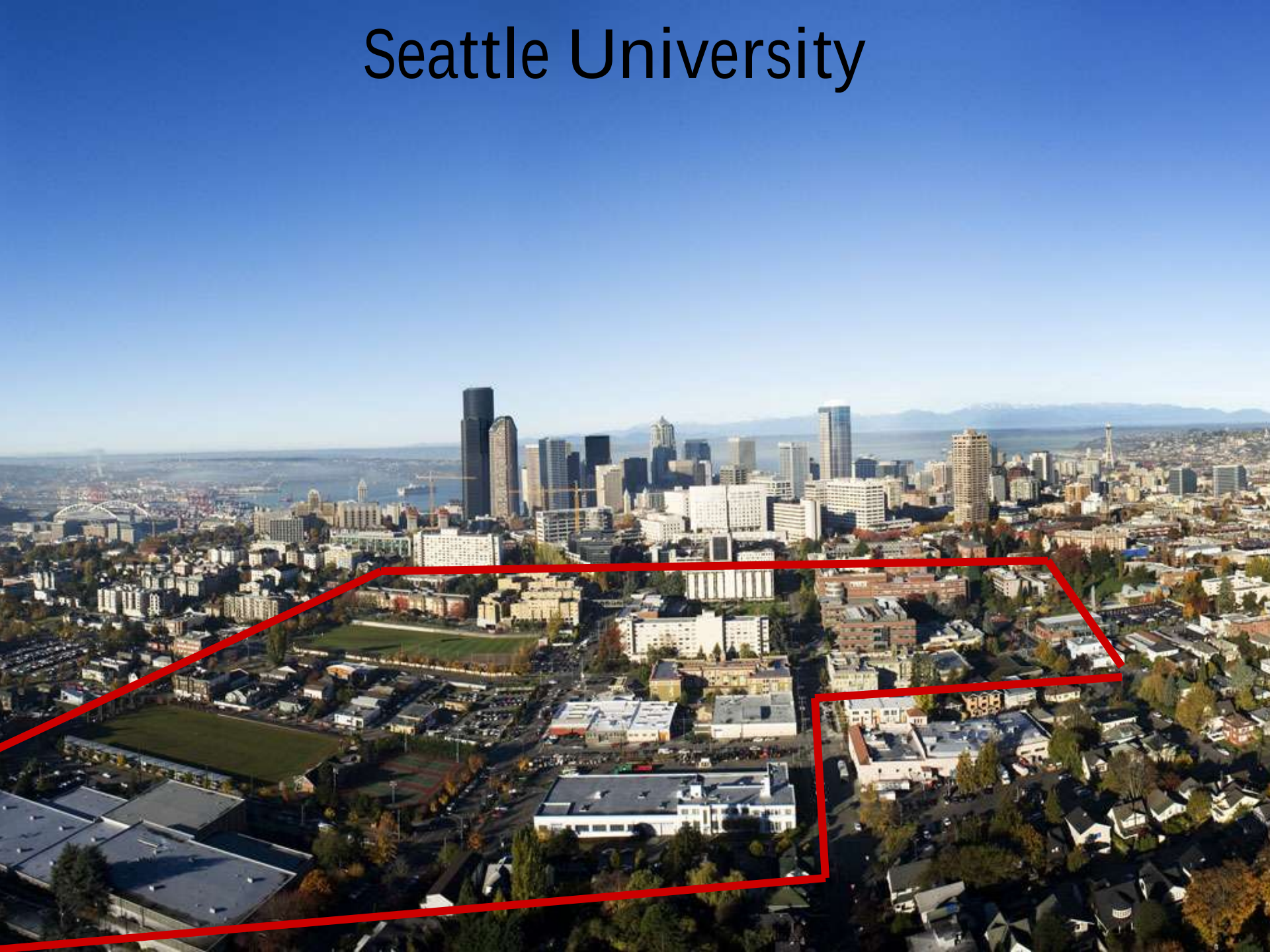
Seattle University

- Jesuit
- Mission: "Seattle University is dedicated to educating the whole person, to professional formation, and to empowering leaders for a just and humane world."

Seattle University

- Located on 48 acres less than ½ mile from downtown business core of Seattle
- Over 7500 students
- 1.9 million square feet – 48% increase over past decade

Seattle University



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1. History of Seattle University's pesticide-free grounds practices
2. Benefits of organic landscape management
3. How to transition to organic landscape management
4. Developing wildlife habitat for native birds and insects
5. How to maintain organic landscapes
6. Integrating the landscape into the educational experience

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“Ciscoe”

- His charismatic personality helped deliver the message

A Brief History
Pesticide Reduction and Elimination

- ‘60’s and ‘70’s, routine spraying of Diazinon
- Early ’80’s, Ciscoe Morris developed IPM policy
- Monitored and targeted sprays
- Safer soap from Canada
- Horticultural Oil
- Nematode release for root weevil control
- Lacewing release campus wide in ’82
- Soil building efforts with compost and wood chips
- Backyard Wildlife Habitat certification in ‘89

IPM Policy

Short Term Strategy

- Short term IPM strategies will address problems that presently exist or subsequently occur in the landscape.

Long Term Strategy

- Long term IPM strategies will address the long range goal of building a healthy environment in which plants will obtain optimum health.

IPM to OLM

From Integrated Pest Management to Organic Landscape Management

- Last Round Up application
- Last application of synthetic fertilizer
- Roundup returned to distributor

- Leadership- Craig Chatburn
- Diligence
- Paradigm shift
- No tolerance policy
- Sports fields buy-in

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Benefits of Organic Landscape Management

Benefits of Organic Landscape Management

- **To the Environment**
- At the Institutional Level
- At the Departmental Level

To The Environment

- No pesticide residues leaching into the ground water
- Reduction of nutrient leaching into the ground water
- Greater water retention in soil - reduces runoff to stormwater system
- Salmon habitat protection and restoration
- Water quality protection
- Increased diversity of wildlife species

Benefits of Organic Landscape Management

- To the Environment
- **At the Institutional Level**
- At the Departmental Level

Institutional Level

- Recognition for Leadership in Sustainability
- Reduced liability
- Recruitment for students
- Environmental Education for students
- Health of Personnel

In January 2005, the Pest Management Regulatory Agency (PMRA) formally recognized the role that municipalities play in the governing of pesticide use. They wrote that communities are able "to further regulate pesticide use, including use restrictio

In natural landscapes, plant life isn't given constant attention and doesn't live on a diet of store-bought chemicals. As a result, the City of Vancouver is committed to reduce the use of pesticides in urban areas for a healthy sustainable city. On July 12, 2005 Vancouver City Council enacted a by-law to restrict the use of pesticides. This by-law will come into effect on January 1, 2006.

Pollution in People:
A Study of Toxic Chemicals in Washingtonians
Our study revealed that toxic chemicals have traveled to the worst possible destination: our bodies.
New chemicals policies are needed today, to keep chemicals that can harm our health out of industries and out of everyday products.

Friday, August 25, 2006

Judge rejects Bush decision on pesticides
Ruling says that weakening of rules lacks scientific justification
By GENE JOHNSON
OCIATED PRESS

judge in Seattle rejected on Thursday a Bush administration decision to weaken rules governing pesticide use. He said the change reflected a "total lack" of scientific justification and that there were "disturbing indications" the administration deliberately muted dissent from government scienti

CITY OF SEATTLE
PESTICIDE USE
REDUCTION STRATEGY

Many municipalities are adopting policy and legislation concerning pesticide use

CITY OF SEATTLE
PESTICIDE USE REDUCTION STRATEGY

Purpose

It is the policy of the City of Seattle to promote environmentally sensitive landscape pest and vegetation management by phasing out the use of the most hazardous pesticides and reducing overall pesticide use while preserving landscape assets and protecting the health and safety of the public and our employees. The following strategy describes how the City will achieve these goals and establishes pesticide reduction targets and timelines.

Students express their concern for environmental issues

Quality of life issues for grounds crew, faculty, staff, and students

Benefits of Organic Landscape Management

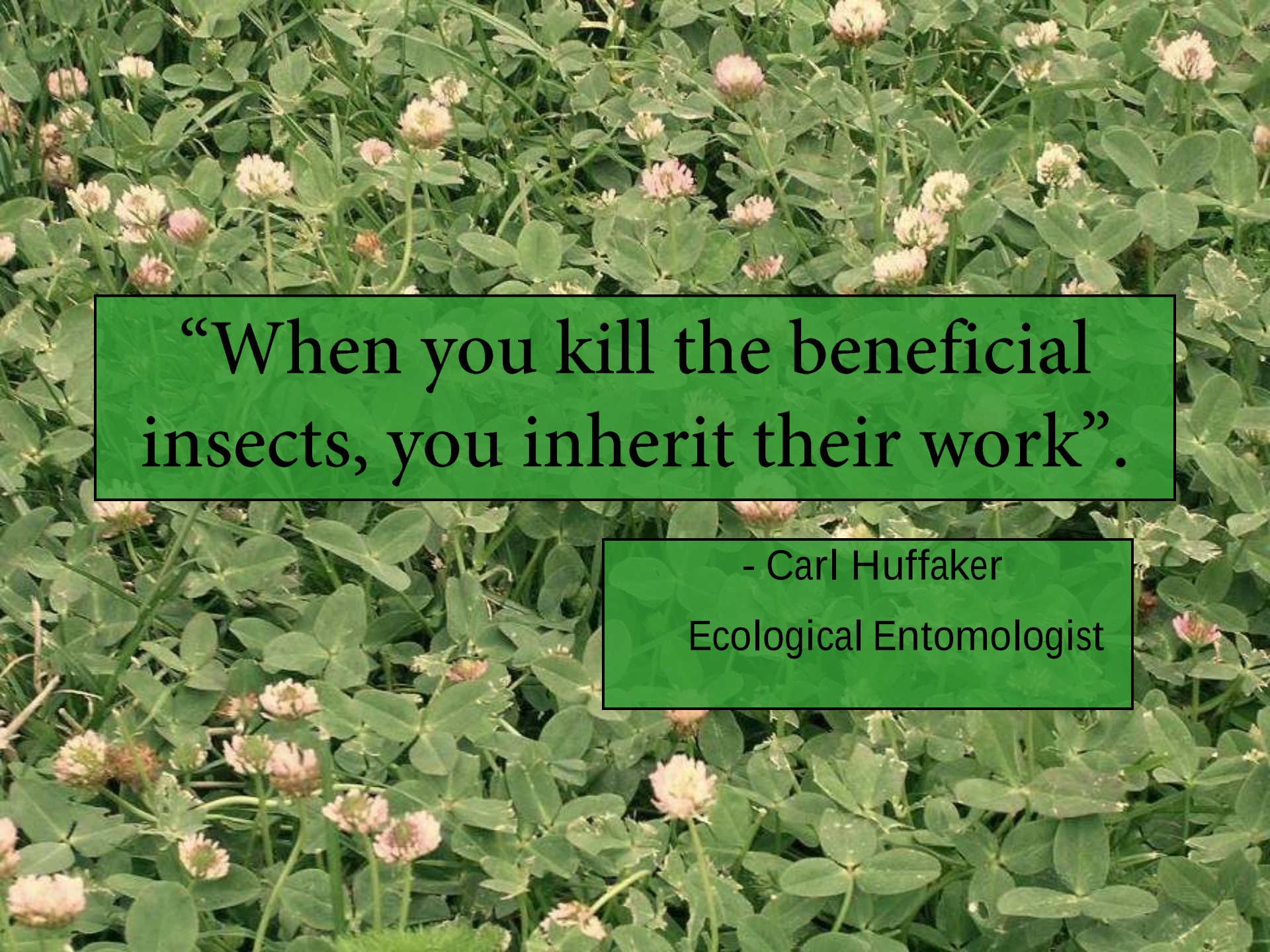
- In The Landscape
- At the Institutional Level
- **At the Departmental Level**

At the Departmental Level

- Reduced record keeping
- Lower pesticide and fertilizer bills
- Reduction in irrigation use- as soil quality improves
- Free disease and insect control- as bird and beneficial insect populations increase
- Personnel retention
- Increased job satisfaction

Reduced administrative labor costs

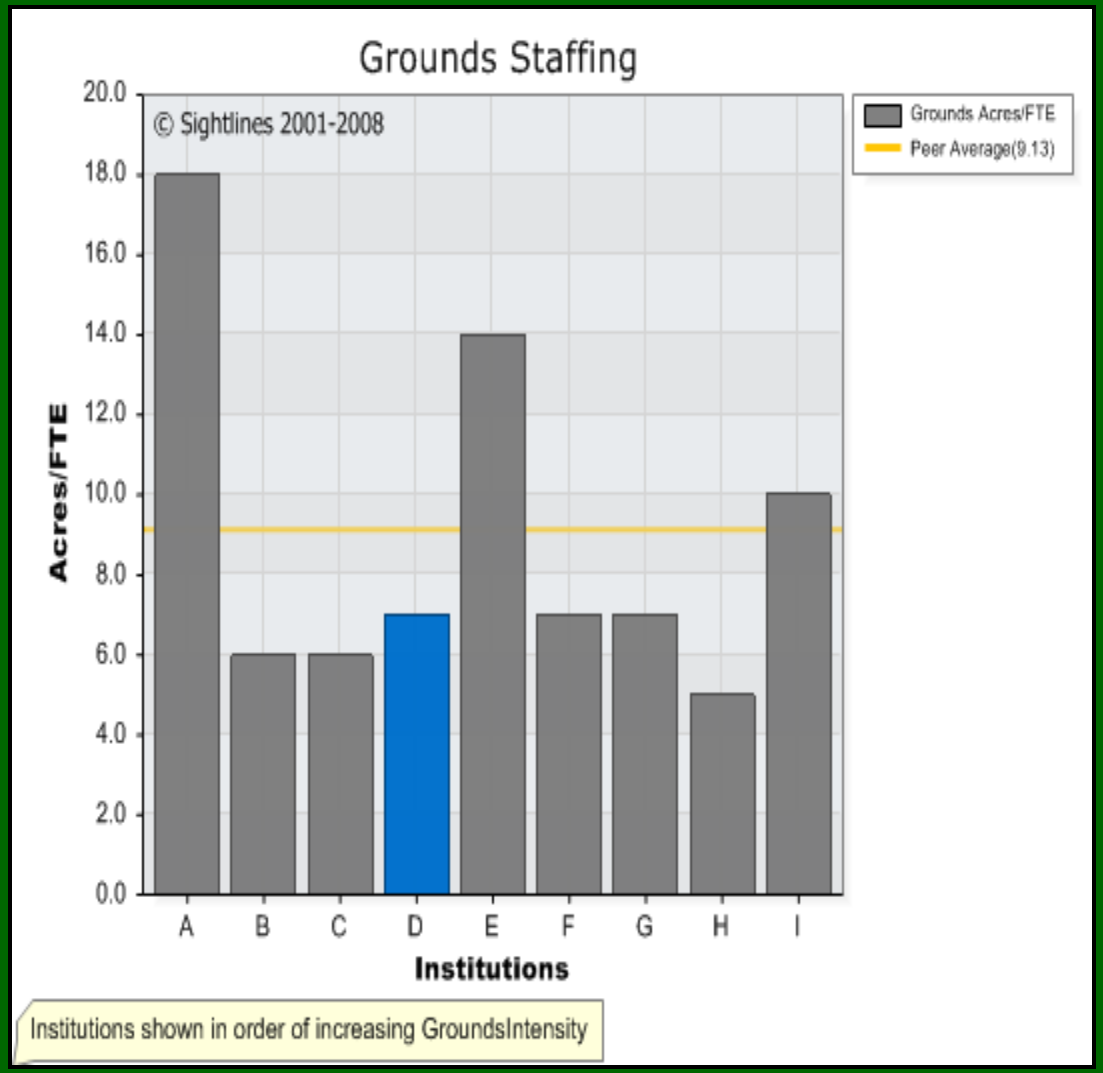
- An important and sometimes overlooked savings that result from switching to 100% organic landscape stewardship comes from the reduced regulatory administrative costs. The notification process involved in a pesticide application is lengthy and cumbersome. The labor cost associated with working through the chain of command from the initial request for permission to use a particular chemical to the final removal of signs after the reentry period has elapsed is a savings that and is often not calculated in the true cost of pesticide use.


“When you kill the beneficial insects, you inherit their work”.
- Carl Huffaker
Ecological Entomologist

Opportunities to collaborate with other staff members

Sharing knowledge and strategies with other institutions

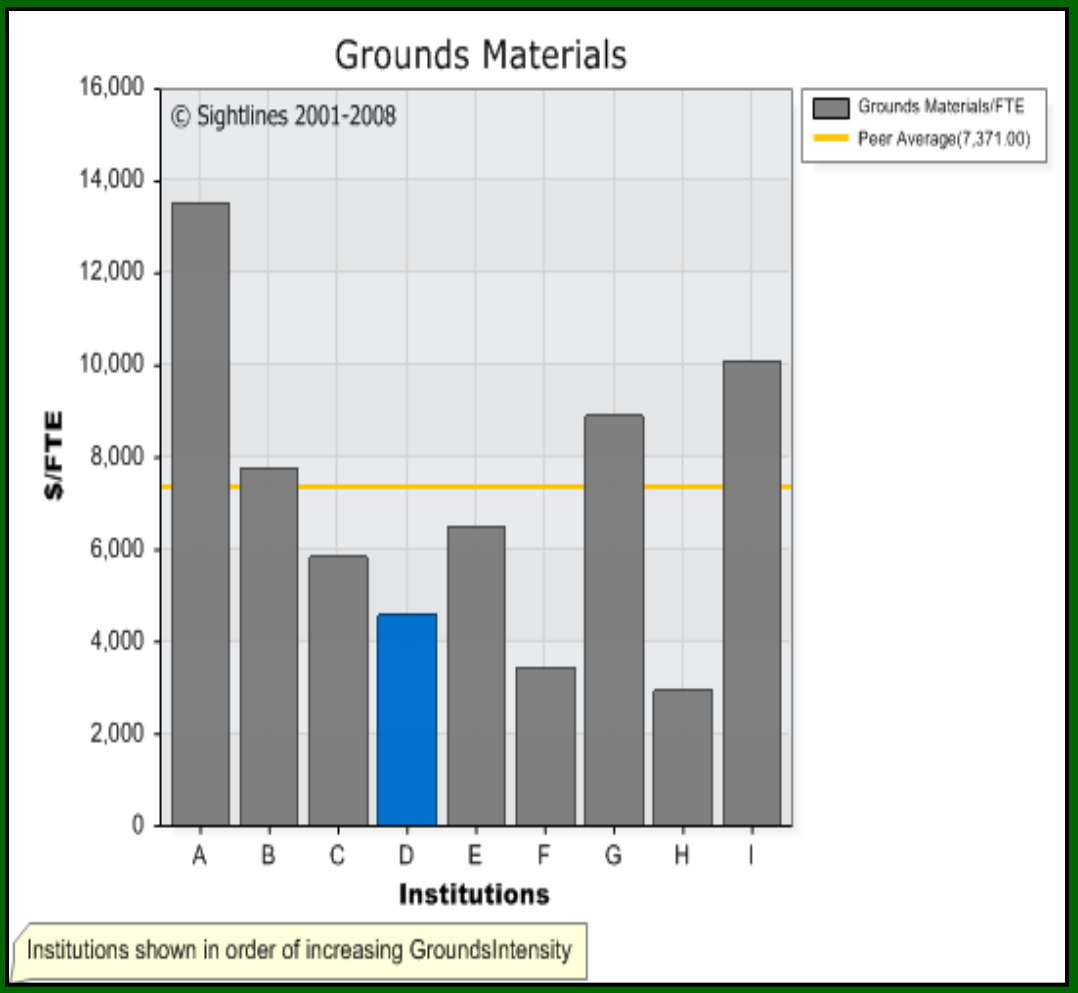
Sightlines



Institutions Shown:

- Boston College
- Georgetown University – Main Campus
- Gonzaga University
- Pacific Lutheran University
- Santa Clara University
- Seattle Pacific University
- Seattle University
- University of San Diego
- University of San Francisco

Sightlines



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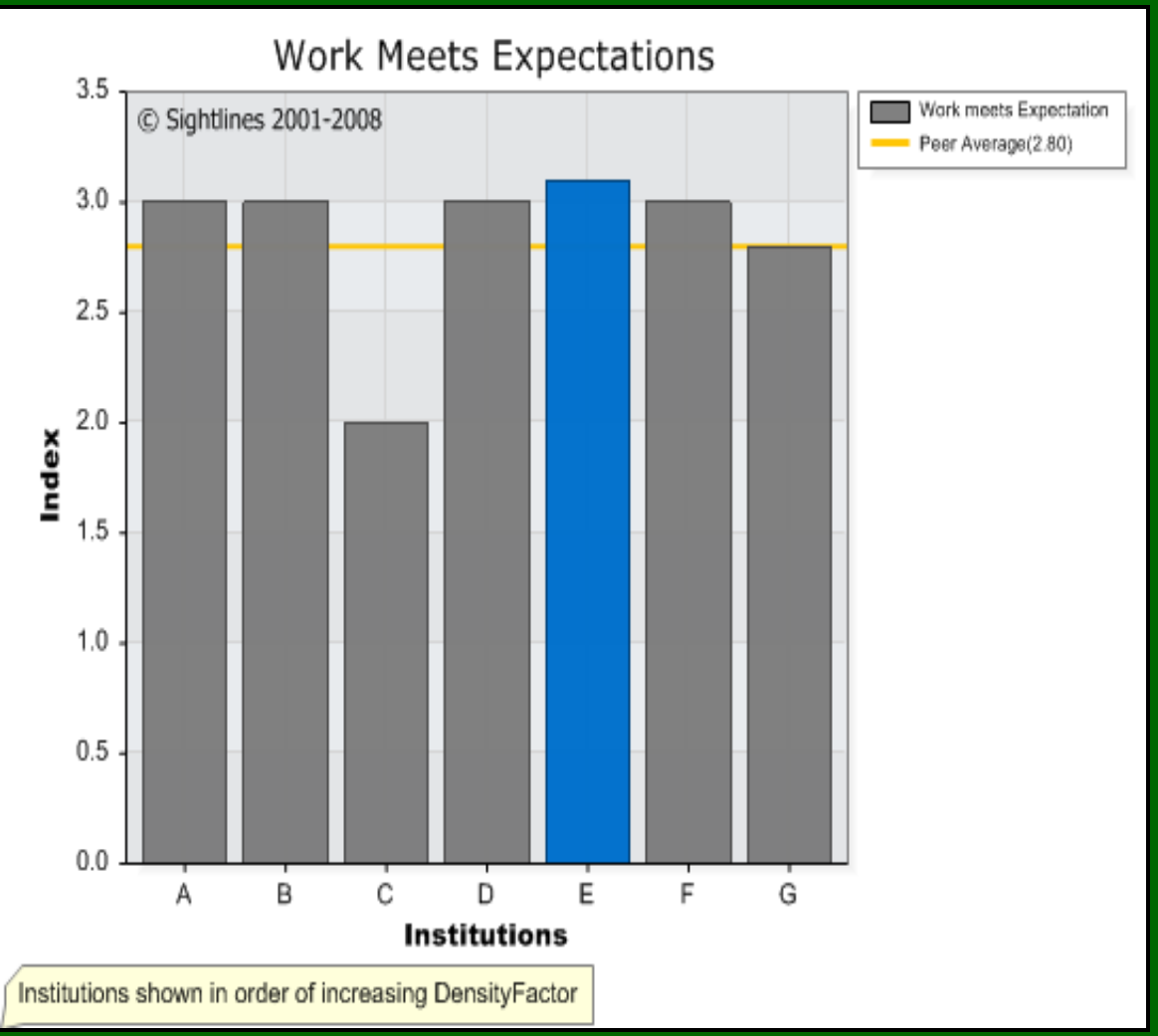

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Beauty and Inspiration

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First steps in making the transition

- Find local resources for advice
- Find suppliers of quality organic fertilizer & compost
- Collect and confiscate all pesticides
- Take soil biology and soil chemistry tests
- Be aware and accessible to skeptical and disheartened staff – change is always tough
- Use weeds, disease and insects as indicators
- Work with architect from conceptual stage to completion in new projects

How to transition to organic landscapes

- Educate yourself
- Communicate your ideas
- Get buy in!
- Develop thresholds
- Create a plan of action and set goals
- Monitor and Assess

Educate yourself

- Find local resources for information and supplies
- Identify local invasives, pests, diseases, etc
- What are beneficial insects you can release?
- Who has been successful in your area? Get in touch with them
- Learn about organic maintenance techniques and how you can apply them to your site
- See our resource list

Communicate

- Talk to other groups in your area that have gone organic
- Work with administration or client to get their support
- Make sure staff concerns are heard

Transparency is Very Important!

- People will be more patient with the transition if they know that you are using organic practices.
- Encourage people to develop an "informed aesthetic"
- Community will be excited to see changes when they know the motivation behind them!

Encourage an **Informed Aesthetic:** occasional weeds look better than no weeds at all, because they are an indicator that this garden is cared for without pesticides!

Get support from staff and community

An excited staff will make transitions easy and will make the gardens more successful.

Develop thresholds

- Set limits (whether concrete or not) for how much insect or disease damage will be tolerated
- Consider plant physiology, not just aesthetics
- Consider whole ecosystem: If there are no aphids, what will birds on campus eat?
- Consider timing: aphid populations will soar shortly before lady bug larvae populations will catch up… can you wait a few weeks?
- How much water, fertilizer, and other inputs are you willing to put into this plant? Is it worth it?
- Consider key plants and important collections: what will you do to protect them?

Pest damage: not the end of the world?

Slug and snails cause little damage to the health of the plant, and holes in leaves can be tolerated aesthetically.

Other pest damage: the end of the plant!

Case: Lawson's cypress

Case: Lawson's cypress

Rhizoctonia, Pythium, and Phytophthora root fungi – spread through soil and water

Value of tree based upon location

Methods of prevention and controlling spread:

compost, compost tea, watering methods, removing duff, keeping trunk clear, maintaining healthy mineral levels in soil

Create a plan of action

- Focus your efforts
- Will you switch overnight or in stages? If so, when, where, and how?
- Set goals and timelines

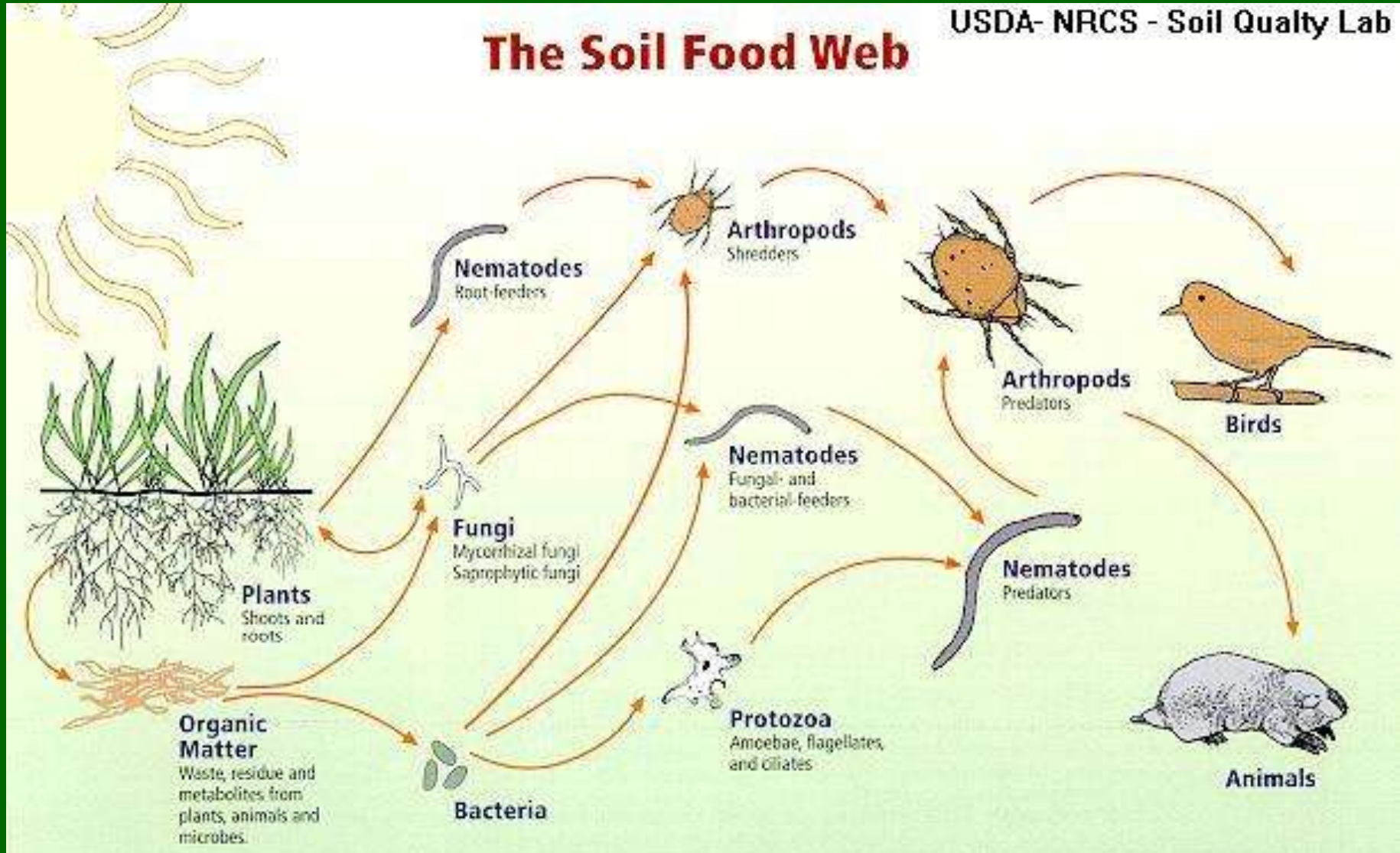
Make special plans for major plants

- Identify specimen trees and their potential problems
- Monitor regularly for target pests and diseases
- Encourage tree health
- Sanitize tools, clean up debris, maintain good air circulation, prune only as necessary and at proper times, compost or mulch
- Create plans for how to deal with major problems
- Monitor climate change and how it affects water availability

Monitor and Assess

The Soil Food Web

USDA- NRCS - Soil Qualty Lab



First trophic level:	Second trophic level:	Third trophic level:	Fourth trophic level:	Fifth and higher trophic levels:
Photosynthesizers	Decomposers Mutualists Pathogens, parasites Root-feeders	Shredders Predators Grazers	Higher level predators	Higher level predators

Soil Analysis – Biology and Chemistry

Soil Foodweb Analysis

Report prepared for:
Seattle University Grounds
Janice Murphy
901 12th Ave
Seattle, WA 98122 USA
(206) 296-2281
janicem@seattleu.edu

Report Sent: 09/20/2007
Sample#: 01-104724 | Submission:01-018384
Unique ID: H-07
Plant: turf
Invoice Number: 0
Sample Received: 09/11/2007

For interpretation of this report please contact:
Local Advisor: or regional lab
Soil Foodweb Oregon
info@oregonfoodweb.
(541) 752-5066
Consulting fees may apply

Organism Biomass Data	Dry Weight	Active Bacterial (µg/g)	Total Bacterial (µg/g)	Active Fungal (µg/g)	Total Fungal (µg/g)	Hyphal Diameter (µm)
Results	**0.880**	39.7	**150**	19.5	291	2.75
Comments	Too Dry	Excellent	Low	Good	Good	
Expected Range Low	0.45	10	150	10	150	
Expected Range High	0.85	25	300	25	300	

	Protozoa Numbers/g			Total Nematodes #/g	Percent Mycorrhizal Colonization	
	Flagellates	Amoebae	Ciliates		ENDO	ECTO
Results	**6557**	**6557**	**31**	43.8	**29%**	**0%**
Comments	Low	Low	Low	High	Low	Low
Expected Range Low	10000	10000	50	20	40%	40%
Expected Range High			100	30	80%	80%

Organism Biomass Ratios	Total Fungal to Total Bacterial	Active to Total Fungal	Active to Total Bacterial	Active Fungal to Active Bacterial	Plant Available N Supply (lbs/acre)
Results	1.94	**0.07**	0.26	**0.49**	75-100
Comments	High	Low	High	Low	
Expected Range Low	0.8	0.1	0.1	0.75	
Expected Range High	1.5	0.15	0.15	1.5	

Nematodes per Gram of Soil
Identification to genus

Bacterial Feeders		
Acrobeles		0.67
Butlerius		3.37
Cephalobus		2.69
Cuticularia		10.78
Diploscapter		6.06
Eucephalobus		5.39
Eumonhystera		0.67
Panagrolaimus		0.67
Rhabditidae		6.74
Fungal Feeders		
Epidorylaimus		0.67
Root Feeders		
Paratrichodorus	Stubby Root nematode	0.67

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Developing wildlife habitat

Three Important Components

- Food Source
- Water
- Shelter

Food Sources

- Nectar and pollen
- Host plants for larva
- Berries, fruits, seed heads
- Banker plants to attract pests

Provide a Diversity of Plant Material

Choose Native Plants

Nectar rich food sources for pollinators and beneficial insects

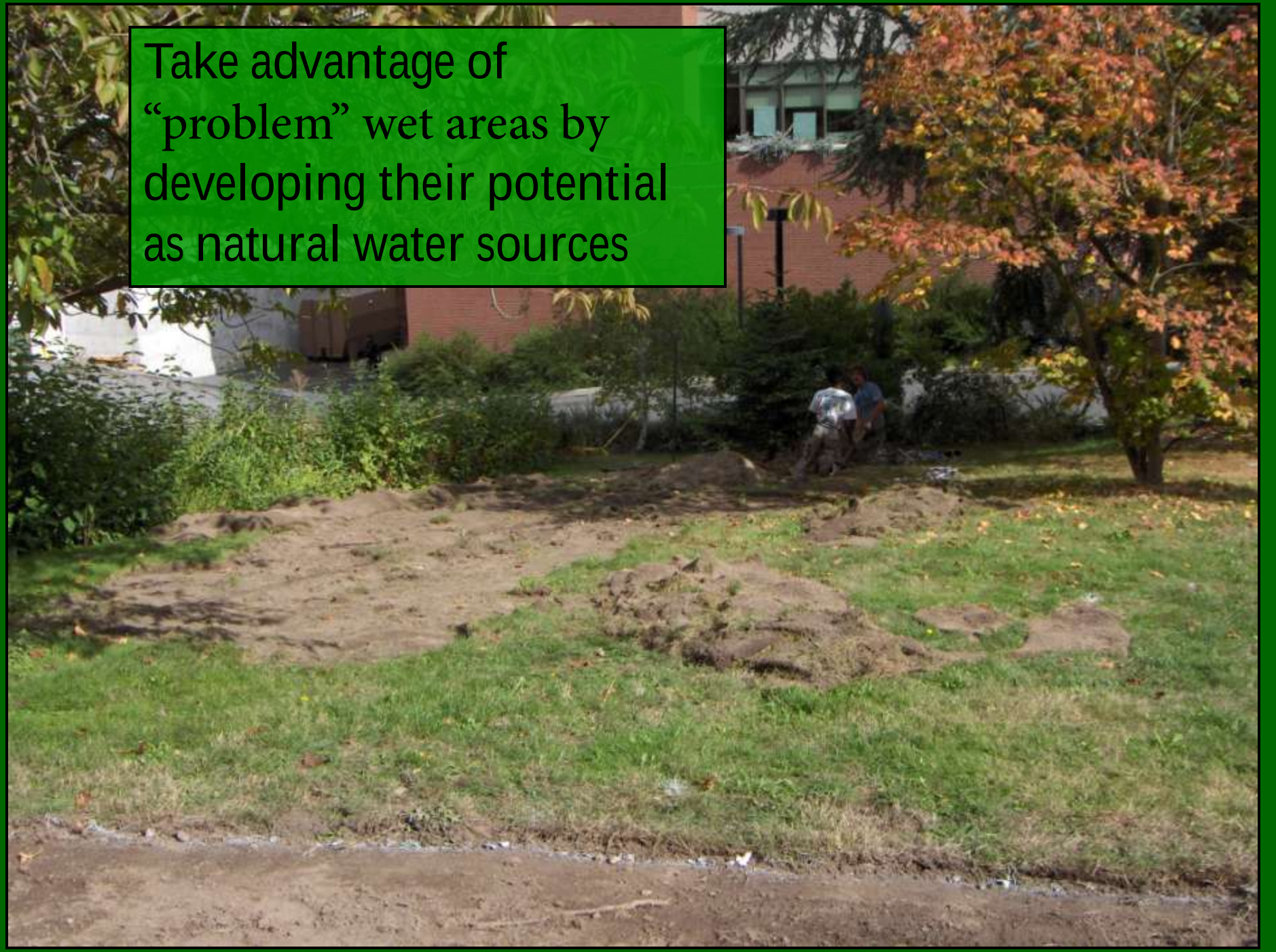
Pollinators are essential for production of fruits, berries, and seeds

Seasonal timing of nectar sources

Beneficial insects and pollinators benefit from a succession of bloom times throughout the season

A Source of Water

- Enhance naturally wet areas
- Bird baths
- Manmade ponds and water features
- Mud, too


Take advantage of
“problem” wet areas by
developing their potential
as natural water sources


Place a dished rock where it will catch water from a sprinkler head

Shelter

- Dense canopy
- Layers of vegetation
- Lots of native plants
- Refugia
- Mulch
- Unmowed grasses
- Nest and roost boxes

Mimic nature's planting scheme with varied heights and types of plant material

Where possible, leave snags in the landscape

Provide a perch site for birds and hummingbirds

Leave a few dead twigs unpruned near nest sites

White crowned sparrow

Provide downed logs and large woody vegetation

Designate a place for undeveloped natural areas

Provide nest boxes appropriate for native species of birds

Mason Bee Box

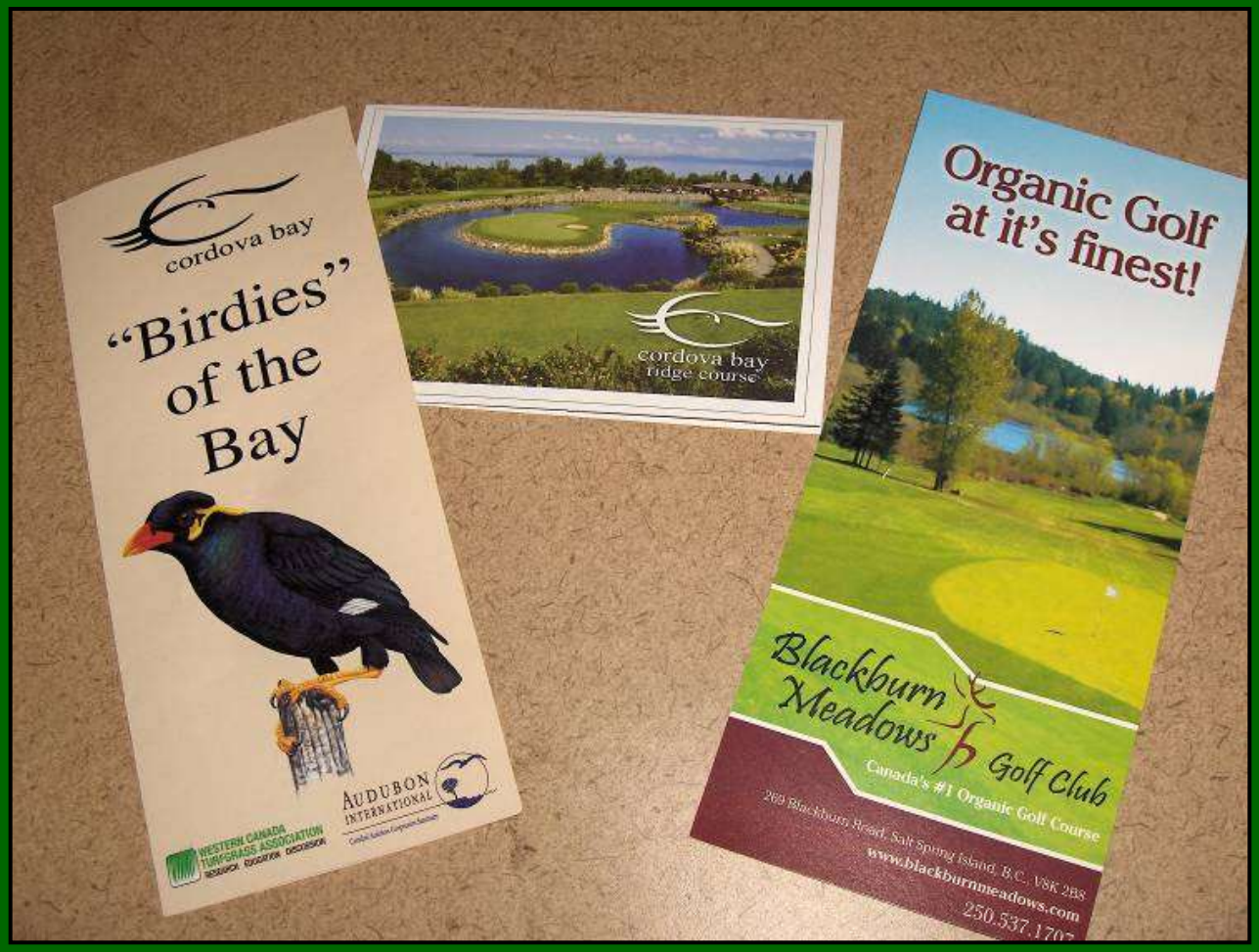
Use signage to educate the human population


BACKYARD
Wildlife
SANCTUARY


Certified
WILDLIFE
Habitat

Use national and local resources for information on developing habitat suited to your area

Partner with local conservation agencies



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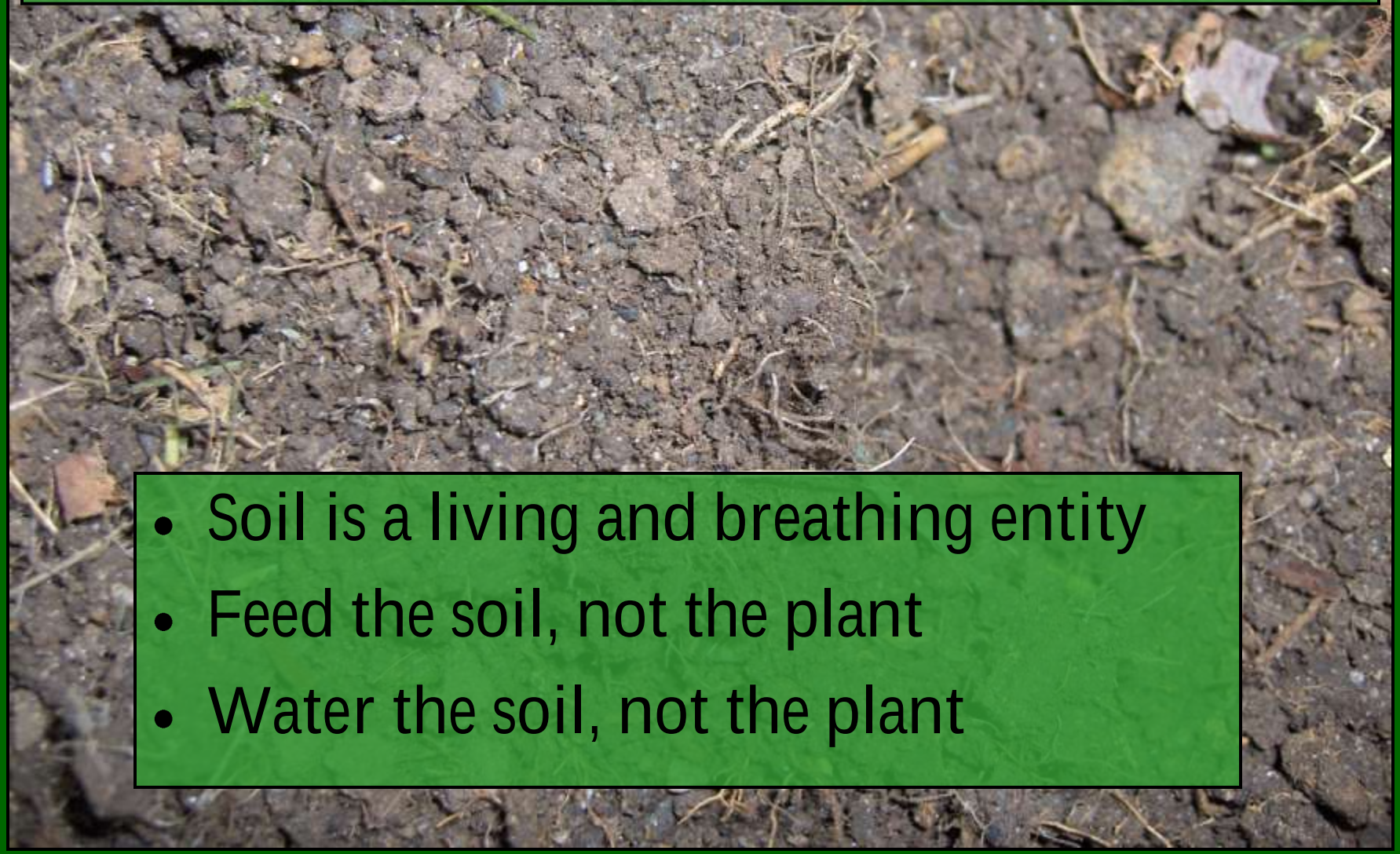
Maintenance of Organic Landscapes

- Plant health care
- Work to build healthy soil
- Mulch! Mulch, mulch, mulch!
- Recycle nutrients
- Plantings – "right plant, right place," layered plantings, competing w/ weeds, groundcovers, building habitat
- Weed control, not eradication
- Careful monitoring of irrigation
- Turf maintenance
- Continue to monitor for pests and cultural issues
- Encourage wildlife to work for you

Plant health care

- Improve soil through mulching, topdressing with compost, and adding soil microbes (compost tea)
- Employ proper pruning and planting techniques
- Water at the appropriate time
- Healthy plants will be better able to fight off disease and insects!

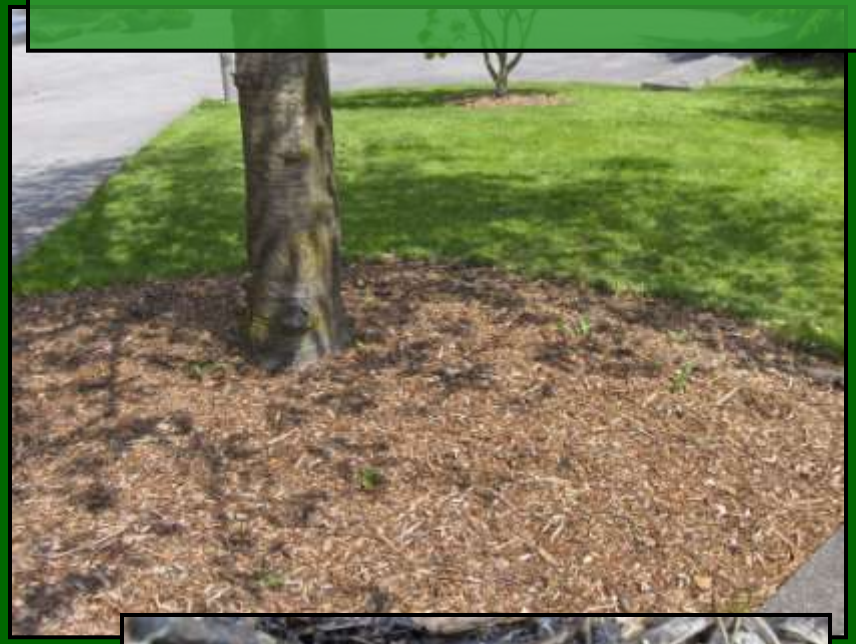
Plant health begins with soil health!



- Soil is a living and breathing entity
- Feed the soil, not the plant
- Water the soil, not the plant

Wood Chip Mulch

Wood Chip Mulch



- Retains moisture
- Slows weed seed germination
- Regulates temperature
- Adds nutrients to soil as it decomposes
- Encourages soil biodiversity
- Reduces compaction
- Protects woody plants from power equipment

Wood Chip Mulch

- Free from local arborists and tree service companies
- Diverse plant sources and all parts of tree

- Allow to decompose for 1-3 months
- Apply 3-6 inch layer, avoiding crowns of plants

Benefits of Wood Chip Mulches

Linda Chalker-Scott 2002

1. **Moderate soil temperature** (*Einert et al., 1975; Greenly & Rakow, 1995; Horowitz & Thomas, 1994; Luke, 1982*)
2. **Protect trees from drought and cold stress** (*Smith, 2000*)
3. **Maintain soil moisture** (*Downer and Hodel, 2001; Fausett & Rom, 2001; Greenly &Rakow, 1995; Litzow & Pellett, 1983; Luke, 1982; Mantinger & Gasser, 1993; Smith, 2000; Smith & Rakow, 1992*)
4. **Provide slow-release nutrients to soil** (Duryea, 1999; Edwards et al., 1994)

Benefits of Wood Chip Mulches

Linda Chalker-Scott 2002

1. **Inhibit undesirable and pathogenic fungi** *(Brantley et al., 2001; Davis, 1994)*
2. **Improve vegetative growth** (*Archbold et al., 1989; Downer and Hodel, 2001; Froment et al., 2000; Green & Watson, 1989; Siipilehto, 2001*)
3. **Increase fruit yield** (*Obiefuna, 1991; Spring, 1993)*
4. **Improve root growth** (*Fausett & Rom, 2001; Green & Watson, 1989*)
5. **Produce best quality plants** (*Calkins et al., 1996*)
6. Suppress weeds (too many references to list!)

Wood Chip Mulching Improves Restoration Success

Union Bay Natural Area Restoration Site

6 mown plots: ½ sprayed,
½ mulched

Native shrubs: *Symphoricarpos*, *Ribes* and *Holodiscus* installed Winter 2000

Mowed/mulched site (Au 2002)

Mowed/sprayed site (Au 2002)

Compost

Compost

More complex food web developed in composting process than in just wood chips
Wood chips: fungal (nitrogen loss due to bacteria coming up from soil to break down)
Compost speeds up soil structure improvements and quality of soil, improves Microbial activity more than raw wood chips

Compost Tea Program

- New program (4 years old)
- Used for transplants, new beds, or diseased or struggling plants
- Small operation, so have to focus efforts on the above areas
- Injected or sprayed
- Increases diversity of microorganisms in soil
- Helps build soil structure
- Not a "fertilizer" which is a short term option, this is a long term solution which builds healthy soil communities

Pull beneficial organisms from high quality compost into water solution

Brewed 24 hours to maximize populations of beneficial organisms

Compost Tea

Recycling nutrients

Mulching over leaves can keep them tidier

Organic maintenance helped by simple design techniques

Right plant, Right place

Work with the conditions you have

Layer vegetation to help reduce weed presence

Plant low maintenance shrubs and groundcovers to minimize bare patches

Use plants that attract beneficial insects and provide habitat for birds

Replace problem plants

Right plant, Right place


Layered vegetation

Tall groundcovers

- Out-compete or hide weeds
- Provide “living mulch”
- Avoid large areas of low groundcovers


“Soldiers in rows” make weeds more obvious and are harder to maintain

Low Maintenance Plants

- Shrubs with multiple seasons of interest, that provide food (nectar, fruit, or leaves) or shelter (dense) to birds or insects, that are low-maintenance (little pruning, no diseases or insects), and/or aren't big water consumers.

Diverse and varied layers provide interest, hide problems, and provide habitat for birds

Replace plants that are not well suited to your region or are disease/insect prone

Replace aggressive plants with a more diverse and interesting display

Turf maintenance

Turf Maintenance

Test soils first to determine baseline levels of nutrients

- Fertilize with organic fertilizer in the early fall
- Eliminating weeds is not practical, instead use them to your benefit and try to think of it as more like a meadow than a golf course
- Use mulching mowers and mow at taller height (3”)
- Aerate and top-dress (with similar material as soil base)

Organic Weed Control

- Focus on CONTROL, not eradication
- Hand tools, line-trimmers, burners
- Sheet mulch
- Regular applications of wood chip mulch
- Keep weeds from going to seed

Using weeds to your benefit

- Weeds serve as indicators of soil conditions

Hand tools

Line trimming weeds

Using weeds to your benefit

Weeds remove nutrients from soil, but those nutrients can be returned if you let plant parts decompose after removal

Burning weeds

Sheet mulching

Pest and Disease Control and Management

- Step one: identify the pest
- Step two: does it cross tolerance threshold?
- Step three: control

Pest and Disease Control and Management

- Beneficial insects

Syrphid fly larva

Lacewing eggs

Lady beetle larva

Pest and Disease Control and Management

- Improve cultural conditions or move plant
- Increase air circulation
- Clean tools before and after working near diseased plants
- Decrease inoculants (clean up debris, weeds, anything that can harbor spores, eggs, etc)
- Use organic controls: beneficial insect releases, nematodes, oils and soaps

Alternative products

Soap based products

Clove oil,
Acetic acid products
(weed control)

Oil based products

Water the soil, not the plants

Monitor

- Continually assess and adapt to struggles and challenges.
- Keep records of diseases, insects, cultural conditions, plantings, problem areas, etc…
- Be aware that what works for one may not work for another

Active rather than passive maintenance

- Continued commitment to organic landscape maintenance
- Adjust as trials succeed or fail
- Keep learning and working with local peer groups
- You aren't just stopping the use of chemicals (inaction) you are creating habitat and a ecosystem for plants to thrive (action)
- Enjoy the process!

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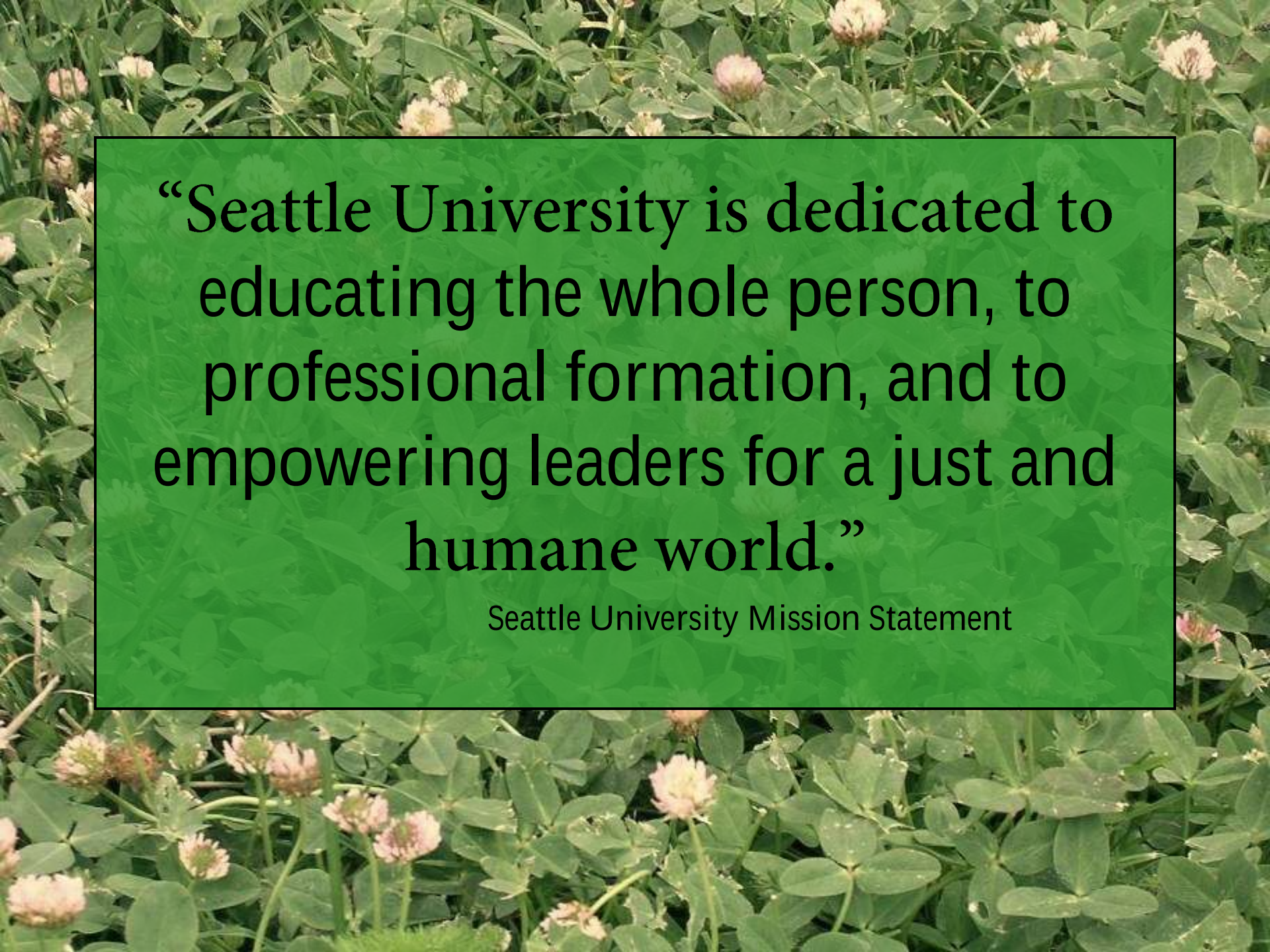
Integrating the Landscape in to the Educational Experience

- Jesuit mission
- Opportunities for reaching out to the academic community
- Ethnobotanical Garden
- Biodiversity Garden
- Shakespeare Garden
- Medicinal Garden
- Kitchen and Herb Garden
- Chardin P Patch
- Kolvenbach House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Seattle University Mission Statement

Environmental Studies students engaged in invasive species removal

Making connections with the greater community

Honoring Native Elders through the Ethnobotanical Garden


Sword Fern
sx̌əx̌ulčac (S)
Polystichum munitum

Campus Chef Inspired: The Herb Garden

Kolvenbach House

Japanese Memorial Garden

Chardin P- Patch Garden

Student vegetable plots

Shakespeare Garden

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4 11 1997

List of Resources

Websites:

- St. Gabriel Organic Products -www.milkyspore.com
- Organic Gardening Magazine - www.organicgardening.com
- National Wildlife Federation – www.nwf.org
- Washington Toxic Coalition – www.watoxics.org
- Beyond Pesticides – www.beyondpesticides.org
- Soil Foodweb, Inc. – www.soilfoodweb.com (USA) or www.soilfoodweb.ca (Canada)

Books:

- Teaming with Microbes: A Gardener's Guide to the Soil Food Web by Jeff Lowenfels and Wayne Lewis
- Ecology for Gardeners by Steven B. Carroll and Steven D. Salt
- Insects and Gardens: In Pursuit of a Garden Ecology by Eric Grissell and Carll Goodpasture
- USDA Soil Biology Primer, available at: http://soils.usda.gov/sqi/concepts/soil_biology/biology.html

List of Resources

Health Issues

- http://www.sierraclub.ca/national/programs/health-environment/pesticides/index.shtml
- http://www.toxicnation.ca/
- http://www.pollutioninpeople.org/

Seed and biocontrol companies:

- Rincon-Vitova www.rinconvitova.com
- Bio-Tactics www.biotactics.com
- Applied Bio-Nomics www.appliedbionomics.com
- Koppert Canada www.koppertonline.ca/home.asp
- Biobest Canada www.biobest.ca

List of Resources

- Bug Garden Research
- Michelle Nakano, Professor, Institute for Sustainable Horticulture, email: Michelle.Nakano@kwantlen.ca
- Bug Garden for Education and Research in Conservation Biological Control and Sustainable Horticulture, Kwantlen University College
- Dr. Robert McGregor, Executive Director of the Institute of Urban Ecology at Douglas Collee, New Westminster,BC. http://www.douglas.bc.ca/community/urban-ecology/contact_us.html
- Biodiversity
- Broadcast applications of non-selective herbicides can indiscriminately reduce survival rates and reproductive success of pollinators. (Smallidge and Leopold 1997)
- Loss of habitat from intensive farming and grazing due to removal of food source, destruction of nest sites, trampling of adults. (Hatfield and LeBuhn 2007)