Pest Management That Makes Sense

Raising the Horticultural Bar

Presented by
Linda Novy
Linda J. Novy & Associates

November 18, 2011
Raising the Horticultural Bar

- Holistic approach to landscape management
- Inter-relationships and synergies between “green” service providers
- How decisions affect natural capital and ecosystem services
- Beginning an ecological dialogue and new business model
Great Team, But…

Who’s In Charge?
Mutually Beneficial Relationships in Nature

*Mycorrhizae*  
*Rhizobium*
Mother Earth Needs Our Help

3rd Annual H2O Water-Wise Fair
Saturday May 20 2006
Figure 1-2: Key natural resources (blue) and natural services (orange) that support and sustain the earth’s life and economies (Concept 1-1A).
Closed Loop System

Sustainable Use of Resources in Nature

Sunlight
Water

Environmental Benefits

Input
Resources Recaptured
Linear System

Unsustainable Use of Resources

- Sunlight
- Water
- Fertilizers
- Pesticides
- Labor
- Machinery

Input

Output

- Greenwaste
- Pollution
- Loss of Beneficial Organisms
Sustainable Use of Resources

**Environmental Benefits**
- Air & Water Quality
- Wildlife Enhancement
- Biodiversity
- Temperature Regulation
- Reduction of Pollution
- Biosphere Protection

**Resources (Inputs)**
- Solar Energy
- Water
- Soil Nutrients
- Organisms (plants, insects, soil biota)
- Power-Labor and Fossil Fuel
- Eco-Education

**Resources Recaptured and Recycled**
- Water
- Organic matter
- Nutrients
- Natural Controls (e.g. beneficial insects)

**Proper Use of Resources**
- Water Management
- Organic matter
- Compost and Site Generated Mulch
- Integrated Pest Management
- Plant Selection
- Soil Management
- Nitrogen-Fixing Plants
- Eco-Literacy

**Minimal Negative Output**

*By Fernando Agudelo-Silva, Ph.D. And Linda J. Novy, September 1999*
Landscape Footprint

Resource Inputs
- Solar
- Soil
- Water
- Life
- Other Energy
- Fuels
- Labor
- Others…

Outputs
- Water?
- Organic Matter?
- Pollution?
- Recreation?
- Food?
- Landscape (Ecosystem Services)

Outputs - Inputs = Landscape Status

By Fernando Agudelo-Silva, Ph.D.
And Linda J. Novy, November 2011
Case Study 1

25-Acre Sonoma County Manufacturing Site
• Site: Lawns, shrubs, oak woodland remnant
• Need: Reduce maintenance costs, improve biodiversity
Case Study 1

• Process:
  – Develop intra-company team and a consulting entomologist/ecologist
  – Assessment, material and labor flow, plant communities, infrastructure
  – Address the “low hanging fruit”
  – Enhance ecology
  – Monitor resource use and report
### Landscape Maintenance Energy Analysis

**Period:** 11/01/96 - 11/01/97

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td><strong>Debris to Public Land-fill (garbage)</strong></td>
</tr>
<tr>
<td>Turf</td>
<td>TBD</td>
</tr>
<tr>
<td>Shrubs, trees, ground cover</td>
<td><strong>Green Landscape Materials</strong></td>
</tr>
<tr>
<td>Natural areas, irrigated</td>
<td>Stockpiled on-site</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td><strong>Water Run-Off</strong></td>
</tr>
<tr>
<td>Used to recycle &amp; pump water</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>IPM Materials/Fertilizer</strong></td>
<td><strong>Non-Market Values</strong></td>
</tr>
<tr>
<td>Herbicides</td>
<td>Recreation</td>
</tr>
<tr>
<td><strong>Herbicides</strong></td>
<td>Education-working lab</td>
</tr>
<tr>
<td>0-10-10</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td>Screening and aesthetic</td>
</tr>
<tr>
<td>0-10-10</td>
<td>TBD</td>
</tr>
<tr>
<td>Nitro King</td>
<td><strong>Restore native habitat</strong></td>
</tr>
<tr>
<td>155 lbs.</td>
<td>TBD</td>
</tr>
<tr>
<td>22-3-9</td>
<td><strong>Improve air quality</strong></td>
</tr>
<tr>
<td>200 lbs.</td>
<td>TBD</td>
</tr>
<tr>
<td>19-6-12</td>
<td><strong>Temperature modification</strong></td>
</tr>
<tr>
<td>200 lbs.</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>Insecticides</strong></td>
<td><strong>Wildlife Diversity</strong></td>
</tr>
<tr>
<td>44 lbs.</td>
<td>Birds</td>
</tr>
<tr>
<td><strong>Beneficial Insect Releases</strong></td>
<td>Turkeys, Peacocks, Swallows</td>
</tr>
<tr>
<td>10,000 Lacewing eggs</td>
<td>Others</td>
</tr>
<tr>
<td><strong>Fossil Fuels/Gasoline</strong></td>
<td>Insects</td>
</tr>
<tr>
<td>Trucks, Blowers, Mowers, Tractors,</td>
<td>Butterflies, Beetles, Yellow Jackets</td>
</tr>
<tr>
<td>Edgers, Chippers, Weed Whippers</td>
<td>Others</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Gopher snakes, Rattle snakes</td>
</tr>
<tr>
<td>2883 gal.</td>
<td>Others</td>
</tr>
<tr>
<td>Oil</td>
<td>Deer, Long-tailed Squirrels</td>
</tr>
<tr>
<td><strong>Preci</strong></td>
<td>Others</td>
</tr>
</tbody>
</table>

| **Mulch & Soil Amendments**          | **Plants**                                  |
| Axis, soil amendment                 | **Ornamental:**                             |
| Compost                              | annuals ornamental                          |
| General landscapers soil             | 71 - flats                                  |
| Peat moss                            | Phormium                                    |
| Potting mix                          | 23 - 1 gallon                               |
| Sustane organic fertilizer           | **Cayce**                                   |
| Top soil                             | 27 - 1 gallon                               |
| Fir bark 3/4”                        | **Asparages myeri**                         |
| Sandy loam                           | 33 - 1 gallon                               |
| **Native**                           | **Anisodoneta**                             |
| 5 yrs.                               | 3 - 1 gallon                                |

| **Recycled/Recovered**               | **Wood Chips**                              |
| Stockpile now - “C” quality         | Stockpile now - “C” quality                |
| Plastic Nursery Flats                | Back to Nursery through GGI                |
| **Wood Pieces**                      | **Burnable, small pieces, chip and stockpile, GGI employees** |
| Chippings                            | **Grass Chippings**                         |
| Grass Chippings                      | Grasscycled                                 |
| Stakes                               | **Oil**                                     |
| **Compost**                          | **(future)**                                |
| **Cardboard**                        | **Cardboard**                               |
| **Aluminum**                         | **Aluminum**                                |
| **Plastics**                         | **Plastics**                                |
## Results – Case Study 1

<table>
<thead>
<tr>
<th>Plant cover</th>
<th>1996 sq. ft.</th>
<th>2002 sq. ft.</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turf</td>
<td>717,570</td>
<td>583,448</td>
<td>-19</td>
</tr>
<tr>
<td>Ivy</td>
<td>88,822</td>
<td>17,768</td>
<td>-80</td>
</tr>
<tr>
<td>Tall fescue</td>
<td>582,496</td>
<td>379,237</td>
<td>-35</td>
</tr>
<tr>
<td>Hypericum</td>
<td>16,192</td>
<td>774</td>
<td>-95</td>
</tr>
<tr>
<td>Pepper trees</td>
<td>30,000</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>Eucalyptus trees</td>
<td>236,250</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>Willow trees</td>
<td>10,800</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>Strawberries</td>
<td>2,796</td>
<td>1803</td>
<td>-36</td>
</tr>
<tr>
<td>Butterfly garden</td>
<td>0</td>
<td>8,163</td>
<td>100</td>
</tr>
<tr>
<td>Boston ivy</td>
<td>10,000</td>
<td>5,000</td>
<td>-50</td>
</tr>
<tr>
<td>Rosemary &amp; grasses</td>
<td>0</td>
<td>250,000</td>
<td>100</td>
</tr>
<tr>
<td>Pyrus trees</td>
<td>2,000</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>Honey locust</td>
<td>16</td>
<td>0</td>
<td>-100</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>4,189,666</td>
<td>4,420,693</td>
<td>-8</td>
</tr>
<tr>
<td>Native Plants</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Low maintenance areas transitioned naturally to native plants.
## Results – Case Study 1

<table>
<thead>
<tr>
<th>Site inputs</th>
<th>1997</th>
<th>2001</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicides</td>
<td>6,643 oz.</td>
<td>11,010 oz.</td>
<td>*65% increase</td>
</tr>
<tr>
<td>Insecticides</td>
<td>89 oz.</td>
<td>64 oz.</td>
<td>39% decrease</td>
</tr>
<tr>
<td>Mulched areas</td>
<td>275,000 sq. ft.</td>
<td>600,000 sq. ft.</td>
<td>118% increase</td>
</tr>
<tr>
<td>Fertilizer 21-7-14</td>
<td>1,274 lbs.</td>
<td>500 lbs.</td>
<td>61% decrease</td>
</tr>
<tr>
<td>Water (AF)</td>
<td>133</td>
<td>130</td>
<td>2% decrease</td>
</tr>
</tbody>
</table>
Case Study 2

San Francisco Commercial Office Building
- Site: Roof Gardens with Urban Forest
- Need: Troubleshoot declining landscape and excessive irrigation expense
Case Study 2

- **Process:**
  - Chemical soil testing, horticultural and infrastructure needs
  - Change irrigation
  - New landscape team seasonal meetings
  - Soil restoration, IPM, native plantings
  - Monitor resource use
Case Study 2

• Results:
  – Improved landscape health and function
  – Reduced water and plant costs
  – LEED Credits
  – Established Landscape Management Team
Case Study 3

- Home Owners Association
- Site: 27 acre site, Daly City
- Need: Master Plan for landscape renovation
Case Study 3

• Process:
  – Develop the team
  – Mapping, tree and irrigation surveys
  – Soil, IPM and landscape maintenance assessment
  – Client education, team meetings
  – Pilot projects
Chemical Soil Analysis

A & L WESTERN AGRICULTURAL LABORATORIES

Report Number: 11-034-032
Client No.: 99999
Send To: LINDA NOVY & ASSOC
PO BOX 969
FAIRFAX, CA 94978-

Laboratory: 61/579
Sample ID: HOA

Date of Report: 02/09/11

Graphical Soil Analysis Report

Analyte

Organic Matter %

Nitrates N ppm

Phosphorus ppm

Potassium ppm

Magnesium ppm

Calcium ppm

Soluble boron ppm

Soluble phosphorus ppm

Zinc ppm

Manganese ppm

Iron ppm

Copper ppm

Boron ppm

Chloride ppm

Results

Low

3.1

17

4

6

95

310

1709

63

3

30.1

4

52

7.4

0.4

High

Medium

Low

Very Low

INCREASING SALINITY

13.0

GE
eq.

Ex. Line

Buffer pH

pH

5.6

Increasing need for lime

Soil Fertility Guidelines

Crop: Landscape

Rates: lb/1000 sq ft

Notes:

C

O

N

M

E

F

T

Prior to planting: Spread the above requirements per 1,000 sq ft and mix into the top 6-8 inches of
soil. Initially, limit nitrogen to 1.5 lb/1000 sq ft or 25-30 ppm NO3-N to avoid salt damage.
Nitrogen sources include composts and legumes as well as blood meal, cottonseed meal, hoof & horn meal,
fish meal, or chicken feather meal. Sodium nitrate is not recommended. Monitor brix levels.
Phosphate availability varies with product. However, poultry-based products are a good source.
Otherwise, consider bone meal or soft rock phosphate. Blood & bone meal will also provide nitrogen.
Potash: Composites may be a significant source of potash. Certain sources of sulfate of potash may also be
used, as well as kelp/seaweed products, wood ash, crushed granite and greensand.
# Soil Food Web Assay

## Foodweb Analysis

### Soil

<table>
<thead>
<tr>
<th>Organism Biomass Data</th>
<th>Dry Weight</th>
<th>Active Bacteria (µg/g)</th>
<th>Total Bacteria (µg/g)</th>
<th>Active Fungi (µg/g)</th>
<th>Total Fungi (µg/g)</th>
<th>Hyphal Diameter (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results Comments</td>
<td>0.890</td>
<td>24.2</td>
<td>671</td>
<td>12.6</td>
<td>372</td>
<td>2.8</td>
</tr>
<tr>
<td>Expected Range</td>
<td>High</td>
<td>Above Range</td>
<td>Above range</td>
<td>Below range</td>
<td>In range</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Range</td>
<td>Low</td>
<td>0.45</td>
<td>0.85</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protozoa (Numbers/g)</th>
<th>Flagellates</th>
<th>Amoebae</th>
<th>Ciliates</th>
<th>Total Nematodes #/g</th>
<th>Mycorrhizal Colonization (%)</th>
<th>ENDO</th>
<th>ECTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results Comments</td>
<td>5175</td>
<td>Low</td>
<td>High</td>
<td>65</td>
<td>Low</td>
<td>Not Ordered</td>
<td>Not Ordered</td>
</tr>
<tr>
<td>Expected Range</td>
<td>Low</td>
<td>10000</td>
<td>High</td>
<td>50</td>
<td>40</td>
<td>40%</td>
<td>80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organism Biomass Ratios</th>
<th>Total Fungi to Tot. Bacteria</th>
<th>Active to Total Fungi</th>
<th>Active to Total Bacteria</th>
<th>Plant Available N Supply (lbs/ac)</th>
<th>Actino bacteria (µg/g)</th>
<th>Predatory Clarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results Comments</td>
<td>0.55</td>
<td>0.03</td>
<td>0.04</td>
<td>0.52</td>
<td>100-150</td>
<td>6.05</td>
</tr>
<tr>
<td>Expected Range</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

For interpretation of this report please contact:

Soil Foodweb Oregon
info@oregonfoodweb.com
(541) 752-5066

Consulting fees may apply

Bacterial Feeders:
- Achromobacter
- Capnabacter
- Microlysmus

Fungal Feeders:
- Rhizobolus
- Rhizobolus

Actinobacteria:
- Foliar nematode
- Fungal

Plant Available N Supply:
- 0.04 lbs/ac
- 0.04 lbs/ac
Pilot Project
Case Study 3

• Results:
  – New sustainable landscape specifications
  – Soil management and resource recapture program
  – Shift IPM to Arborist
  – Restoring native plant communities and urban forest
  – Client committed to ecological approach
Case Study 4

- Private Home Owner
- Site: 1.5 acre site, San Anselmo
- Need: Restore native plants, coordinate services
Case Study 4

• Process:
  – Soil and landscape assessment
  – Meet and coordinate the team
  – Monthly implementation with each service provider
  – Soil restoration and maintenance modification
  – Removal of invasive non native species
Case Study 4

A & L WESTERN AGRICULTURAL LABORATORIES
1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

REPORT NUMBER: 11-180-116
CLIENT NO: 99999

SEND TO: LINDA NOVY & ASSOCIATES
PO BOX 969
FAIRFAX, CA 94978

SUBMITTED BY: LINDA

DATE OF REPORT: 07/01/11
LAB NO: 55621
SAMPLE ID: 1

Graphical Soil Analysis Report

Cation Saturation (computed)

Percent

Sodium
Potassium
Magnesium
Calcium

2.3
24.9
56.6
1.2

Low
Average
High

0.2

0

100
50
0

Increasing salinity

Increasing need for lime

ECe

L

Ex. Lime

pH

Buffer pH:

6.7

0.2

17.8

6.0

CEC

mg/kg

Soil Fertility Guidelines

CROP: NATIVES

RATES: lb/1000 sq ft

NOTES:

C
MICRONUTRIENTS: Where levels appear to be high, avoid any further applications for the time being. Very
O
high (VH) levels may not necessarily be toxic, but avoid. Maintain correct soil pH.
M
NITROGEN sources include composts and legumes as well as blood meal, cottonseed meal, hoof & horn meal,
F
fish meal, or chicken feather meal. Sodium nitrate is not recommended. Monitor brix levels.
N
POTASH: Composts may be a significant source of potash. Certain sources of sulfate of potash may also be
used, as well as kelp/seaweed products, wood ash, crushed granite and greensand.
T
MAINTENANCE: Split the above amount over the year at a time according to local conditions and
S
requirements. Choose a source that best fits this combination.

<table>
<thead>
<tr>
<th>Element</th>
<th>Lime (T score)</th>
<th>Phosphate P2O5</th>
<th>Potassium K2O</th>
<th>Magnesium Mg</th>
<th>Sulfur SO2-S</th>
<th>Iron Fe</th>
<th>Copper Cu</th>
<th>Boron B</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>70</td>
<td>2.2</td>
<td>3.5</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NaHCO3-P unreliable at this soil pH

Mike Butters, GPa
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Case Study 4

• Results:
  – Coordinated service delivery
  – Soil management, compost, chips and AACT
  – Reduced IPM treatments
  – Restoring native plant communities
  – Client committed to ecological approach
5 Key Points

• Perform a site evaluation for each new project.
• Create a professional network with other service providers. Meet seasonally onsite.
• Educate staff and clients about the ecology of each property.
• Commit to Sustainability and Environmental Restoration.
• Provide ongoing monitoring.
Thank You!