Managed systems have a major role in determining environmental health. Students in this area gain understanding and skills needed to produce plants while protecting the environment. They take courses in soil science, plant development, crop production strategies, weed management and ecology.

### A. Major Courses (15-18 credits)

- **Agro 1660**: First-Year Colloquium/Experience in Agroecosystems Analysis (2 cr, F)
- **Agro 1103**: Crops, Environment and Society (4 cr, F)<sup>E</sup>
- **Agro 3660**: Plant Genetic Resources: Identification, Conservation, and Utilization (3 cr, S)
- **Agro 4096**: Professional Experience – Internship (1-3 cr, F/S) or **Agro 4097**: Undergraduate Research Thesis (1-4 cr, F/S)
- Select one of:
  - CFAN 1501: Biotechnology, People, & the Environment (3 cr, S)<sup>T</sup>
  - CFAN 3001: Pests and Crop Protection (3 cr, S)
  - Agro 3203W: Environment, Global Food Production, and the Citizen (3 cr, S)<sup>P</sup>
  - Agro 4103: World Food Problems (3 cr, F)<sup>P</sup>
- **Agro 4660**: Senior Capstone (2 cr, F)

### B. Communications (4 credits)

- **Writ 1301**: University Writing (4 cr, F/S)<sup>F</sup> or **Writ 1401**: Writing and Academic Inquiry (4 cr, F/S)<sup>F</sup>

### C. Mathematical Thinking (3-4 credits)

- **Math 1142**: Short Calculus (4 cr, F/S)<sup>M</sup>
  or **Math 1031**: College Algebra and Probability (3 cr, F/S)<sup>M</sup>
  or **Stat 3011**: Introduction to Statistical Analysis (4 cr, F/S)<sup>M</sup>

### D. Physical and Biological Sciences (33 credits)

- **Biol 1009**: General Biology (4 cr, F/S)<sup>B</sup>
  or **Biol 1001**: Introduction to Biology I (4 cr, F/S)<sup>B,E</sup>
- **Biol 2022**: General Botany (3 cr, F/S)
- **Biol 3407 or 3408W**: Ecology (3 cr, F/S)<sup>E</sup> (calc pre-req)
  or **ESPM 3108**: Ecology of Managed Systems (3 cr, F)
- **Chem 1061**: Chemical Principles I (3 cr, F/S)
- **Chem 1065**: Chemical Principles Lab I (1 cr, F/S)
- **BioC 2011**: Biochem for Agricultural & Health Sciences (3 cr, F/S) or **BioC 3021**: Biochemistry (3 cr, F/S)
- **Phys 1101W**: Introductory College Physics I (4 cr, F/S)<sup>P</sup>
  or **GCD 3022**: Genetics (3 cr, F/S)
  or **Biol 4003**: Genetics (3 cr, F/S)
- **Soil 2125**: Basic Soil Science (4 cr, F/S)<sup>E</sup>
- **Agro 4005**: Applied Crop Physiology and Development (4 cr, F/S)
  or **Biol 3002**: Plant Biology Function (2 cr, S) and **Biol 3005W**: Plant Function Laboratory (2 cr, S)<sup>W</sup>
  or **Hort 3005W**: Envrn. Effects on Horticultural Crops (4 cr, S)

### E. Emphasis Area Electives (minimum 17 credits)

Emphasis area electives should be chosen in consultation with your faculty advisor to ensure they prepare you for your future career goals or graduate studies.

Take 17 or more credit(s) from the following, including at least one course from each category*. Courses taken to fulfill previous requirements cannot be double counted here:

#### Crop Protection
- **Agro 4505**: Biology, Ecology and Mgmt of Invasive Plants (3 cr, S)
- **EEB 5122W**: Plant Interactions with Animals & Microbes (3 cr, F)<sup>M</sup>
- **Ent 1005**: Insect Biology (3 cr, F)<sup>E</sup>
- **Ent 5211**: Insect Pest Management (3 cr, F)
- **Ent 5341**: Biological Control of Insects and Weeds (3-4 cr, S)
- **PlPa 2001**: Introductory Plant Pathology (3 cr, S)
- **PlPa 5103**: Plant Microbe Interactions (3 cr, S)
- **PlPa 5400**: Principles of Plant Pathology (3 cr, F)

#### Crop Production
- **Agro/Hort 3131 Student Organic Farm Planning, Growing & Marketing (3cr, S)
- **Agro 4605**: Management Strategies for Crop Production (3 cr, F)
- **APS 4072**: What Does it Mean to be Green? (3 cr, F)
- **Hort 5052**: Specialty Greenhouse Crop Production (3 cr, F even yrs)
- **Soil 3416**: Plant Nutrients and the Environment (3 cr, F)

#### Sustainability and the Environment
- **Agro 5321**: Ecology of Agricultural Systems (3 cr, F)<sup>E</sup>
- **ESPM 3221**: Soil Conservation and Land Use Mgmt (3 cr, S)
- **ESPM 3612W**: Soil and Environmental Biology (3 cr, F)<sup>W</sup>
- **Hort 5031**: Organic Viticulture & Fruit Production (2 cr, F odd yrs)
- **Hort 5032**: Organic Vegetable Production (3 cr, S even yrs)
- **Hort 5071**: Restoration and Reclamation Ecology (3 cr, F)<sup>E</sup>

#### Taxonomy and Systematics
- **Agro 2501**: Plant ID Urban & Rural Landscapes (2 cr, F even yrs)
- **Ent 5021**: Insect Taxonomy and Phylogeny (4 cr, S)
- **Ent 5371**: Principles of Systematics (3 cr, S)
- **PBio 4321**: Minnesota Flora (3 cr, F)

* Note: a number of these courses may require additional prerequisites not met through the major. Check the course catalog or consult with your faculty advisor to plan accordingly.
F. Liberal Education Requirements and Themes (15-24 credits)

Students are strongly encouraged to take classes that fulfill multiple liberal education and theme requirements. Students must complete all Core requirements and four of the five Theme requirements.

**Completed through required coursework:**

- **F** – Freshman Composition Requirement
- **M** – Mathematical Thinking Core Requirement
- **B** – Biological Science w/ Lab Core Requirement
- **P** – Physical Science w/ Lab Core Requirement
- **E** – Environment Theme

**Possibly completed through required coursework:**

- **GP** – Global Perspectives Theme (3 cr) *(completed if taken Agro 3203W or Agro 4103)*
- **TS** – Technology and Society Theme (3 cr) *(completed if taken CFAN 1501)*

**Most likely NOT completed through required coursework:**

- **SS** – Social Science Core (3 cr)
- **L** – Literature Core (3 cr)
- **AH** – Arts/ Humanities Core (3 cr)
- **HP** – Historical Perspectives Core (3 cr)
- **DSJ** – Diversity and Social Justice in the US Theme (3 cr)
- **CIV** – Civic Life and Ethics Theme (3 cr)

G. Writing Intensive Requirements

Required: 4 WI courses, 2 of them 3xxx OR 4xxx, one in your major.

- **X** Phys 1101W *(completed if Agro 3203W taken)*
- *(completed if Biol 3005W taken)*
- *(completed if Hort 3005W taken)*
- **Additional writing intensive course**

I. Free Electives (21-34 credits)

Students are encouraged to make choices that strengthen their expertise in an area and/or provide comparative understanding from another culture or discipline. To this end, students should strongly consider using free electives to complete a University minor, study abroad experience, or a student designed content area. Students construct these expertise areas with the help of their faculty advisors.

**Please note:**

Students are strongly encouraged to have an international experience before graduation. Courses completed during an international experience (study, work, volunteer, research) can meet program requirements, liberal education requirements, and/or electives. Discussion with an advisor prior to commencing an international experience is required to plan how courses tie into the APS program and Agroecology emphasis area.
### APS: Agroecology Area of Emphasis

#### Suggested 4-Year Plan

(This is just one possible scenario for completing this curriculum in four years. There are many other possibilities.)

**First Year: 31-33 credits**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 1660 (2) First Year Colloquium</td>
<td>BIOL 1009 (4) General Biology</td>
</tr>
<tr>
<td>AGRO 1103 (4) Crops, Environment, and Society</td>
<td>MATH 1142 (4)* Short Calculus</td>
</tr>
<tr>
<td>CHEM 1061 / 1065 (3/1) Chemical Principles I &amp; Lab</td>
<td>Lib Ed Requirement (3-4) Social Science</td>
</tr>
<tr>
<td>WRIT 1301 (4) University Writing</td>
<td>Elective (3-4)</td>
</tr>
</tbody>
</table>

Total: 14 credits

* Or MATH 1031 (3) or STAT 3011 (4)

**Second Year: 32-36 credits**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioC 2011 (3) Biochemistry for Agricultural and Health Sciences</td>
<td>PHYS 1101W (4) Introduction to College Physics</td>
</tr>
<tr>
<td>Soil 2125 (4) Basic Soil Science</td>
<td>BIOL 2022 (3) General Botany</td>
</tr>
<tr>
<td>Lib Ed Requirement (3-4) Historical Perspectives</td>
<td>CFAN 1501 (3) Biotechnology, People and the Env. <em>TS theme</em></td>
</tr>
<tr>
<td>Lib Ed Requirement (3-4) Literature</td>
<td>Lib Ed Requirement (3-4) Diversity &amp; Social Justice theme</td>
</tr>
<tr>
<td>Elective (3)</td>
<td>Elective (3)</td>
</tr>
</tbody>
</table>

Total: 16-18 credits

* or other TS theme course

**Third Year: 31-35 credits**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 3407 (3) Ecology</td>
<td>AGRO 3660 (3) Plant Genetic Resources</td>
</tr>
<tr>
<td>EMPHASIS (3-4) Taxonomy &amp; Systematics Elective</td>
<td>EMPHASIS (3-4) Crop Protection Elective</td>
</tr>
<tr>
<td>GCD 3022 (3) Genetics</td>
<td>AGRO 4005 (4) Applied Crop Physiology and Development</td>
</tr>
<tr>
<td>Lib Ed Requirement (3-4) Civic Life and Ethics theme and Writing Intensive (if needed)</td>
<td>AGRO 3203W (3) Environment, Global Food Production and the Citizen</td>
</tr>
<tr>
<td>Elective (3)</td>
<td>Lib Ed Requirement (3) Arts/ Humanities</td>
</tr>
</tbody>
</table>

Total: 15-17 credits

**Fourth Year: 28-35 credits**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 4660 (2) Senior Capstone</td>
<td>EMPHASIS: Agroecology Elective (3-4)</td>
</tr>
<tr>
<td>EMPHASIS: Sustainability and the Environment (3-4)</td>
<td>EMPHASIS: Agroecology Elective (3-4) (if need to reach 17 credits)</td>
</tr>
<tr>
<td>EMPHASIS (3-4) Crop Production Elective</td>
<td>Elective (3)</td>
</tr>
<tr>
<td>Lib Ed or Writing Intensive (if needed) or Elective (3-4)</td>
<td>Elective (0-4) as needed to reach 120 total cr</td>
</tr>
<tr>
<td>Elective (3)</td>
<td>Elective (3)</td>
</tr>
</tbody>
</table>

Total: 14-17 credits

* AGRO 4096 or AGRO 4097 should be taken fall or spring junior year even if work is actually done during summer months (add 1-4 credits)