

2012 NASP IMDS Instructional Plan

Title: Inventory/Monitoring and Decision Support (IMDS)
Dates: September 10-21, 2012
Class Location: Peavy Hall 272, Oregon State University, Corvallis

PERSONNEL

Coordinator/Instructor: JB - **John Bailey** - Associate Professor
 Instructor: LG – **Lisa Ganio**, Associate Professor
 Instructor: CM - **Claire Montgomery**, Professor
 Instructor: KB - **Kevin Boston**, Associate Professor
 Instructor: ESM – **Erin Smith-Mateja** , USFS-FVS Group
 Instructor: NR – **Nicole Younger**, Inventory Forester
 Instructor: JS - **John Sessions**, Professor

COURSE OVERVIEW

This course spans two weeks (76 hours) and includes repeated progress assessments, an integrative project (and presentation), and a final exam. It addresses the eight basic NASP/IMDS topics at the specified contact-hour intensity (Table 1). Instructors are identified by initials and color (above). The weekend field trip is not shown but is a recommended activity for all participants for reinforcement of IMDS concepts and general team building.

Table 1. Schedule overview by topic and instructor.

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1 (9/10 - 9/15)	JB – Welcome; LG – Statistics overview (a.m.); JB- From samples to models to plans (p.m.)	LG - Sampling and statistical inference (a.m.); CM – Investment analysis principles (p.m.)	LG – Planning for inventories and monitoring (a.m.); CM – Social cost/benefit analysis (p.m.)	LG – Simple Regression and Covariance (a.m.) KB - Legal requirements for planning (p.m.)	KB - Legal requirements – Part II (a.m.); JB – Density and productivity metrics (p.m.)
Week 2 (9/17 – 9/21)	JS - Forest Regulation w/ exercise (a.m.); ESM- G&Y models intro; FVS start-up (p.m.)	ESM- G&Y models cont.; FVS project work (a.m.); JS - Forest Planning tools (p.m.);	NY – Inventory and monitoring principles (a.m.); JB – Field data collection, mgt. and use (p.m.)	JB – Modeling, projection and DMDs (a.m.); NY – Inventory and monitoring uses (p.m.)	JB – Final quiz and project presentations! + evaluations (1/2 day only)

The following instructional plan details each day by instructor, as well as general lecture and exercise intervals, describing:

- **learning objectives** (LO) for specific in-class/lab activities and field,
- content and flow of **lectures, computer labs** or **field exercises**, and
- important summary ideas and **discussion questions**.

Each day begins at 8:00 am in the OSU classroom (Peavy Hall 272) and concludes at or before 5:00 pm. Breakfast is provided at the hotel prior to class (*via* a coupon); there is one hour available for lunch at noon, typically using a local dining card. We will often do an organized dinner at 6:30 pm, or participants can make their own plans on their own schedule.

DAILY PLAN – WEEK #1; MONDAY

8:00 am in Peavy Hall, room 272 (“PVY272”), on the OSU campus

Welcome and introductions – How this works. What you need to learn. Expectations?

Monday morning: Statistics Overview: Statistics and Sampling for Mensuration – Lisa Ganio

LO: Basic terms and concepts in forest mensuration, sampling and statistics

LO: Central tendency, variability, and complex distributions

Lecture blocks: 8:30-12:00, with two *Morning Breaks*

- 1) Concepts of sampling and statistics – what do you know and use already?
 - a. Means and standard deviations; confidence intervals
 - b. Continuous vs. discrete variables
 - c. Replication and control – statistical tests; “significance”
- 2) Central tendency and variability measures; probability theory
- 3) Numerical sampling for ‘the now’ – proportional to frequency vs. appraisal sampling for ‘current value’ – proportional to size
- 4) Types of errors and setting up hypotheses (adaptive management)

Discussion points:

- 1) What should we worry about – bias or precision?
- 2) Replication and pseudo-replication – what’s up with that?
- 3) What do the distributions of common mensuration variables look like?

LUNCH CATERED TO PVY 272**Field Trip to McDonald-Dunn Forest: 1:00-5:00 – John Bailey**

LO: Basic terms and concepts in forest mensuration, sampling and statistics

LO: Measures of tree productivity, site index and site class; site index charts

Instructional Points:

- 1) Review of mensuration techniques (types and oddities)
- 2) Introduction to PNW trees and forest types, as well as regional management patterns
- 3) Stratifying by stand types and quantifying stand dynamics
- 4) Silviculture research plots relative to current management trends

Discussion points:

- 1) What, if anything, makes silviculture and IMDS unique in the PNW?
- 2) How will you carry this information back to your home offices?

5:00 Drop off at the hotel;

Group dinner at 6:30 in Downtown Corvallis (American Dream Pizza: 214 SW 2nd St.)

DAILY PLAN – WEEK #1; TUESDAY

<8:00am Quiz (PVY 272) – on statistics; 20 points>

Tuesday morning: Sampling and Statistical Inference – Lisa Ganio

LO: Sampling schemes and intensities, including permanent plots

LO: Sample size, stratification and proportional allocation of plots

Lecture blocks (PVY 272): 8:10-12:00, with two *Morning Breaks*

- 1) Random vs. Systematic sampling
- 2) Fixed-area, Variable-Radius and Line Intercept sampling
- 3) Stratification: purpose and techniques
- 4) Optimal allocation for sampling – sample size

Discussion points:

- 1) When can/should you stratify in your sampling design?
- 2) Temporary vs. permanent plots?
- 3) How do we make decisions in light of uncertainty and missing data?
- 4) The roles of hypothesis testing and statistical tests in forest management?

LUNCH AT MARKETPLACE WEST (campus dining cards)

< Economics assignment **DUE**>

Tuesday afternoon: Economic Principles – Claire Montgomery

LO: Project-level investment analysis

LO: Finding economics data on the web

Lecture blocks (PVY272):

- 1) 1:00-2:30 – Arithmetic of investment analysis, then *Snack Break*
 - a. Simple discounting and compounding
 - b. Series Equations
 - c. Inflation
- 2) 2:45-5:00 – Using investment analysis
 - a. NPV, BCR, IRR
 - b. Discount rates

In-class exercises (please bring your laptops or share)

- 1) Compute nominal and real log price growth rates from ODF log price data.
- 2) Finding forest economics data on the web.

Discussion points:

- 1) How can investment analysis be used in forest planning?

5:00 return to the hotel; dinner on you own with campus dining card or individually on per diem

DAILY PLAN – WEEK #1; WEDNESDAY
<8:00 am Quiz (PVY 272) – on statistics; 20 points>

Wednesday morning: Planning Inventories and Monitoring – Lisa Ganio

LO: Introduce forest inventories and current/appropriate uses for multiple objectives

LO: Compare and contrast types of forest inventories and their appropriate use

LO: Large-scale inventory and monitoring designs and techniques

Lecture blocks (PVY 272): 8:10-12:00, with two *Morning Breaks*

- 1) Inventory principles and types; what do you want to know?
- 2) Large-scale inventory and monitoring designs – monitoring for multiple objectives
- 3) Data sources for silvicultural and yield estimation

Discussion points:

- 1) How do you choose one inventory or monitoring approach over another?

LUNCH AT MARKETPLACE WEST (campus dining cards)

Wednesday afternoon: Economic principles and cost-benefit – Claire Montgomery

LO: Basic terms and principles of forest economics

LO: Social cost benefit analysis and what it entails

Lecture block (PVY272): 1:00-2:45, then *Snack Break*

- 1) Cost-Benefit Analysis (concepts and principles)
 - a. What is economics about?
 - b. The general framework of cost benefit analysis
- 2) Measurement and adding up issues
 - a. Placing a dollar value on things that matter
 - b. Adding up over people – fairness and “Who pays?”
 - c. Adding up over time – discounting issues

Lecture block (PVY272): 3:00-5:00

- 1) Finding minimum cost stand management regimes that meet non-timber criteria
- 2) Evaluating the impact of active management for old forest structure on WP markets

Discussion points:

- 1) What role(s) can economics play in public forest land management decisions?
- 2) What cost benefit analysis can and cannot tell policy makers and forest managers.
- 3) What does the discount rate signify to a private timberland owner? ... to a public agency managing forest land on behalf of society?

6:30 Group dinner at El Sol de Mexico restaurant on 9th St.

DAILY PLAN – WEEK #1; THURSDAY

<8:00 am Quiz (PVY 272) – on inventories; 20 points>

Thursday morning: Regression and Covariance – Lisa Ganio

LO: Relevant statistical concepts to real inventory and monitoring situations

LO: Correlation and regression analyses – computer lab exercises

LO: Relationships among time, tree growth, mortality and economics

Lecture Blocks (PVY 272): 8:10-12:00, with two *Morning Breaks*

- 1) Correlation vs. ratio and regression estimation – the **principles**
- 2) Regression terminology and concepts: Simple linear regression and multiple regression

Discussion points:

- 1) Causation vs. correlation – what IS the price of tea in China?
- 2) How do you correctly interpret information from simple- and multiple linear regressions?

Computer exercises (PVY 240): [working with regression](#)

LUNCH – pizza in the Peavy Courtyard (from Woodstock's)**Thursday afternoon: Planning and Legal Requirements for Planning I – Kevin Boston**

LO: Legal context for federal land management and planning

LO: Relationship between forest activities and other Federal Acts

LO: Implications for current Forest Planning activities

Lecture blocks (PVY 272): 1:00-5:00; with 2:45 *Snack Break*

- 1) Review and discussion of “**The Acts**” that influence forest planning directly
 - a. National Forest Management Act
 - b. Federal Land Policy and Management Act
 - c. Oregon and California Act
 - d. National Environmental Planning Act

Discussion Points:

- 1) What are the requirements under these various Acts, and how have they been interpreted by the Agency through the CFR's?

5:00 return to hotel; Dinner on you own, with campus dining card or individually on per diem

DAILY PLAN – WEEK #1; FRIDAY

<8:00 am (PVY 272) – 2nd attempt at economics assignment due; 20 points>

Friday morning: Legal Requirements for Planning II – Kevin Boston

LO: Legal context for federal land management Planning –

LO: Relationship between forest activities and other Federal Acts

LO: Implications for current Forest Planning Activities

Lecture Blocks (PVY 272): 8:10-12:00, with 10:00 *Morning Break*

- 1) Review of The Acts that influence forest planning activities indirectly
 - a. Endangered Species Act
 - b. Clean Water Act – non point and point source
 - c. Clean Water Act – wetlands issues
- 2) Existing cases that are influencing forest planning activities

Discussion Points:

- 1) What are the requirements under these various Acts, and how have they been interpreted by the Agency through the CFR's?
- 2) How are the interpretations and implementations of the acts changing with recent court rulings and agency rulings?

LUNCH AT MARKETPLACE WEST (campus dining cards)**Friday afternoon: Site Productivity, Density and Growth/Yield – John Bailey**

LO: Basic terms and principles of forest economics

LO: Factors impacting site productivity in given situations

LO: Explain the importance of manipulating site productivity and stand density

LO: Terms, components and processes important to tree and stand growth

Lecture blocks (PVY 272): 1:00-5:00, with a 3:00 *Snack Break*

- 1) Components of stand growth (birth, growth, and mortality,)
- 2) Basic concepts of site productivity and density as determinates of stand growth:
 - a. Physiological mechanisms for growth, mortality, and competition
 - b. Measures of site quality (direct and indirect); site index theory and use
 - c. Measures of density; stand vs. tree plasticity and value
- 3) Review of tree growth – primary and secondary – and its measurement/analysis
- 4) PAI and MAI relative to stand dynamics; management options

Discussion points:

- 1) **Why** are productivity and density so fundamental to management?
- 2) How do inventory procedures impact forecasts of future stand conditions?

Leave for the Field Trip to the beautiful Oregon Coast

Coast Weekend Escape

Friday:

Field trip: beginning **5:00pm**, with travel snacks

- 1) Seeing forest management and stand development stages in the Oregon Coast Range.

Discussion points:

- 1) What tools are available to manage density and mortality in Douglas-fir forests?
- 2) How do these observations relate to “home” forests?

*6:30pm Group dinner at **Mo's** (seafood);*

Saturday:

Buffet breakfast at Shilo Inn (available 6:30-7:45).

8:00am: departure for field trip into the Siuslaw National Forest to see:

- thinning demonstrations (morning host: Colin Crook), and
- Cape Perpetua National Scenic area (afternoon for open wandering)

Sandwich lunches at Cape Perpetua

6:30pm Group dinner at Rogue Brewery (buffet style) back in Newport with brewery tours and shopping time. 9:00pm bonfire outside the Shilo Inn

Sunday:

Breakfast at the Shilo Inn restaurant, charged to the room (whenever you get up).

11:00am check-out and load vehicles; then three hours of free time (*lunch on your own*) in Newport until our return trip to Corvallis,

2:00pm Leave Shilo Inn parking lot for Corvallis Garden Hilton, arriving 3:30ish

Dinner on you own, with dinning card or individual on per diem

DAILY PLAN – WEEK #2; MONDAY

<8:00 am (PVY 272) – policy assignment due; 20 points>

Monday morning: Forest Regulation – John Sessions

- LO: Basic sustained yield principles related to timber resources and law, LSY
- LO: Calculate and compare area and volume control
- LO: Basic harvest schedules and allocation problems
- LO: Regulation concepts with economic and sustainability principles

Lecture blocks (PVY 272): 8:10-9:45, then a *Morning Break*

- 1) Sustained yield **definitions and principles**; even/uneven-aged management
 - a. Area vs. volume regulation – where and when
- 2) Harvest scheduling and allocation; timber and non-timber resources
- 3) Spatial vs. non-spatial analysis

Computer exercises (Peavy Hall, room 240): 10:00-12:00

- 1) Binary-search forest regulation exercise – area control, volume control
- 2) Non-spatial regulation with timber/non-timber outputs

Discussion points:

- 1) What is the desired future condition and dynamics?
- 2) How does one measure/inventory if one plan is better than another?
- 3) Balancing the means with the ends.

LUNCH AT MARKETPLACE WEST (campus dining cards)**Monday afternoon: Modeling – Erin Smith-Mateja and John Bailey**

- LO: Compare growth models and project future stand conditions
- LO: Components of stand growth and yield tables
- LO: Example data sets including all the above elements – computer lab exercises

Lecture blocks (PVY 272): 1:00-2:45, then *Snack Break*

- 1) **Modeling principles and limits**
- 2) **Types of growth models: physiological vs. empirical; choosing the “right” model**
- 3) Introduction to the Forest Vegetation Simulator

Discussion points:

- 1) Models vs. the real world and why the two should **not** be confused
- 2) Why does model behavior typically stabilize over time and space?

Computer exercise (PVY 240): 3:00-5:00 – Erin Smith-Mateja

- 1) Explanation of FVS input database
- 2) Begin FVS simulation exercises

Discussion points:

- 1) Are our modeling tools adequate to address current issues in forest management? What do we do well and where do we need improvement?

6:30 Group dinner at local Laughing Planet, downtown Corvallis

DAILY PLAN – WEEK #2; TUESDAY

< 8:00 am Quiz (PVY272); on forest regulation; 20 points >

Tuesday morning: Modeling (con't) – Erin Smith-Mateja

LO: Example data sets including all the above elements – computer lab exercises

LO: Compare growth models and project future stand conditions

Lecture blocks (PVY 272): 8:15-9:00

- 1) Addressing common issues about FVS modeling
- 2) **Project assignment – John Bailey**

Computer exercise (PVY 240): 9:00 -12:00, with a 10:00 *Morning Break*

- 1) Complete FVS exercises
- 2) Begin model runs for the **integrative group project**

Discussion points:

- 2) What are the differences among FVS variants, and why?

LUNCH AT MARKETPLACE WEST (campus dining cards)**Tuesday afternoon: Forest Planning – John Sessions**

LO: Basic principles of land use planning and forest planning

LO: Vegetation management and planning decisions at multiple scales

LO: Connect natural resource policy and social impact analyses

LO: Decision support modeling appropriate for Forest Planning issues

LO: Integrate various inventory and socio-economic analyses

Lecture blocks (PVY 272): 1:00-2:45, then a *Snack*

- 1) Standard frameworks for **decision making**
- 2) Prescriptions – the key building blocks
- 3) Spatial goals and landscape planning
- 4) Available tools for forest planning

Computer exercises (PVY 240): 3:00-5:00

- 1) Planning for a *small* watershed – an example

Discussion points:

- 1) Why plan at all, and what is THE fundamental planning unit in forestry?
- 2) How do we balance growth and yield of timber vs. non-timber resources?
- 3) Is there a difference between a “goal” and a “constraint?”

Dinner on you own, with campus dining card or individually on per diem

Model runs for homework

DAILY PLAN – WEEK #2; WEDNESDAY

<8:00 am Quiz (PVY 272); on forest planning; 20 points>

Wednesday morning: Forest Monitoring – Nicole Younger

LO: Basic terms and principles of monitoring relative to forest planning

LO: Effectiveness, implementation and validation monitoring

LO: Analyze and interpret monitoring data and incorporate into Forest Plan revisions

Lecture blocks (PVY 272): 8:15-12:00, with a 10:00 *Morning Break*

- 1) Monitoring: **baselines and statistics** – critical elements; types and scales
 - a. Implementation and effectiveness monitoring
 - b. Compliance and validation monitoring – interpreting data
- 2) Methods for monitoring and updating inventory estimates
 - a. Setting monitoring **objectives**
 - b. Data sources for change detection
 - c. Stand-based and strata-based yield curves

Discussion points:

- 1) How does monitoring fit into the big picture around the Agency?
- 2) Are the desired results being achieved currently relative to NEPA and such?

LUNCH AT MARKETPLACE WEST (campus dining cards)**Wednesday afternoon field trip (1:00pm): Data Collection and Management – John Bailey**

LO: Field data collection, management and analyses

LO: Synthesizing data/information into silvicultural prescriptions

Instructional blocks (in the field with surface fuels/carbon data collection):

- 1) Planning for data collection: preparing data sheets (paper vs. electronic)
- 2) Field data management and security
- 3) Including **meaningful data summaries** and figures into prescriptions
 - a. age distributions and stand tables RULE!
- 4) Identifying thresholds and patterns – even-aged and uneven-aged distributions

Discussion points:

- 1) Common pitfalls to field data collection and use in prescriptions.
- 2) Given the silvicultural toolbox, what data and information do you need for your sites?

6:30 Group dinner at a Mexican “burrito line” place near campus – Chipotles

DAILY PLAN – WEEK #2; THURSDAY

<8:00am Quiz (PVY 272) – on data and modeling; 20 points>

Thursday morning: Density and Vegetation Models (con't) – John Bailey

LO: Components of stand growth and yield tables

LO: Metrics of growth (e.g., density management diagrams)

Lecture blocks (PVY 272): 8:15-9:45, then *Morning Break*

- 1) Density management diagrams and stand table projection (simple growth models)
- 2) Management impacts on tree and stand structure, value and wood quality

Discussion points:

- 1) What confidence should we have in these simple tools and projections?
- 2) What about potential effects of climate change?

Computer exercise (PVY 240): 10:00 -12:00

- 1) Stand Table Projection
- 2) Work on FVS runs for the Integrated Project

LUNCH AT MARKETPLACE WEST (campus dining cards)**Thursday afternoon: Inventory and Monitoring Needs and Challenges – Nicole Younger**

LO: Information needs assessments (e.g., for adaptive management)

LO: Transition from single samples/inventories to monitoring frameworks

Lecture blocks (PVY 272): 1:00-2:45, with 2:45 *Snack Break*

- 1) Error sources, needs, and challenges
- 2) Concepts and key points to keep in mind

Discussion points:

- 1) What does the future hold for large-scale inventories and monitoring?
- 2) Implications for “adaptive management” arguments?

Project work time (PVY 240): 3:00-5:00

Dinner on you own, with campus dining card or individually on per diem

DAILY PLAN – WEEK #2; FRIDAY

<8:00-8:30am (PVY 272) – DOUBLE Quiz (40 POINTS) on inventory and monitoring>

Friday morning (PVY 272): Integrated Group Project presentations – John Bailey

LO: Cement knowledge through personal examples and project work

8:30-11:00 Group presentations on modeling problem (20 points each)

Approximately 15 minutes per group, plus questions –

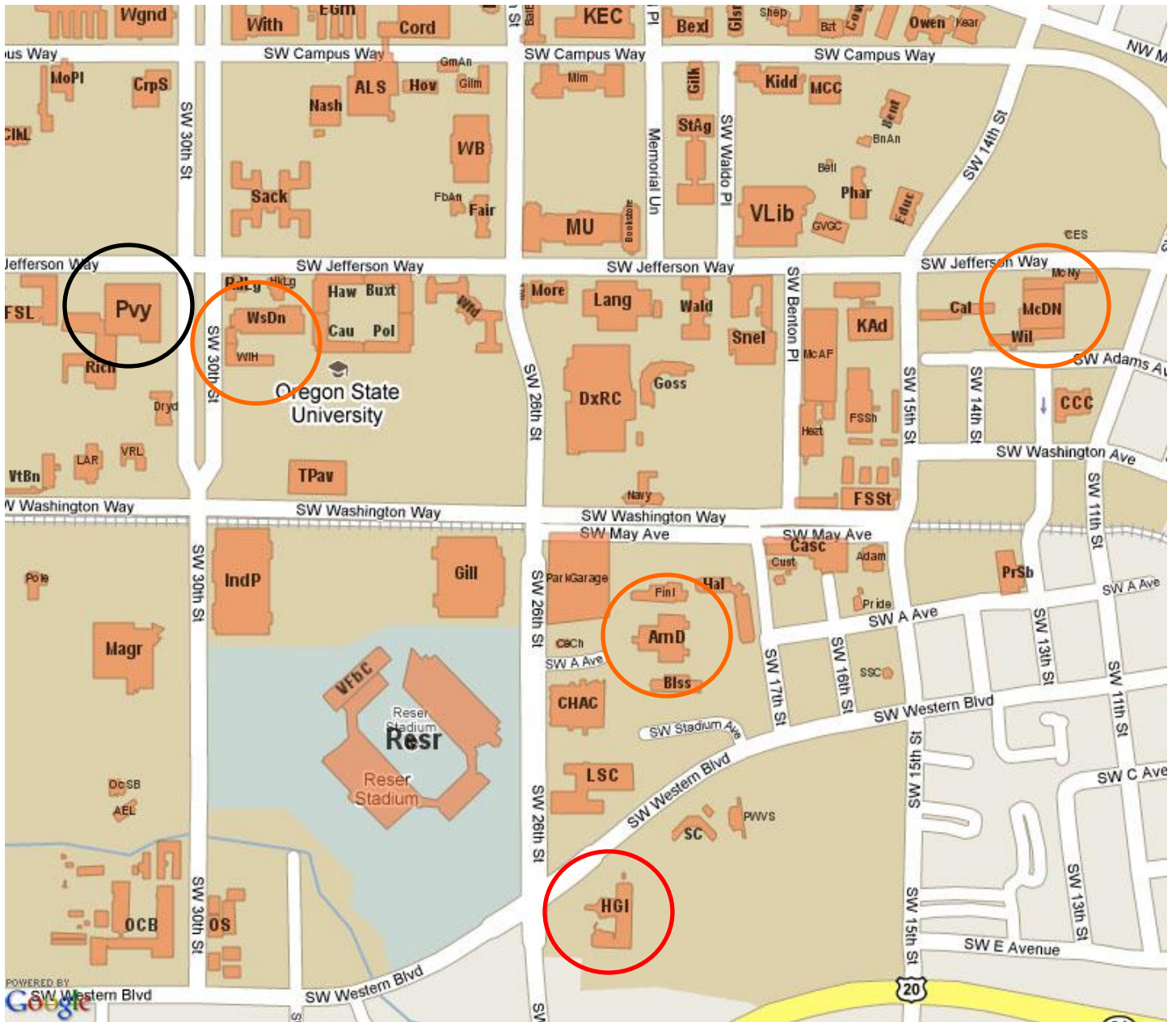
Morning Break at the half-way point

11:00 Course Evaluations and Student Awards

CATERED LUNCH in PVY 272 – with farewells and wishes for safe travel.

Getting home:

Portland departures: HUT shuttle departs Corvallis at 12:00pm, arriving at PDX about 2:30pm



Integrative Group Project (4-person teams)

All silvicultural prescriptions have three fundamental components:

1. A detailed site/stand description with data that is relevant to published and interpreted forest management objectives and likely stand management actions,
2. Component silvicultural activities (tools and techniques) and their direct impacts on stand development and ecosystem processes/services, and
3. Anticipated, longer-term stand development and ecosystem responses following proposed management actions and an analysis of alternatives.

Silviculturists develop and choose their tools/techniques based more on anticipated long-term ecosystem development **RELATIVE TO** the management objectives than on current stand conditions. For this exercise (and to reinforce the learning objectives of the IMDS module of NASP), we will focus on the third and last component using an example stand for a home District within your group. You might look at each and ponder the advantages and disadvantages of each before you choose.

DUE Friday morning of week #2; 10-page maximum plus supporting tables and figures. Your written presentations should have four parts:

Part I. Site/stand description (10 points) – Use summary model output and appropriately computed statistics to synthesize tables and figures that describe your existing stand and its projected development over time in the absence of future management.

Part II. Scoping summary (10 points) – Address the interested publics and summarize three basic areas:

- 1) The extent of the land area of interest,
- 2) Broad planning objectives of the Forest, and
- 3) Relevant laws and anticipated management/environmental issues for the stand.

This scoping effort should conclude with a brief introduction of at least three proposed “alternatives” that span the range of options available to address these management objectives and issues.

Part III. Prescription Alternatives (70 points) – The (obvious) main portion of the project concerns the details associated with three or four silvicultural alternatives and their projected effects of stand growth and development, in general, for the stand. This is the true “prescription”, describing each tool/technique and its application **IN SOME DETAIL** with a comprehensive timeline and justification of the various tools and techniques chosen as they were modeled. Each alternative should have a complete analysis of the long-term development (economic, ecological, and sociological responses) of the stands following implementation of each alternative, but focus attention on the most interesting scenarios and contrasts. This section presents (in detail) all the decisions relevant to land management objectives and environmental issues (i.e., the scoping effort).

Part IV. Record of Decision (10 points) – Create a 1-page decision matrix (scoring) and associated synthesis text that summarizes the pros and cons of all the alternatives (including a “no-action” alternative) for the stand. Consider legal, planning and economic dimensions as well as the basic data (statistics), model runs and silviculture. Assume you’ve done an EA with all consultations for the area.

Your oral presentations (also Friday_morning) should **focus on** Parts III and IV, since you all will only have ~15 minutes to present, and therefore should use only a few slides.