2015 NASP IMDS Instructional Plan

Title: Inventory/Monitoring and Decision Support (IMDS)
Dates: September 14-25, 2015
Class Location: Peavy Hall, Oregon State University, Corvallis

PERSONNEL

Coordinator/Instructor: JB - **John Bailey** - Associate Professor
Instructor: LG – **Lisa Ganio**, Associate Professor
Instructor: GL – **Greg Latta**, Faculty Research Associate
Instructor: ESM – **Erin Smith-Mateja**, USFS-FVS Group
Instructor: MP – **Matt Powers**, Assistant Professor
Instructor: JS - **John Sessions**, Professor
Instructor: JJ - **James Johnston**, Faculty Research Assistant

COURSE OVERVIEW

This course spans two weeks (76 hours total) and includes ***daily*** progress assessments, an integrative group project (and presentation), and a final quiz. It addresses the eight basic NASP/IMDS topics at the specified contact-hour intensity (per 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 to reinforce IMDS concepts and share information.

Table 1. Schedule overview by topic and instructor.

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1 **(9/14 -18)**	JB – Welcomes; LG – Statistics overview (a.m.); JB- From samples to models to plans (p.m. field)	LG - Statistical inference and principles (a.m.); GL – Investment analysis principles (p.m.)	LG – Simple Regression and Covariance (a.m.); ESM- G&Y models intro; FVS start-up (p.m.)	ESM- G&Y models cont.; FVS work (a.m.); MP – Statistics for inventories/ monitoring (p.m.)	MP – Inventory and monitoring principles (a.m.); JB – Density and productivity metrics (p.m.)
Week 2 **(9/21 –25)**	GL – Social cost/ benefit analysis (a.m.); JS - Forest Regulation w/ exercise (p.m.)	MP – Inventory and monitoring uses (a.m.); JB – Field data collection, mgt. and use (p.m.)	JJ – Law and policy for forest planning I (a.m.); JS - Landscape Planning tools (p.m.);	JJ - Law and policy for forest planning II (a.m.); JB – Modeling, projections and display (p.m.);	JB – Final quizzes and project presentations! + evaluations *(1/2 day only)*

The instructional plan on the following pages 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 campus 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

< Statistics pre-work assignment **DUE;** 20 points>

Begins 8:00am in historic Peavy Hall, room 272 ("PVY 272"), on the beautiful OSU campus

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Welcomes and introductions: 8:00-9:30 – John Bailey

1) Schedule, process, logistics and rules; questions; what you should learn; expectations?
2) **Project Assignment** – identify and form groups, schedule work

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: 10:00-12:00

1) Concepts of statistics – what do you know and what do you use?
    a. Characterizations of distributions: Continuous vs discrete; shapes and names
    b. Descriptive measures
2) Measures of central tendency: mean, median, mode
3) Measures of spread; standard deviation, min/max, range; quartiles are good
4) Accuracy and Precision : Comparison vs estimation, representation and sampling
    a. Achieving representative samples
    b. Bias is a long-run property – using unbiased statistics

Ideas for discussion:

1) How can I tell if my data are normally distributed?
2) How does the size of my sample affect my ability to characterize the distribution?
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:

3) Review of mensuration techniques (types and oddities) and stand dynamics
4) Introduction to PNW trees and forest types, as well as regional management patterns
5) 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: Basic terms and concepts in forest mensuration, sampling and statistics
LO: Relevant statistical concepts to real inventory and monitoring situations

Lecture blocks (PVY 272): 8:15-12:00, with a *morning break*

1. How do we know if a statistic is precise? What are sampling distributions?
2. Confidence interval for the mean and the standard error
3. Testing a statistical hypothesis: a T-test.
4. Achieving pre-set precision – the sample size equation

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

Discussion points:

1) What is the difference between a standard error and a standard deviation?
2) Can we change the distribution of our data by increasing the sample size?
3) Can we change the sampling distribution of a mean by increasing the sample size?
4) Why is the purpose of our sampling needed to design the sampling plan?

LUNCH - QDOBA DELIVERY TO PVY 272

Tuesday afternoon: Economic Principles and Investment Analysis – Greg Latta

LO: Project-level investment analysis
LO: Finding economics data on the web

Lecture blocks (PVY 272):

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

Computer Exercises (Peavy Hall, room 240): 3:00-5:00

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

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DAILY PLAN – WEEK #1; WEDNESDAY

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

Wednesday morning: Simple 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 (PVY 272): 8:15-9:45

1) Introduction to regression – describing trends in means
2) Deciding if linear regression is an appropriate description
3) Predicting means versus predicting observations
4) Using regression to increase precision

Discussion points:

1) How many distributions does one regression line describe?
2) Why do we make the assumption that all the regression distributions have the same variance?

9:45-10:00 *Break*

Computer Exercises (PVY 240): 10:00-12:00; *working with regression*

LUNCH - JIMMY JOHN'S DELIVERY TO PVY 272

Wednesday afternoon: Modeling – Erin Smith-Mateja

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) Why models are used
2) Types of Forest Growth Models
3) Describe the primary components of an individual tree model
4) Introduction to the Forest Vegetation Simulator

Computer exercise (PVY 240): 3:00-5:00; *review of FVS*

1) 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 **El Sol de Mexico** restaurant (1597 NW 9th St.)*

DAILY PLAN – WEEK #1; THURSDAY

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

Thursday 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 review/updates/Q&A – 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 – pizza in the Peavy Courtyard (from Woodstock's Pizza)

Thursday afternoon: Statistics for Inventories and Monitoring – Matt Powers

LO: Introduce forest inventories and current/appropriate uses for multiple objectives
LO: Relevant statistical concepts to real inventory and monitoring situations

Lecture blocks (PVY 272): 1:00-5:00, with a *snack break at 2:45*

1) The role of randomization and replication in producing accurate and precise statistical descriptions for inventories/monitoring
2) Developing strategies for multiple objectives; considerations of scales and sample sizes
3) Related measurements: linear and non-linear correlations
4) Images and statistics to describe correlations
5) Introduction to regression

Discussion points:

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

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

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DAILY PLAN – WEEK #1; FRIDAY

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

Friday morning: Forest Inventory and Monitoring Principles – Matt Powers

LO: Sampling schemes and intensities, including permanent plots
LO: Sample size, stratification and proportional allocation of plots

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

1. Sources of sampling error
2. Sampling designs (simple, systematic, stratified, double, cluster, and multi-stage)
3. Plot design (fixed vs. variable radius, size, nested, edge effect)
4. Optimal allocation for sampling – determining sample size

Discussion points:

1. When can/should you stratify your sampling design?
2. What about 3P sampling and inventories?
3. What do you see the future holding for large-scale inventories and monitoring?

LUNCH – Barbeque delivery

Friday afternoon: Site Productivity, Density and Growth/Yield – John Bailey

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): 1:00-4:00, 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 **4:00pm**, 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);*
9:00PM Bonfire on beach near Shilo Inn

Saturday:

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

8:00am: departure for field trip (hosts: **Central Oregon Coast Ranger District**) We will go into the Siuslaw National Forest to see:

- Stewardship commercial thinning sales (for promoting late-successional reserve habitat under the Northwest Forest Plan), and
- Cape Perpetua National Scenic area (for recreation planning and general afternoon open wandering)

Sandwich lunches at Cape Perpetua

6:30pm Group dinner at Rogue Brewery back in Newport, with brewery tours and shopping time.

Sunday:

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

11:00am check-out and load vehicles; then four hours of free time (*lunch on your own*) in Newport until your return trip to Corvallis, which can be independent of my trip!

3:00pm Leave Shilo Inn parking lot for Corvallis Garden Hilton, arriving 4:00ish

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

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DAILY PLAN – WEEK #2; MONDAY

<8:00 am Quiz turn-in (PVY 272) – economics assignment DUE; 20 points>

Monday morning: Economic Principles and Cost-Benefit Analysis – Greg Latta

LO: Basic terms and principles of forest economics
LO: Social cost benefit analysis and what it entails

Lecture block (PVY 272): 8:15-10:00, with *break*

1) Cost-Benefit Analysis (concepts and principles)
2) Measurement and "adding up" issues
   a. Placing a dollar value on things that matter
   b. Adding up over people – fairness; adding up over time – discounting issues

Lecture block (PVY 272): 10:15-12:00

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 public *vs*. private timberland owner?

LUNCH AT MARKETPLACE WEST (campus dining cards)

Monday afternoon: Forest Regulation – John Sessions

LO: Basic sustained yield principles related to timber resources and law, LTSY
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): 1:00-2:45, then a *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): 3:00-5:00

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.

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

DAILY PLAN – WEEK #2; TUESDAY

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

Tuesday morning: Inventory and Monitoring uses – Matt Powers

LO: Information needs assessments (e.g., for adaptive management)
LO: Transition from single samples/inventories to monitoring frameworks
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 block (PVY 272): 8:15-11:00, with *break*

1) Types of monitoring
    a. Implementation, effectiveness, compliance, validation, growth & yield, and change monitoring
    b. Design elements of monitoring: establishing the objective, temporal and spatial scales, baselines, measurement precision, and analysis
2) Monitoring as a component of adaptive management
3) Monitoring and the LMP/RMP process
    a. Assessment, planning, and monitoring phases
    b. Key elements of a monitoring plan: goals/objectives/desired condition, monitoring questions and indicators
    c. Documentation in monitoring programs

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?
3) How do we design a monitoring plan that is adaptable to future technology and policy changes?

LUNCH (catered box lunches)

Tuesday afternoon field trip (11:00am): Field 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/regeneration 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?

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

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DAILY PLAN – WEEK #2; WEDNESDAY

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

Wednesday morning: Policy and Legal Requirements for Planning I – James Johnston

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): 8:15-12:00; with *Breaks*

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. National Environmental Planning Act

LUNCH AT MARKETPLACE WEST (campus dining cards)

Wednesday 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?"

*6:30 Group dinner at a Mexican "burrito line" place near campus – **Chipotles***

DAILY PLAN – WEEK #2; THURSDAY

<8:00am Quiz (PVY 240) – on forest planning; 20 points>

Thursday morning: Planning and Legal Requirements for Planning II – James Johnston

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 240): 8:15-12:00; with *Breaks*

2) *Continue* review of "The Acts" that influence forest planning activities indirectly
    d. Endangered Species Act
    e. Clean Water Act – non point and point source
    f. Clean Water Act – wetlands issues
3) 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)

Thursday afternoon: 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)

Computer exercise (PVY 240): 1:00-5:00, with *breaks*

1) Stand table projection (as a simple growth model)
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?

Work on FVS runs for the **Integrated Project**

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

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DAILY PLAN – WEEK #2; FRIDAY

<8:00am Quiz – on law and policy; 20 points>

(LaSells-Stewart Center)

Friday morning: Integrated Group Project presentations – John Bailey

LO: Cement knowledge through personal examples and project work

8:15-11:00 Group presentations on modeling problem (20 points each)

15 minutes per group, plus questions – *Morning Break* at the half-way point

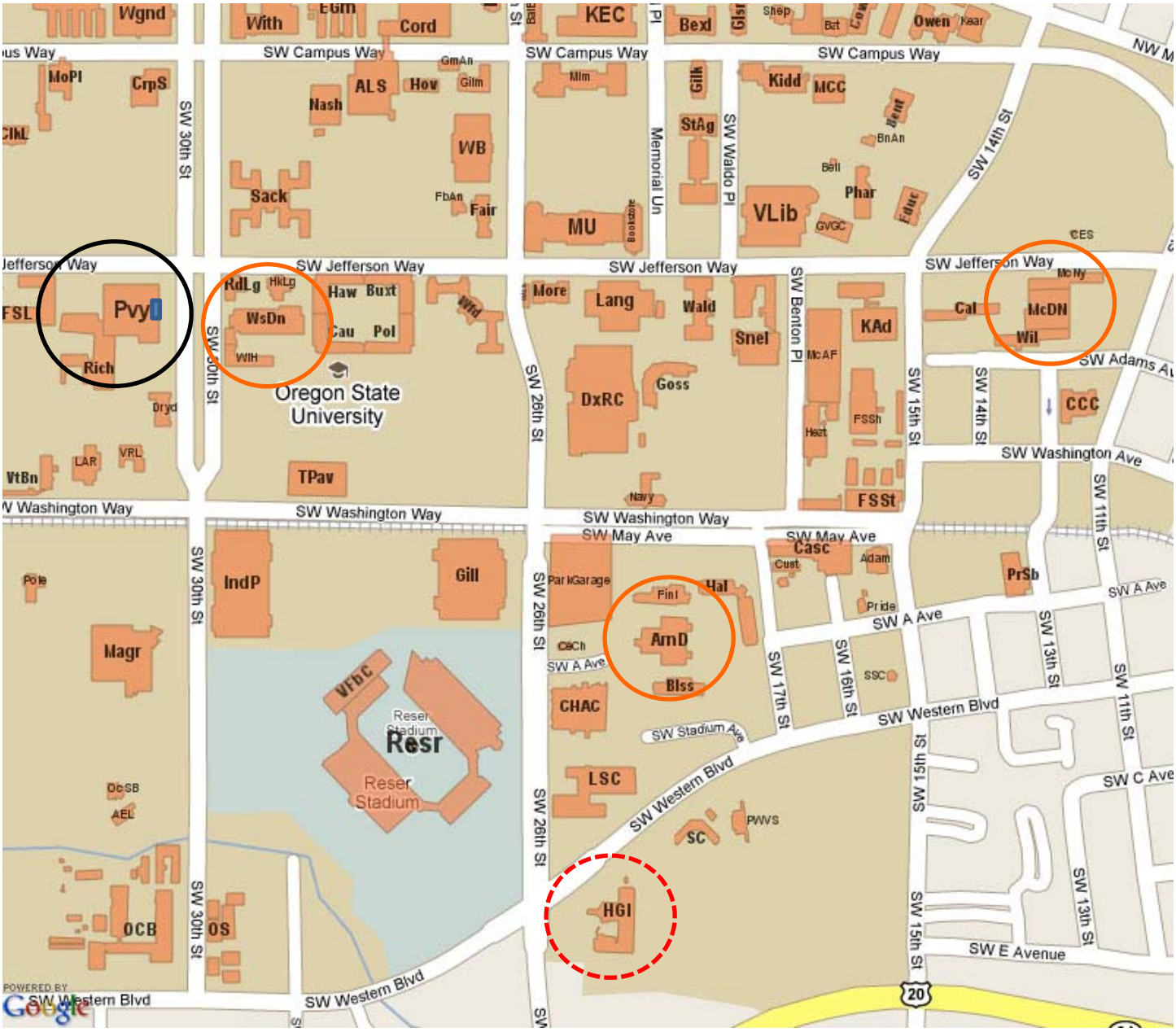
<Written Group Projects DUE (100 POINTS)>

11:00 Course Evaluations and Awards

BOX LUNCHES (sandwiches) – with farewells and wishes for safe travel.

Getting home:

Portland departures: HUT shuttle departs Corvallis at **12:00pm**, arriving at PDX about 2:30pm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SW Campus Way
SW Jefferson Way
SW Washington Way
SW May Ave
SW A Ave
SW Western Blvd
SW Stadium Ave
SW C Ave
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SW 11th St
SW Waldo Pl
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Memorial Un
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Kidd
MCC
VLib
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Educ
GVGC
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Bell
RdLg
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Buxt
WsDn
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Goss
KAd
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Wi-Fi Access:

OSU CONFERENCE CENTER
User: 08Sept21
Password: orangeAardvark
Log onto: **Guest Conference** and select: **Local Data Base** (not ONID)
Valid Sept. 08-21, 2014

OSU CONFERENCE CENTER
User: 22Oct05
Password: shakyPanda
Log onto: **Guest Conference** and select: **Local Data Base** (not ONID)
Valid Sept. 22 – Oct.5, 2014

Classmate Emails:

Integrative Group Project (4- or 5-person teams by region)

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; 20-page maximum plus supporting tables/figures from the model runs. 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 (No Action).

Part II. Scoping summary (10 points) – Summarize the interested publics that you will need to engage, appropriate policies and procedures, and summarize three basic areas:

1) The extent of the land area of interest,
2) Broad planning objectives of the Forest, and
3) Specific 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 main portion of this project concerns the details associated with 4-5 silvicultural alternatives and their projected effects on growth and development, in general, for the stand – one each per group member independently. This is the true "prescription", describing each tool/technique and its application 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 ≥50-year development (economic, ecological, and sociological responses) following implementation of the treatments, but focus attention on the most interesting scenarios. This section should consider all the decisions relevant to land management objectives and other scoping issues.

Part IV. Record of Decision (10 points) – Create a 1-page decision matrix (scoring) and associated synthesis text on a second page that summarizes the pros and cons of all alternatives (including a "no-action" alternative from the site description) 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 (Friday morning; 20 points) should **focus on** Parts III and IV after a quick introduction of I and II, since you all will only have 15 minutes to present; therefore, you should use only a few slides per alternative, so get to the point (*and practice it*).