

Ecosystem Services from Family Forestlands

Graduate Seminar and Research Fellow Final
Report for the American Forest Foundation

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INTRODUCTION

In 2009 the Institute for Natural Resources (INR) and Oregon State College of Forestry (CoF) contracted with the American Forestry Foundation (AFF) to conduct a graduate research seminar focused on policy development for enhancing provision of ecosystem services from family forestlands, and to launch an online seminar for students, forest owners, and resource professionals. The graduate seminar, held during fall term 2009 at the Oregon State University campus, brought together 10 masters and PhD students from Oregon State University and the University of Oregon.

The seminar focused on the ecological, social and policy dimensions of ecosystem services and market transactions involving ecosystem services from family forestlands. It was organized into five different units (Socio-cultural context, policy context, carbon, water and habitat, and needs assessment), and emphasized hands-on, practical interactions with managers and owners, with three different field trips to family forestland sites in western Oregon. It was enriched by the participation resource economists, sociologists, wildlife biologists, hydrologists, ecologists, state regulatory agency staff, and leaders of nongovernmental environmental organizations. The class syllabus is attached as an appendix to this report.

There has been considerable research that defines ecosystem services and describes the potential of ecosystem service markets to enhance services like carbon sequestration (see, for instance, Miles and Kapos 2008). Family Forest landowners are judged to be likely participants in these markets due this owner groups' diverse goals, attachment to "place," flexibility, human capital, and geographic/temporal scale (described in Bliss and Kelly 2008 and Fischer and Bliss 2008).

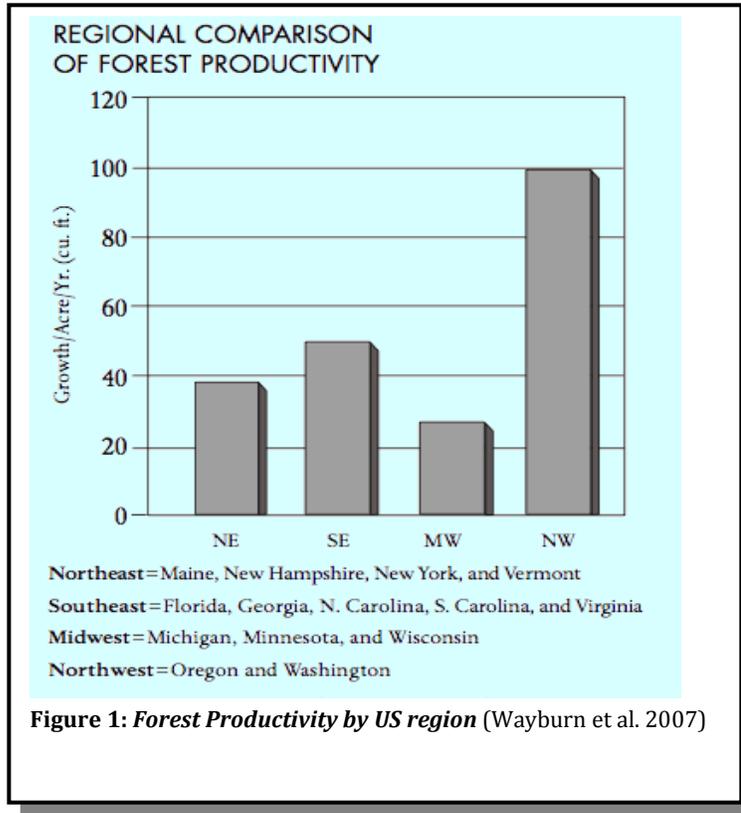
INR and CoF's seminar was conducted in studio fashion, with students working with instructors and resource professionals to develop and implement a needs assessment that could report an answer to the question: *What do family forest owners need to know, learn, and access in order to enhance provision of ecosystem services and simultaneously benefit from their production?*

This document reports on the seminar's Needs Assessment and suggests future directions for AFF's involvement in ecosystem services from family forestlands.

The Needs Assessment

Because forests in the Pacific Northwest are uniquely productive and offer vast carbon sequestration potential (see **Figure 1**) (Wayburn et al. 2007), and because carbon sequestration is currently one of the better developed ecosystem services markets, the needs assessment portion of our seminar focused on the challenges and opportunities facing Oregon family forestland owners' participation in carbon markets. The Needs Assessment was informed in part by a survey of leaders of the Oregon Small Woodlands

Association (OSWA), a fifty-year old association that represents approximately 2,200 family forestland owners in Oregon.



The survey was conducted by phone in November 2009. A “snowball” technique was employed in which OSWA Chapter leaders were questioned and asked to refer other interested OSWA members in the area. A total of 30 OSWA members completed the survey.

Survey respondents are leaders in a woodlands owner association, or referred by association leaders. Due to their active participation in a practitioner network, their knowledge of emerging markets may be somewhat higher than average family forestland owners. Their views may help shape their peers view, and provide insight into the likely future trends in family forestland owners’ attitudes.

KEY FINDINGS

The results of the seminar’s November 2009 survey are summarized below:

- | | |
|---|----------------|
| 1. Does your forestland provide any ecosystem services? (“Services that forestland provides to society such as clean water, wildlife habitat, and carbon sequestration”; ask for examples.) | YES 97% |
| | NO 3% |

2. Have you heard of ecosystem services? YES 57%
NO 43%

3. Have you heard of carbon markets? YES 93%
NO 7%

4. Which of the following statements best describes your opinion of carbon markets?

I don't know enough about carbon markets to have an opinion. 7%

I am quite familiar with carbon markets. 44%

I am interested in learning more about carbon markets. 30%

I am not interested in learning more about carbon markets. 19%

5. Where would you normally go more information on forestry issues such as new markets? (Ask for examples.) (See below)

6. In a carbon market, forest owners are paid for the carbon their forests sequester, or store. I'm going to read several factors that could influence your decision on whether to participate in a carbon market. Please tell me whether you would likely find each factor Very Important (VI), Important (I), Somewhat Important (SI), or Not Important (NI).

The price paid for sequestering carbon:	SI	I	SI	NI
	56%	26%	7%	11%

Potential limits on my forest management options:	SI	I	SI	NI
	82%	15%	0%	4%

Potential limits on my timber harvest options:	SI	I	SI	NI
	63%	22%	4%	11%

The feeling that participating might be the right thing to do:	SI	I	SI	NI
	11%	15%	15%	59%

The potential red tape involved in participating:	SI	I	SI	NI
	48%	33%	7%	11%

The potential upfront or ongoing costs involved in participating:	SI	I	SI	NI
	52%	30%	11%	7%

7. Participating in carbon markets might require forest owners to alter their management practices. For example, they might be required to lengthen harvest rotations (that is, grow older trees) or reduce the size of timber harvests. What incentives might induce you to participate in a carbon market if it had such

requirements? Please say which of the following statements best describes your opinion:

I would only participate if the revenue from carbon offset any revenue lost by not harvesting timber:	37%
I might participate if I received sufficient annual revenue from carbon:	44%
I would not participate at any price paid for carbon:	15%
I might participate if I felt carbon sequestration is the right thing to do:	4%

8. Markets for other ecosystem services such as habitat, threatened and endangered species, water, and wetlands are also attracting considerable interest. Please say which of the following statements best describes your opinion of such markets:

I would only participate if the revenue from such markets offset any revenue lost by not harvesting timber:	26%
I might participate if I received sufficient annual revenue from such markets:	30%
I would not participate at any price paid for these services:	4%
I might participate if I felt it was the right thing to do:	30%
I don't know enough about ecosystem services markets to have an opinion:	11%

9. Approximately how many acres of forestland do you own? (Include all acres managed on behalf of family).

1-9	0
10-99	7%
100-499	52%
500-999	22%
1,000 or more	19%

Family forests in Oregon are managed for diverse goals and objectives (Bliss and Kelly 2008 and Fischer and Bliss 2008), and it should come as no surprise that family forestland owners perceive that a wide variety of ecosystem services are provided by the lands they manage. The ecosystem services that OSWA members surveyed believe are provided by their lands are summarized in the table below:

Ecosystem Services Observed by OSWA Members	N
Water Filtration	23
Wildlife Habitat	20
Climate/Carbon Sequestration	9
Hunting/Fishing	6
Clean Air	6
Timber Production	5
Erosion Control	4
Recreation	4
Biodiversity	3
Aesthetics	2
Education	2
Fuel	1
Unmanaged Land	1
Medicinal	1

Figure 2. The number of respondents (N) who suggested each ecosystem service in response to the question “What ecosystem services does your forestland provide?”

Respondents believe that they face a number of barriers to entering carbon sequestration markets. 85% of respondents said that potential limits to timber harvest options would influence their decision to participate. 44% said they might participate if they received sufficient revenue from carbon, and 37% said they might participate if the revenue from carbon would offset revenue lost from not harvesting timber; 81% cited revenue from carbon as their main incentive for participating. If participation in a carbon sequestration included demonstration of additionality, family foresters believe they must earn at least enough income from carbon sales to make up for any loss in revenue from changing their management practices.

Personal communications with family forestland owners during seminar field trips revealed that many family foresters believe they are already managing their forests for substantial carbon storage benefits; they believe that maximum additionality would be achieved by first harvesting significant timber from their holding before registering under sequestration protocols. They believe that additionality requirements constitute a perverse incentive for owners to undermine other services—such as wildlife habitat—that they provide.

One hundred percent of survey respondents asked for a definition of ecosystem services, suggesting that developing shared understandings of terminology will be a necessary precursor to participation in ecosystem services markets. While the phrase “ecosystem

services markets” has little cache, most survey respondents were familiar with carbon markets, reinforcing the value in focusing the AFF seminar’s needs assessment on this dimension of the issue.

Oregon family forestland owners get information about forestry issues including emerging new markets from a variety of governmental and non-governmental sources. Five of the 30 family forest owners that were interviewed said that they get information from the Oregon Department of Forestry, suggesting that this agency is not currently seen as a major source of information. Nineteen respondents received information from the OSWA, and thirteen respondents got information from Oregon State University Cooperative Extension. This data suggests that if government wants to play a leading role in establishing markets it should partner with existing governmental and nongovernmental institutions with strong relationships with family forestland owners.

Where Oregon Small Woodland Association members go for information on forestry	
<i>Information Source</i>	<i>Number of respondents</i>
Private	5
Woodland Carbon Company	4
Professional foresters	1
Non-profit	23
Watershed Councils	1
Int’l Union for Conserv. of Nature	1
American Forest Foundation	1
Society of American Forestry	1
Oregon Small Woodland Association	19
Government	18
Oregon State University Extension	13
Oregon Department of Forestry	5
Other	3
Magazines	2
Friends	1

Figure 3.

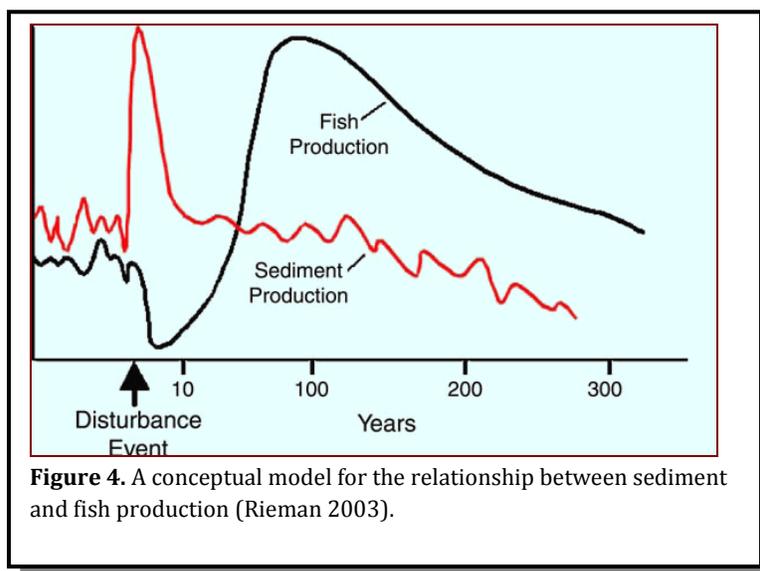
A key finding of the survey, that mirrored other research (Fischer and Bliss 2008), was the premium that family forestland owners placed on autonomy and flexibility.

Approximately 97 percent of respondents agreed that potential limits on their forest management options were important or very important considerations in making decisions about participation in a new market. A desire to maintain flexibility is not necessarily

informed strictly by economic consideration. 30% of respondents said that they might participate in a carbon sequestration market if they felt it “was the right thing to do.” Indeed, family forestland owners appear quite sensitive to the moral dimensions of carbon markets. Many landowners, both during field trips and in the course of the seminar’s survey work, expressed concern that carbon markets themselves were unethical to the extent that they objected to “pay to pollute” policy schemes.

The diversity of goals for which family forestlands are managed may create tradeoffs with the goals of carbon sequestration. During a field trip to a family forestland recently inventoried for carbon stocks in preparation for potential participation in a carbon offset project, the landowner showed seminar participants portions of their property that were managed for even aged Douglas fir, and other portions of their property which consisted of a diverse stand of mixed hardwood, oak and conifers. The former part of the ownership was managed for optimal growth and carbon sequestration as part of potential inclusion in an offset project. The latter part of the ownership was valued for biodiversity and wildlife habitat, although it did not achieve nearly as much carbon storage.

With the assistance of ecologists, biologists and silviculturists, the AFF seminar also explored how process-oriented forest restoration efforts (see Drever *et al.* 2006) may contrast with carbon market outputs. Fire, ice and windstorms, and pest infestations are disturbance processes that drive provision of key ecosystem services (decay, soil formation, nutrient cycling, etc.). They are also difficult to predict and manage, and may create substantial losses in carbon stocks during the life of an offset project (Hurteau *et al.* 2008). For example, a wildfire may create substantial losses in carbon storage but provide a pulse of sediment to local streams that will eventually benefit native fish populations (see **Figure 4**). These and other tradeoffs between effective carbon sequestration and ecosystem dynamics may be particularly relevant in eastern Oregon, which is typified by arid fire-prone forest types.



CONCLUSIONS AND RECOMMENDATIONS

A number of studies have described policy barriers to creation of effective and durable ecosystem markets (INR 2008). These barriers include but are not limited to:

1. Expanding the number of potential buyers and sellers;
2. Developing funding mechanisms;
3. Developing standards and methodologies for valuing ecosystem services;
4. Developing methods for “bundling” services;
5. Developing institutions that support financing, pricing, information sharing and standards;

The goal of the nascent ecosystem services community of practice is to establish reliable market mechanisms to induce and incentivize behavior that augments ecosystem service provision. Most likely there will be not one single market, but a range of market and quasi-market mechanisms that will lead to changes in behavior, land use, and management. These options may include incentive payments for preserving wildlife habitat, voluntary carbon exchange markets, cap and trade, or wetland mitigation banking.

Development of ecosystem services markets must integrate the unique needs, aspirations, and values of Oregon family forestland owners. The key challenges/opportunities identified by our seminar included:

1. The importance of accommodating Oregon family forestland owners’ strong preference for flexibility in land management decision-making, an especially important consideration given emerging carbon markets’ (see, for instance, California Climate Action Registry 2007) insistence on rigid accounting, monitoring and implementation standards.
2. The wide range of ecosystem services provided by Oregon family forests requires sophisticated methods for bundling services and accounting for potential tradeoffs.
3. Providing education and technical assistance will be essential in developing support for markets, meeting the technical demands of market participation, and ensuring that participation is not cost prohibitive.

These findings suggest a number of specific policy change recommendations.

Recommendations to address the challenges and opportunities unique to Oregon family forestland owners include:

1. Most current definitions of additionality provide credits for management that increase ecosystem services relative to those that would have existed without the credits. This definition puts early adopters at a disadvantage. State government’s should lead efforts to create consensus definitions of additionality that serve discreet policy goals, i.e. accomplish more regional carbon sequestration, and that

account for the diverse management practices of family forestland owners, e.g., the fact that some family forestland owners already store significant amounts of carbon above and beyond regulatory requirements.

2. Because upfront costs of participating in markets, i.e., inventory and monitoring plan costs, are often prohibitive to family forestland owners, cost-sharing programs should be developed that act as incentives to help family forest owners participate in markets. Federal, state, or local governments may have to underwrite cost-sharing programs.

Based on our interactions with experts in a variety of fields and family forestland owners themselves through the course of the AFF seminar, we believe that integrating family forestland owners into emerging ecosystem services markets could best be accomplished by local “intermediary” organizations or institutions that can be responsive to family forestland owners unique needs. Public utilities, soil and water conservation districts, watershed councils and other such entities could act as organizers, aggregators and sources of technical assistance to facilitate the entry of family forestland owners into markets.

For instance, INR and CoF are currently working with the Eugene Water and Electric Board (EWEB), a public utility that serves Oregon’s eastern Lane County, on a scheme by which EWEB would demonstrate the augmentation of multiple ecosystem services (anchored by carbon sequestration) on forestland it owns in the McKenzie River Basin, offer inventory and monitoring services to family forestland owners for free, developed sophisticated models for the augmentation of service that would result, and provide funds to owners who adopt certain practices.

The use of intermediaries like EWEB should address many of the issues that confront family forestland owners, and create a local portfolio of services that can be leveraged into effective and efficient participation in regional and national markets.

REFERENCES

Bliss, J.C., Kelly, E.C. 2008. Comparative advantages of small-scale forestry among emerging forestland tenures. *Small-scale Forestry* 7(1):95- 104.

California Climate Action Registry 2007. *Forest Sector Protocol*. Version 2.1.

Drever CR, Peterson G, Messier C, Bergeron Y, Flannigan M. 2006. Can forest management based on natural disturbances maintain ecological resilience? *Canadian Journal of Forest Research-Revue Canadienne De Recherche Forestiere* 36:2285-2299.

Fisher, A.P, and Bliss, J.C. 2008. Behavioral assumptions of conservation policy: Conserving oak habitat on family forestland in the Willamette Valley, Oregon. *Conservation Biology* 22(2):275-283

Hurteau et al. 2008. Carbon protection and fire risk reduction: Toward a full accounting of forest carbon offsets. *Frontiers in Ecology and the Environment* **6**: 493-408.

Institute for Natural Resources. 2008. Policy Cornerstones, Action Strategies for an Integrated Ecosystem Marketplace in Oregon, Oregon State University.

Miles, L., Kapos V. 2008. Reducing greenhouse gas emissions from deforestation and forest degradation: global land-use implications. *Science* 320:1454–1455.

Reiman, B., D. Lee, D. Burns, R. Gresswell, M. Young, R. Stowell, J. Rinne, P. Howell. 2003. Status of native fish in the western United States and issues for fire and fuels management. *Forest Ecology Management*, **178**: 197-211.

Appendix: Class Syllabus

Ecosystem Services and Family Forestlands Syllabus (September 28, 2009)

Overview

Private forestlands are increasingly recognized for the ecosystem services they provide to society, including clean air and water, wildlife habitat, biodiversity and carbon storage. This special graduate seminar will focus on the ecological, social and policy dimensions of ecosystem services and market transactions involving ecosystem services transactions from family forestlands. The class will emphasize hands-on, practical interactions with managers and practitioners, and is designed to provide important professional background for students in a variety of fields including water, wildlife, forestry, environmental sciences, public policy, rural studies and natural resource managements.

Key information

Web pages:

http://www.cof.orst.edu/eco_services_bliss/

<http://www.forestry.oregonstate.edu/communitiesandnaturalresources/>

<http://www.ecosystemsproject.org>

<http://www.fs.fed.us/ecosystems-services>

<http://www.ecosystemcommons.org>

<http://fiatools.fs.fed.us/NWOS/tablemaker.jsp>

<http://www.affoundation.org/>

Contact information:

Instructor: Dr. John Bliss (541.737.4427 / john.bliss@oregonstate.edu)
Instructor: Dr. Sally Duncan (541.737.9931 / sally.duncan@oregonstate.edu)
AFF Fellow: James Johnston (541.554.1151 / james.johnston@oregonstate.edu)

Assignments and grading

Grades will be based on 2 assignments, a final project and class participation

Assignments: 40%

Final project: 40%

Participation: 20%

Assignments will typically be concise memos approximately 5 pages in length.

The final project will be a concise needs assessment report.

Participation includes class and field trips.

There is a lot of reading in the first half of the course, with the second half of the course devoted to synthesis of readings, speakers and field trips and work on the final project. The goal is to spread the workload evenly over the course.

There are no assigned textbooks. Law and Policy of Ecosystem Services by J.B. Ruhl, Steven E. Kraft and Christopher Lant (Island Press 2007) will provide helpful background for students.

The Class Sessions

Class will meet every Monday from 1-4 PM. There will be at least two field trips that should not last longer than 3-4 hours total.

UNIT 1—SESSION #1 | September 28 | Family forestlands, the socio-cultural context

1:00 – 1:30 | Introduction and Needs Analysis Discussion | John Bliss and Sally Duncan

1:30 – 2:45 | Roundtable discussion of family forestland issues—What is important to family forestland owners? | Paige Fischer (USFS), Ken Faulk (OSWA), Karen Fleck Harding (MRWC), and Rick Fletcher (OSU)

2:45 – 3:00 | Break

3:00 – 4:00 Critical perspectives on ecosystem services markets | Gina LaRocco (Defenders of Wildlife), Bill Jaeger (AREC) and Court Smith (OSU Anthropology)

Assigned reading

Nelson, Erik, *et al.* 2009. Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. *Front. Ecol. Environ.* 7(1):4-11, doi10.1890/080023.

Vira, Bhaskar and William M. Adams. 2009. Ecosystem services and conservation strategy: beware the silver bullet. *Conservation Letters* 2:158-162

Justus, James *et al.* 2009. Buying into conservation: intrinsic versus instrumental value. *Trends in Ecology and Evolution* 24(4):187-191.

Bliss, John C., and Erin C. Kelly. 2008. Comparative advantages of small-scale forestry among emerging forestland tenures. *Small-scale Forestry* 7(1): 95 - 104.

Fisher, A. Paige, and John C. Bliss. 2008. Behavioral assumptions of conservation policy: Conserving oak habitat on family forestland in the Willamette Valley, Oregon. *Conservation Biology* 22(2): 275-283.

Needs Analysis Framework.

UNIT 1—SESSION #2 / October 5 / Field trip to family forestland

1:00 - 1:30 | Family forestlands, the socio-cultural context, cont'd (in the field) | John Bliss

1:30 — 4:00 | Field trip to family forestland | Sara Leiman (Wren)

Assigned reading

Institute for Natural Resources. 2008. Policy Cornerstones and Action Strategies for an Integrated Ecosystem Marketplace in Oregon.

Center for Energy and Environmental Markets. 2005. The Importance of Market Institution in Generating Prices.

Sec. 2708 of HR 2419 (“The Farm Bill”)

SB 513 with handwritten amendments (“sausage-making”)

UNIT 2—SESSION #3 / October 12 / The Policy Context

1:00 - 1:10 | Definitions and topologies | James Johnston

1:10 - 1:30 | Why ecosystem services markets? | James Johnston

1:30 - 2:45 | Needs analysis/assessment framework | Sally Duncan

2:45 - 3:00 | Break

3:00 - 3:30 | Market frameworks

3:30 – 4:00 | Current policy initiatives

Assigned readings

Wayburn LA, JF Franklin, JC Gordon, CS Binkley, DJ Mladenhoff, NL Christensen. 2007. Forest Carbon in the United States: Opportunities and Options for Private Lands. Pacific Forest Trust.

Smithwick EAH *et al.* 2002. Potential Upper Bounds of Carbon Stores in Forests of the Pacific Northwest. Ecological Applications.

Law BE *et al.* 2004. Disturbance and Climate Effects on Carbon Stocks and Fluxes Across Western Oregon USA. Global Change Biology.

Mitchell RS *et al.* Forest Fuel Reduction Alters Fire Severity and Long-Term Carbon Storage in Three Pacific Northwest Ecosystems.

Hurteau *et al.* 2008. Carbon Protection and Fire Risk Reduction: Toward a Full Accounting of Forest Carbon Offsets. Frontiers in Ecology and the Environment.

Oregon Forest Resources Institute. 2006. Forests, Carbon and Climate Change. Selected chapters.

California Climate Action Registry. 2007. Forest Sector Protocol v. 2.1

UNIT 3—SESSION #4 | October 19 | Carbon

1:00 – 1:45 | The science of carbon sequestration on private lands | Mark Harmon, OSU CoF

1:45 – 2:30 | The economics of carbon sequestration on private lands | Darius Adams, OSU CoF

2:30 – 2:45 | Break

2:45 – 3:30 | California Climate Action Registry, the international context | All

3:30 – 4:00 | Moving forward in Oregon | All

Assigned reading

Oregon Department of State Lands. 2000. Wetland Mitigation Banking Guidebook for Oregon.

Adamus P, J Morlan, K Verble. 2009. Manual for the Rapid Wetland Assessment Protocol (ORWAP). Oregon Department of State Lands.

Casey F, Vickerman S, Hummon C, Taylor B. 2006. Incentives for Biodiversity Conservation: An Ecological and Economic Assessment. Washington DC, Defenders of Wildlife.

Brown TC, Bergstron JC, Loomis John B. 2007. Defining, Valuing and Providing Ecosystem Goods and Services. *Natural Resources Journal* 47(2):331-376

Bean M, Kihlslinger R, Wilkinson J. 2008. U.S. Habitat Banking to Support the Conservation of Wildlife Habitat and At-Risk Species. Washington DC, Environmental Law Institute

Assignment

1. Class teams continue work on developing FF needs survey.
2. Pick one of the topics below and write 250-500 words on the discussion board that addresses the question. This should be done by Nov. 2. Before the end of the term, comment on another person's post (or comment on another person's comment).
 - a. Consider Mitchell vs. Hurteau 2008. Conduct a literature review and/or build a science-based model that contributes to the debate. What are the implications of your results for family forestland owners in Oregon?
 - b. Consider the California Climate Action Registry. How might a landowner or entrepreneur "game" this system (i.e., how would one manipulate, not break, the rules to accrue an advantage, economic or otherwise, that is unfair, doesn't really accomplish the intended purpose of the protocols, doesn't really enhance or protect and ecosystem service, etc.).
 - c. Adapt the California Climate Action Registry to the specific needs and opportunities of family forestland owners in Oregon, i.e., re-draft the parts that need to be re-drafted to account for what you've learned about family forestland owners in our neck of the woods, and to account for any problems with the Californian model.
 - d. See Justin's email (forwarded by James) that describes federal legislative efforts on the carbon sequestration front (the media articles and placemaker amendment language). Given what you know of carbon sequestration, formulate a framework for federal carbon sequestration language (i.e., what would the law/policy require in terms of participation, baseline, additionality constraints, etc.). Feel free to contrast your federal framework with California's (from which it can certainly borrow if you think that's appropriate).

UNIT 3—SESSION #5 | October 26 | Field trip to carbon sequestration project

1:00 - 4:00 Field trip to Woodland Carbon Company site (Monroe) | Ken Falk, Woodland Carbon Company.

Assigned reading

Cont'd from Session #4

UNIT 4—SESSION #6 | November 2 | Water and Habitat

1:00 - 2:00 | Wetland Mitigation Banking | Dana Field, EPA

2:00 – 3:00 | Valuing wildlife habitat | Randy Rosenberger and Anita Morzillo, OSU CoF

Break

3:00 – 4:00 | Discuss needs analysis

Assignment:

Finalize survey, due in class November 9.

UNIT 4—SESSION #7 | November 9 | Water and Habitat

1:00 – 1:30 | Pollination and biodiversity as ecosystem services | Matt Betts, OSU CoF

1:30 – 2:15 | Questions and discussion

2:15 – 2:30 | Break

2:30—3:30 | Class works on finalizing survey protocol and calling plan.

3:30 – 4:00 | Tools for valuing wildlife habitat | Kevin Halsey, Parametrix, Inc.

Assignment:

(Due November 18.)

Write up “Gap Analysis” of current family forestland management, reporting your findings from literature, interviews, survey. See “Needs Analysis Framework.”

There is no minimum or maximum page limit. <10 pages of high quality, concise text, plus any graphics, data displays, etc. should be adequate.

Note: this may be a group project, or an individual project.

UNIT 4—SESSION #8 | November 16 | Capstone field trip

1:00 – 4:00 | Counting on the Environment site | Bobby Cochrane, Willamette Partnership

UNIT 5—SESSION #9 | November 23 | Needs Analysis Working Session

1:00 – 4:00 | Class discussion of Needs Analysis Framework Final Project

UNIT 5—SESSION #10 | November 30 | Public symposium

1:00 – 4:00 | Class presentations