

# Report on the CLAMS workshop of June 11, 2002

## Introduction

On June 10<sup>th</sup>, 2002 a public symposium on the findings of the Coastal Landscape Analysis and Modeling Study was held at Oregon State University. On the following day, June 11<sup>th</sup> a small workshop was held at the USDA PNW Forestry Sciences Laboratory for about 60 potential users of CLAMS information and other interested parties. The objectives of the workshop were to get feedback from policy makers, managers, watershed councils, landowners, NGO's and others on the nature and direction of the CLAMS research effort. After a morning presentation on the approach and findings of CLAMS attendees were broken into 4 small discussion groups that had a diversity of representation. Each group was then asked to develop a list of responses to the following questions:

1. What values do you see in broad scale assessments in general?
2. What specific benefits do you see in CLAMS?
3. What concerns do you have about CLAMS?
4. What changes and improvements in CLAMS research and models would you suggest?

The entire group was then asked to vote for the response that they favored most under each question. This report is a summary of the workshop, the answers to the questions and responses of the CLAMS team to questions 3 and 4 regarding concerns and next steps. See the appendix for the list of all the responses of the attendees and the vote tallies.

This report is intended to inform interested parties on future directions, possibilities, and limitations of the CLAMS work. We will use it to inform our sponsors of possible future funding priorities.

## Values and Benefits of broad scale assessments and CLAMS

The attendees identified a number of benefits and values of the CLAMS effort. The following list is a summary of some of them.

1. Allows people to see broad-scale consequences of efforts and general trends
2. Potential to inform policy makers of consequences of decisions
3. Can use models to ask "what if" questions and test sensitivity of assumptions
4. Provides a consistent information across ownerships
5. Enables graphical visualization of potential futures
6. Provides a systems perspective to show connectedness of issues

## Concerns and suggested next steps

The following is a summary of the major concerns and suggested next steps (in approximate order of decreasing votes).

1. Improve socio-economic analysis
2. Spend more effort on model validation especially of current conditions
3. Broaden focus to include non-forest lands
4. Improve communication to foster public and user understanding
5. Characterize uncertainty in models
6. Improve quality of road layer
7. Define applicability of models in terms of:
  - a. Spatial scales
  - b. Who the intended users are
  - c. Its connection to policy making
8. Include other ecological dynamics such fire, disease, and climate change
9. Develop a simplified version of CLAMS or subcomponents and user friendly versions
10. Expand spatial extent (e.g. Cascades)

## Responses to Concerns and Suggested Next Steps

In this section the CLAMS team responds to each of the 10 major concerns and ideas for next steps. The responses include identification of actions that have already been completed under an issue and/or a brief description of plans for future actions that address the concern. Suggestions for model improvements or evaluations that can be undertaken with current resources are identified and suggestions that would require new work and funding are also identified.

## 1. Improve socio-economic analysis.

Table 1. Summary of possible improvements, responsibilities and funding needs

Type of improvement	Who does it?	New funds needed?	Comments
1. Economic report for LAMPS	Lennette/Bettinger	No	Will give a report and revenues and costs by category for each owner group for a simulation
2. Integrate LAMPS with the Western Oregon Timber Supply Model	NJohnson/Adams/Latta/Lennette/Bettinger	No	Will use the results from WOTSM (an economic model of timber supply) to set harvest levels, prices, management intensities in LAMPS for private lands
3. Describe the current socio/economic context of the Coast Range	BJohnson/NJohnson	Probably not	I believe that Becky Johnson has done this (CLAMS presentations/COPE book)/NJohnson would work with her to gather the materials
4. Describe the socio/economic history of the Coast Range for the last 200 years	??	Yes	Would link socio/econ development and change to major natural resource drivers (timber/fishing/tourism) over the last 200 years. Would cover the birth/growth/death of communities as the centers of natural resource extraction shifted over time.
5. Describe the native people's settlement and use of Coast Range	??	Yes	Cover the 10,000 years before 1800.
6. Estimate the economic effects of alternative policies (timber outputs only??)	BJohnson/Lettman/NJohnson	Probably not	Would utilize the work of Lettman on log flows (perhaps with some update) and work of BJohnson on input/output
7. Make operation the ROS spatial analysis to help estimate the effect on recreation opportunity of	Brian G-Y	??	

different alternatives			
8. Undertake benefit/cost analysis of alternatives	N. Johnson/Brian G-Y	Probably not	Compare aggregate timber and biodiversity values under different alternatives

## 2. Spend more effort on model validation especially of current conditions

Model quality is a major concern of the CLAMS team. We have expended considerable effort already on this topic but more work can always be done to improve the models or evaluate their error. Validation of a model in the sense of it being “sound” or “free from error” is not a realistic goal. Models by their nature are simplifications and will always contain error. However, models with considerable uncertainty and error can still be useful in policy making, management, and science especially if the only alternative is subjective guesses or opinions about the outcomes of a particular course of action. A realistic set of activities concerning model quality should include determining the errors or uncertainties, identifying the insights they can provide despite their weaknesses, identifying what effort would be needed to make them better, and evaluating how much improvement is possible given the inherent uncertainty in ecological and social systems. In many respects the most important value of modeling is identifying what we don’t know or understand.

The question of model quality is also related to the way in which the models will be used. Models that are useful for one spatial scale or place might not be for another. For example, some of the concern about the vegetation layer is probably related to the desire to use it (or concern that it will be used) for relatively fine scale planning, analysis and decision-making. The vegetation model (map) was never intended to be used at the site scale as the sole data source for watershed planning and implementation of management actions. The goal of the vegetation model is to provide a map of regional-scale vegetation patterns and an approximation of the fine-scale detail. While some users may find it matches local conditions fairly well, others may find large errors. This is to be expected and the published model error analysis that we have already done confirms this. We have no plans to improve the vegetation model for local applications. Some users may still want to use it at fine scales and they may find it a useful starting point. However, other information from sources such as aerial photos and site visits should be used when working at fine scales.

We use several different approaches to evaluate model quality. The gold standard for any model is a comparison of model results with independent data collected in a random fashion across the entire study area. Unfortunately, we cannot use this approach because of the enormous cost of collecting new field data for the whole Coast Range for a large number of different kinds of measures. In addition, it is not possible to evaluate simulations of the future without conducting long-term monitoring to see how well simulations match reality. Evaluations of models in ecological research are rarely able to use this ideal method. Instead researchers use a variety of other approaches to assess model error and quality. These are listed below along with the ideal approach (no. 7):

1. Review and critique of model assumptions and results by subject experts and/or landowners and managers
2. Analyze the sensitivity of model components to identify those components that have the greatest or least impact on model results
3. Compare results with results from other simulation models
4. Compare results with historical data
5. Publish models and applications in peer-reviewed scientific literature
6. Test model results against data that were not used to build the model or through cross-validation in which some sample data are held out of model building and then used to test the model
7. Test model results against independent data from a random sample across the study area

We use all of these approaches in evaluating the models. For many models it possible only to use approaches based on peer review of assumptions and conclusions (approaches 1 and 5). Table 2 is a summary of models and approaches that have been used or will be used to evaluate the quality of the models.

Table 2. Completed and planned model evaluations (Detailed descriptions of what was done to evaluate individual models are available upon request). The numbers in the table below refer to the approaches listed above.

Model	Completed evaluation approaches	Planned or Additional Evaluations	Comments on additional evaluation
Current vegetation	1, 2, 3, 5, 6	Stratify error analysis by zones, (e.g. riparian areas, ownership types)	Can do with existing funds and resources
Wildlife and other terrestrial indicator models	1, 2, 5, 6 depending on the species	1, 2, 5 and 6 for new indicators. Obtain new field data on habitat relationships and demographics for species lacking data, or install a complete random sampling design for selected species	No funds available to obtain new field data.
Stream locations	1, 3	5, 6. Mount field effort to evaluate quality of stream layer using GPS and random sample design	No funding available for new data collection

Table 2 continued

Model	Completed evaluation approach	Planned or Additional Evaluation	Comments on additional evaluation
Aquatic habitat indicators	1	5 and 6	Approaches 5 and 6 will be done with existing resources. No funding for new data collection
Future forest landscape conditions	1, 2 (for some attributes, e.g. clearcut sizes )	5	Can't really test future projections without long-term studies
Forest/Non-forest classification	1, 6	5 and 7	Will be done with existing resources
Stand-level simulations	1, 2, 3, 4, 6	5	No funding available for new data collection
Fire history models	1, 2, 5	None planned	
Landslide and debris flows probabilities	1, 4	5	No funding for new data collection
Land-use change	1, 5, 6,	None planned	

### 3. Broaden focus to include non-forest lands

At the present, we *do* include non-forest lands. These are identified within the model and forest land-use change simulates losses of forest into non-forest uses. However, conditions and dynamics within the non-forest lands are not simulated. We recognize the importance of non-forest lands on ecosystems and human systems. However, the funding we have gotten from our sponsors (PNW Research Station, OSU, ODF, BLM) is intended for work within forest lands and to increase our effort on non-forest lands would require a major new modeling effort and a significant level of new funding. We might be able to link with the Willamette Basin Project to provide a picture of conditions on the east side of the Coast Range but no similar studies exist for the interior or coastal valleys of the Coast Range.

### 4. Improve communication to foster public and user understanding

We view this as an important goal and we are striving to develop new ways of communicating to the public. We will be producing several communications over the next year. First, we will be submitting a special feature on CLAMS for the journal, *Ecological Applications*. This will contain 6-8 papers and will summarize our results to date. Second we will be updating our web page with information that better explains

what CLAMS is and what scale it should be applied. We may host another workshop sometime in the fall of 2003 to present new findings and follow-up on concerns raised in the workshop in June, 2002. New communication products such as brochures, atlases or a new more interactive web site probably would require new funds, which we do not have at this time.

## **5. Characterize uncertainty in models**

This is a very important concern. We plan to describe the uncertainty in our models in our reports and publications (see above). Formal uncertainty analysis (i.e. identification of statistical error and uncertainty in the component models and the aggregate effects of those errors) of the entire set of models is not possible nor do we know of a feasible way to do it. We can do some comparison results from alternative forms of the models where there is some uncertainty (e.g. vegetation model, wildlife models, LAMPS) about the parameters (numerical assumptions) in the models. A formal uncertainty analysis would be a research project that would require new funding and additional time.

## **6. Improve the quality of the road layer**

CLAMS is using road location, road density, road proximity to a stream, and the number of road/stream crossings to assess recreation opportunities, wildlife habitat suitability, watershed condition, and aquatic habitat relationships. Road metrics are calculated from road digital line graph (DLG) data i.e., roads depicted on 1:24,000- scale topographic maps. Although they are the finest-scale, most consistent road data currently available, the DLGs do not represent the actual extent of roads; are inconsistent across quadrangle boundaries due to different dates of mapping and interpretation of mapping guidelines; and have no associated attributes such as surface type or construction date. The minimum criteria for road data to meet the needs for aquatic analyses would accurately portray location and spatial extent of existing and historical roads. Economic and other social science analysis of recreational characteristics of the landscape also require location and surface type information. Closure or decommissioning status, construction date, and location and quality of culvert crossings would be added to the optimum data set. To address economic costs of transportation, as well as other applications requiring useable route information, a fully connected road network is needed. No existing road data meet these criteria. Road data on federal and some state lands provide the best representations of location and extent, however they lack consistent attribute information and coverage is limited to jurisdictional boundaries. Inconsistent attributes and density reflecting ownership patterns will introduce errors when calculating metrics such as road density and road/stream crossings and when modeling relationships with other landscape characteristics. The other issue associated with road data is simulating future roads under different policy scenarios. Although we currently lack plans or funding to model future roads, we recognize the importance of doing so and would pursue this if possible.

Table 3. Possible improvement to assessment or quality of road layer

	Type of improvement	Who does it?	Currently funded	Comments
<b>Current Condition</b>				
<b>Continue to use 1:24,000-scale DLG</b>	Evaluate 1:24,000 DLG road mapping relative to existing geographically limited but higher quality road data and calibrate if warranted	Burnett/ Clarke	Partially funded	Geographically limited but higher quality road data were obtained from the USFS, BLM, and the State (Spencer-Gross data).
	Evaluate 1:24,000 DLG road mapping relative to a spatially representative sample of newly-created high quality road information and calibrate if warranted	Burnett/ Clarke	No	The road layer would be created using digital orthophoto quadrangles (DOQs) selected from throughout the Coastal Province of Oregon. It would provide a broader distribution of “higher quality” road data, and more consistency across ownerships than the existing higher quality road data
	Conduct a sensitivity analysis using road densities calculated from 1:100,000-scale DLGs, 1:24,000-scale DLGs, and higher quality road layers to assess if differences will affect interpretation of potential road impacts	Burnett/ Clarke	Partially funded	Determine the road density calculated from a higher resolution road layer that corresponds to thresholds between high and low road-impact classes found in the literature but obtained from 1:100,000-scale DLGs. Assess for selected areas if differences between the DLG and higher resolution road layers result in shifts from the high to low road-impact class.
	Conduct a sensitivity analysis relating road metrics calculated from high-resolution road layers to fish abundance, distribution, and habitat data	Burnett/ Clarke	No	More costly and time consuming but indicates specific sensitivity of fish and habitat relationships to roads in the Coastal Province of Oregon.
	Evaluate relationships between roads and other landscape characteristics	Burnett/ Clarke	No	Identify potential surrogates for road metrics.

<b>Augment “best available” road layer</b>	Acquire existing better road layer from private industry	Gary Lettman	N/A	
<b>Develop a new road layer</b>	Road layer would be spatially accurate and be assigned all desired attributes	Contractor with input from CLAMS	No	Expensive and time-consuming but could be developed to meet needs of a broad array of public and private entities. Coordinate with state and federal efforts
<b>Future Condition</b>				
	Evaluate usefulness of existing models, for example SNAP, to project roads into the future	Garber-Yonts/Burnett/Clarke	No	
	Develop new model	Programmer	No	
	Run existing or new model	???	No	
	Land owner survey to determine owner intentions with regard to road building, decommissioning, and removal.	Norm Johnson, Gary Lettman	No?	May be incorporated with planned management intention survey

## **7. Define applicability of models in terms of: a) Spatial scales; b) Who the intended users are; c) its connection to policy making**

We recognize the importance of better defining the applicability of the models in terms of scale, use and connection to policy making. We will do this in subsequent reports and papers (see above). We can also do some analysis to give us better insights to the scale of use question.

## **8. Include other ecological dynamics such fire, disease, and climate change**

It would be valuable to look at these other dynamics, however we do not have the resources at this time to undertake research to develop new models. We currently have small disturbances (<5 acres or 2 ha) in LAMPS that incorporate wind and disease mortality. The stand level models also include finer grained mortality that result from a number of factors including disease and insects. We use statistical fire models to estimate fire history in the Coast Range and then compare this with current and future forest management. We have not included fire in the LAMPS simulations given the episodic and relatively long intervals (200 + years) of fire in the Coast Range and the relatively short time interval of our simulations (100 yrs). It is also very difficult to predicting effects of human fire suppression efforts on future simulated fires. One,

strategy would be to develop a scenario of a large fire (just as we would a scenario of a different type of forest policy) and study the behavior of the models. Incorporating climate models would be interesting and valuable but would require substantial new resources or development of new scenarios.

### **9. Develop a simplified version of CLAMS or subcomponents and user friendly versions**

In our reports we will discuss the feasibility of developing simpler versions of the models. We will compare the CLAMS approach with a simpler approach to simulating forest management that was used in the Willamette Basin project. The results of this comparison should be instructive about the relative merits of simple and complex models. At this time we do not have funding to develop a simplified version

### **10. Expand spatial extent (e.g. Cascades)**

This has been discussed several times in the past with our sponsors and potential users. The decision was to make sure we took advantage of all that has been developed and learned in the Coast Range before taking on another geographic area. At this point we do not have funding for such an effort but do not rule it out either.

Summary of major activities and communications of CLAMS in next 12-18 months.

1. Revise model simulations from June 2002, to correct minor errors-fall 2002
2. Prepare 8 draft manuscripts for Special Feature in the journal *Ecological Applications*. Analyses are based on scenarios presented in June 2002. Target date: December 31, 2002.
3. Prepare draft manuscript for journal *Forest Ecology and Management* on stand-level modeling in CLAMS including comparisons of models and evaluation of results with independent stand growth data—January 2003.
4. Prepare chapters for book on managing for compatible uses of forests (Spies and Reeves). Chapters will be based on work in CLAMS. January 2003
5. Update web site to incorporate reports and analyses from work in fall 2002. Winter 2003
6. Develop and analyze 2-3 new management scenarios based on natural disturbances to meet our obligations from funding by the PNW Station's Wood Compatibility Initiative. Finish analyses in early summer 2003.

7. Summer 2003. Present findings of CLAMS work at scientific meetings including the International Association for Landscape Ecology, and the Ecological Society of America Annual Meeting.
8. Develop and analyze new a biodiversity policy scenario to meet objectives of the grant from the National Commission on Science for Sustainable Forestry (NCSSF). This grant will enable us to improve our timber and biodiversity models and to add a component to examine effects on carbon storage. Finish Analyses in early fall of 2003.
9. Compare results of CLAMS analysis of forest policy with that of the Willamette Basin Project landscape change model (The Pacific Northwest Ecosystem Research Consortium). Project will use the Yamhill River Drainage for comparison of current practice scenarios. Summer 2003. Research is funded through NCSSF projects to Spies et al. and Radosevich et al. Report on comparison will be available by end of 2003.
10. Host a workshop for potential interested parties to discuss results of recent analyses and their implications to policy and management. Late Fall 2003.
11. Prepare manuscript and report for NCSSF project—December 2003.

## APPENDIX

### Summary of CLAMS Workshop 6/11/02

Responses to questions posed to workshop attendees and subsequent votes (dots) for most important items under each question

#### **Q1 What values do you see in broad-scale assessments in general?**

- Allow people to see broad-scale consequences of their actions. – **8 DOTS**
- Use a model to ask “what if” questions. – **5 DOTS**
- Allows policy adjustment under changing conditions by constant revisiting. **5 DOTS**
- Aggregates individual actions into broader-scale effects (spatial patterns over time). – **4 DOTS**
- Necessary for setting strategic goals. – **4 DOTS**
- Offers a forum to develop, test, and refine analytic tools. – **4 DOTS**
- Can help society forum mix of social, econ, environmental factors for decision-making. **4 DOTS**
- Value in “systems” look (multi-ownership), not landowner-specific. – **3 DOTS**
- Potential to change the questions that we ask (\*feedback loops). – **3 DOTS**
- Provides a context. – **3 DOTS**
- Method for understanding temporal and spatial scale issues. – **2 DOTS**
- Scale of assessment needs to be appropriate to questions asked.—i.e., Qs need to be regional or provincial. – **2 DOTS**
- A landowner can use broad-scale assessment to provide context for improving/changing management of their own lands. – **1 DOT**
- Forum for crystallizing current scientific understanding of biophysical interactions. – **1 DOT**
- Broad-scale questions are important. – **1 DOT**
- Context for fine-scale decision-making. – **1 DOT**
- Enables adaptive management occur (if it’s done right). – **1 DOT**
- Developing priorities for action. – **1 DOT**
- Project implementation of policies on the ground and assessment of effects.
- Allow simultaneous examination of multiple ownerships. – **1 DOT**
- Providing a basis for educating various publics.
- Allows us to agree on what is the core data we require. – **1 DOT**
- “Platform” for everyone to begin discussions at the same place. – **1 DOT**
- Educates public on connectedness of issues – systems vs single-issue approach. – **1 DOT**
- Large-scale modeling can put off local people – needs fine tuning to local conditions. **1 DOT**
- Allows for collaborative planning across ownerships.
- Allows us to understand and avoid unintended consequences.
- Helps put the past in perspective.
  
- Natural and social processes occur at large scales.
- Question – transfer ability of data/concepts.
- Need to agree on what is “broad scale”!
- Value in a credible vegetation system and ability to grow forward.
- Ability to put concerns into perspective.
- Ability to validate (or not) broad-scale forest plans.
  
- Outreach to a large audience.
- Context for broad-scale decision-making.
- Can promote integration across disciplines.
- Understand interaction b/w economies, communities, and environments at multiple scale.
- Highlights limitations of current institutions and decision-making processes.
- Augments the capacity of local groups.
- Provide important information for county commissioners and other local governments.
- Common basis for society to understand current state of affairs.
- Assessments may help us understand what is important.
- Forum for diverse entities and interests to broker solutions.
- Understand likely consequences of alternative courses of action.
- Flaws in model are often readily apparent.

- Broad-scale assessments are a scientific necessity b/c ecological and social processes operate at these scales.
- Identify information needs for improvement of future assessments.
- Serve as repositories for monitoring and implementation info (if they are kept up-to-date).
  
- Integrate scales.
- Using assumptions and how it applies to wildlife over the long term.
- Context setting for different mgt approaches.
- Cumulative effects of mgt can be examined.
  
- Provides current conditions and trends.
- Answers Qs relevant to specific areas.
- Sets scale context for decision-making.
- Risks coming up with wrong trends, conditions based on poor data.
- Will not replace site specific data gathering.
- Essential learning process, but unclear direction.
- Crossing scales is problematic.
- Crucial to include all ownerships for whole picture.

**Q2 What specific benefits do you see in CLAMS?**

- Can provide info. to answer two questions: – **8 DOTS**
  1. Are there broad-scale ecology. Trends that result in unacceptable consequences?
  2. Are there broad-scale positive trends occurring?
- Potential to inform policymakers on consequences of their decisions, including unintended ones. –
  - **8 DOTS** Good at showing trend lines, not at answering specific questions. – **2 DOTS**
  - Ability to test the sensitivity of different assumptions. – **5 DOTS**
  - Ability to display potential futures in visually graphic ways. – **4 DOTS**
  - Consistency of datasets (unified) over broad area. – **4 DOTS**
  - CLAMS increases public awareness about change over time; dynamism. – **3 DOTS**
  - Shows that private industry is primary deer/elk habitat. – **1 DOT**
  - Need for deer/elk habitat indices. – **1 DOT**
  - GIS maps alone are hugely valuable. – **1 DOT**
  - Useful tool to do assessment in shorter time, w/fewer people, visually. – **1 DOT**
  - Offers opportunity to integrate across a variety of resources. – **1 DOT**
  - Giant leap forward in visualization of environmental conditions. – **1 DOT**
  - A public model using public data – people can access it – nonproprietary data. – **1 DOT**
  - Allows us to prioritize restoration opportunities. – **1 DOT**
  - Underlying research has increased our knowledge of these systems. – **1 DOT**
  - Validation of local work (i.e., fish habitat potential). – **1 DOT**
  - 
  - CLAMS has potential to provide more objective information.
  - Spatially explicit veget layers allow choice of wildlife simulators.
  - Consistency
    - Ability to validate the NWFP.
  - Allows you to formulate and test hypotheses that could lead to revised laws and regulations.
  - Assumptions are laid out and can be made more transparent than other models.
  - It's our best understanding of historical conditions.
  - New insights about development patterns
  - Increased public awareness of the need to conserve natural disturbance processes.
  - CLAMS brings the uncertainty of forest mgt to the forefront.
- Good start, but will it get finished?
- Provides holistic coverages for veg, streams, etc.
- Quantitative integration of physical effects over space.
- May be select 6-8 key policy variables for a simpler version.
- Decision may be made regardless of real levels of confidence.

### **Q3 What concerns do you have about CLAMS**

- Still needs to portray social and economic contexts clearly – should be displayed as graphically – **9 DOTS**
- Direct more resources into validation (ground-truthing directly, not scavenging existing data). – **5 DOTS**
- Need institution mechanism for keeping these projects going. – **4 DOTS**
- Will there be an assessment of nonforest? Some of most critical issues are there (espec. riparian). – **4 DOTS**
- ROADS omitted from watershed processes context. – **4 DOTS**
- Do model assumptions collectively support what we see on ground? (ground-truthing). – **3 DOTS**
- “Map tyranny” – pretty pictures imply credibility. – **2 DOTS**
- Need a ranking of uncertainty levels. – **2 DOTS**
- Assumptions need to be clearly expressed--which are science and which are expert opinion? – **2 DOTS**
- Presents only one future conditions versus a range of possible future conditions. – **2 DOTS**
- Will this work at a basin level? - scale issues. – **2 DOTS**
- What’s the process for interpreting output? (in science, policy, etc., sectors). – **2 DOTS**
- Output needs to reach the relevant decision forum. – **1 DOT**
- Models stay updated (+ input data are up-to-date). – **1 DOT**
- Need for technology transfer. – **1 DOT**
- Critical eval. Of model assumptions is needed (wildlife HSIs). – **1 DOT**
- May lose support (\$) just as it becomes useful. – **1 DOT**
- Need for sensitivity analysis. – **1 DOT**
- Need continued buy-in (confidence) by all in the neutrality/objectivity of data and models. – **1 DOT**
- Assuming the model is working, how do you carry out the public discussion (what’s the mechanism?) (where’s the accountability?). – **1 DOT**
- Model requires massive inputs but limited ability to modify parameters and only limited outputs. – **1 DOT**
- Illusion that greater complexity = greater credibility. – **1 DOT**
- Runs only at broader scales. – **1 DOT**
- Is CLAMS a flexible tool for “what if” (results are a modeler’s projection of alternatives) **OR** are the results at least partially hard-wired? – **1 DOT**
- Different stakeholders will want different assurances of accuracy and assumptions – depends on your question and scale. – **1 DOT**
- Will take huge investment in underlying data/models to become valid policy development tool. – **1 DOT**
- Confidence levels will vary with question, scale, and stakeholder. – **1 DOT**
- How can stakeholders utilize CLAMS? -- **1 DOT**
- How does CLAMS dovetail w/other modeling systems? – **1 DOT**
- Appropriate use of models in public and regulatory dialogue (potential for inappropriate application of scale) ex. Broad to fine. – **1 DOT**
- Concern that CLAMS will be taken for an oracle.
- Concern for inadequate integration of aquatic and terrestrial components.
- Time and cost involved in exporting to another region.
- People may put too much certainty onto CLAMS results.
- Margins of error are unclear in results.
- Need to layout assumptions to public; model needs to be transparent.
- How do you overcome the inherent disbelief in the truth of the models. By being open about assumptions, may make CLAMS more vulnerable than others (models) that are not as open.
- Limitations and applicability need to be made clear.
- Needs to provide explicit sense of accuracy.
- Tools not accessible to the public.
- Assumes that many factors are static. How realistic is this?
- May become a divisive rather than a unifying project.
- Lack of feedback loops (ecological and economic).

- Initial year stuck at 1006 – how is this updated.
  - Need to know appropriate spatial scale for using this information.
  - Provides only means of predicting outcomes of alternative courses of action.
  - Assumptions need to be transparent so we can look back at them.
  - Components of CLAMS vary in their level of scientific maturity.
  - But CLAMS gives us a framework to update and improve these components.
  - Based on forest policy and land management need to incorporate watershed and stream restoration policies.
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- Credibility may be attacked by those who don't like the outcome.
  - Establish credibility first.
  - Ambiguity of term (+ thus applications) of "focal species." What is appropriate value to get from these? (Needs to clarify).
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- Need explicit definitions of forest types and succ. stages.
  - Need an ongoing process of engaging interest groups in validation.
  - Problem in funding these assessments.
    - Are benefits worth the cost?
    - May absorb funding better directed at different scales.
    - e.g., custom mapping or assessments.
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- So complex that few people can "work under the hood" → CLAMS-lite.
  - Needs a friendlier user interface.
  - Needs to move from research to analytical phase.
  - Limited coverage of lowlands.
  - Reflects lack of national concern for rural America.
  - Even at the broad scale, little confidence in the results.

**Q4 What Changes/Improvements in CLAMS Research and Models would you suggest?**

- Define where and at what scale this tool is used appropriately (or not). – **8 DOTS**
- Broaden focus to include more land uses than just forest. – **7 DOTS**
- Inadequate consideration of economics (larger scale – how human behavior might change recreation, forest/nonforest transitions). – **6 DOTS**
- Improve social and economic analysis tools. What businesses might the landscape support? Effects on communities? Nontimber forest products? -- **5 DOTS**
- Confidence ratings for models (Monet vs Picasso). – **4 DOTS**
- Basin level analysis tool esp. cumulative fix for watersheds, fish and wildlife. – **4 DOTS**
- Model validation. – **3 DOTS**
- Characterize decision environments where the model would be useful – make sure the model is useful in these environments. – **3 DOTS**
- Tie in with envision/other ways to visually display results. – **1 DOT**
- Better representation of lowland vegetation. – **2 DOTS**
- Fire, disease/other dynamic disturbance simulators. – **1 DOT**
- Include roads. – **3 DOTS**
  - Systems.
  - Decommissioning.
  - Dynamics of road network.
- Data quality esp. terrestrial habitat on private lands needs to be improved. – **2 DOTS**
  - Presence of snags/down wood.
  - Presence of biotopes (TSPO richness areas).
- Higher resolution veg. mapping (specifically riparian areas, buffers 1-2 pixels wide) (or less). – **2 DOTS**
- Break out % of riparian areas by industrial/nonindustrial.
- Formally clarify the relationships between CLAMS and decision-making processes. – **2 DOTS**
- Better ROADS data and analysis of consequences. – **2 DOTS**
- What can we do on nonfederal ownerships for Coho (e.g., bring in metro plan) (especially nonforest). – **1 DOT**
- Need some discussion of confidence intervals of maps, graphs (add error bars to graphs). – **1 DOT**
- Larger spatial extent – include the Cascades. – **1 DOT**
- Social and economic dynamics, context, models. – **1 DOT**
- Marketing/communications plan! – **1 DOT**
- Many changes involve adding things not currently encompassed (exotics, global chg.). – **1 DOT**
- Tech transfer to technicians with organizations. – **1 DOT**
- Evaluate consequences of using 2 G & Y models.
- Make available more vegetation classes.
- Update approach for assessing recreation to account for population growth and new uses (e.g., ATVs).
- Expand # fish spp. covered.
- Allow people to put their own assumptions into the model.
- Invest in better interfaces so the public can use the model.
- Incorporate a more formal public outreach process.
- Link the project with decision forums. Land management agencies – state, fed, tribes, EPA.
- Plug into a decision support model (e.g., Keith Reynolds).
- Integrate tested decision-making tools into CLAMS.
- Effects.
  - Peakflows.
  - Chronic inputs and sedimentation.
  - Debris flows and runouts.
- Ability to deal w/nonpoint pollution off all ownerships + land uses.
- Wildlife models need to be validated.
- Bring in additional plans to compare/contrast in one broad landscape.
- Large woody debris model (aquatic) is not calibrated for distance to stream.

- Need to consider conversion between F1 + PN1 forestry industry + private nonindustrial.
- Friendlier user interface.
- Insertion of other wildlife habitat models to better understand trends.
- Roll-out to extend beyond Oregon → Sim forest?
- Business decision needed on whether to continue investing in CLAMS – what is R01? (research vs application \$).
- Tie in with full range of NSO/NWFP for future decision making.
- Global climate  $\Delta$ .

#### **Q5 What should be the next steps?**

- Broaden to include all land uses (nonforest). E.g., blockages downstream on ag. Land. – **7 DOTS**
- Expand and build public understanding, acceptance, and support. – **7 DOTS**
- “Ground-truthing” of current conditions (veg., wildlife hab.). Current is more import. Than future/simulations for many users. – **6 DOTS**
- Produce a clear public document that (1) lays out assumptions (key assumptions) and (2) has maps. – **5 DOTS**
- Develop models for urban and rural influences on environment and validation to integrate w/forest.

#### **5 DOTS**

- “Field tests,” e.g., 7<sup>th</sup>-field HUCs, to explore applications. – **4 DOTS**
- Define the user base – “institutional owners.” – **4 DOTS**
- Carry out model validation at multiple scales. – **3 DOTS**
- Take risks and be willing to release some of the modes to agencies so they can test and validate, recognizing that there is some uncertainty to them. – **2 DOTS**
- Identify the range of scenarios the public and agencies and tribes think is important. – **1 DOT**
- Identify key audiences and develop means/vehicles for communicating messages to them; develop appropriate materials for each group. – **1 DOT**
- Identify additional biophysical responses to be considered. – **1 DOT**
- Link strategic planning tool w/ tactical planning but maintain capability to do broad-scale analysis.

#### **1 DOT**

- Uses of CLAMS needs to be limited to uses appropriate for the quality of the results so people know what are the limits of reliability if they use the info. – **1 DOT**
  - Results and disclaimer +/-or.
  - Peer review and confidence intervals.
- Develop a simpler, user friendly “CLAMS-like” model to ask basic questions. – **1 DOT**
- Analyze effects on school districts. – **1 DOT**
- Define role and responsibilities of CLAMS in public debate and secure support and funding. – **1 DOT**

#### **DOT**

- Data that are useful at scale of doing projects (e.g., stream restoration).
- Increase of emphasis on social and economic effects.
- Run some additional scenarios.
- Replicate CLAMS in other areas.
- Pick out the “best parts” to use in other places.
- Refine landowner classes and management practices (particularly for the tribes).
- Make more linkage b/w habitat and species viability.
- Consider other alliances/partnerships to facilitate spread of CLAMS (even-simplified CLAM-like things/products).
- Maps for every BLM/FS office for debris flow runouts and large wood.
- Talk to/make alliances with general public and interest groups.
- Create a multi-interest advisory group to examine assumptions and spread info through their networks.
- Define who is the customer for CLAMS.

## CLAMS Workshop Attendees

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