Spatial Analysis Project Technical Team Meeting Minutes
May 1, 2001, 9:30-3:00

Cloquet Forestry Center

DRAFT

Present: George Host, Tim Jones, Lawson Gerdes, Chris Edgar, Daren Carlson, Jim Manolis, Mark White, Howard Hoganson, Jan Green.

## I. Updates—provided by Jim Manolis

### *A. Overall Project*

1. On Feb. 20, the Strategy Team & Tech Team meeting had a joint meeting and agreed upon recommendations for the future modeling component and the synthesis/interpretation component

2. On March 6, the FRC Landscape Committee approved the future modeling proposals. They generally felt that more money is needed for synthesis and interpretation component, but they did not have time to discuss this in detail.

3. The project acquired additional funds from within DNR: $85,000 for the air photo analysis project and $5k for synthesis/interpretation.

### *B. GLO note digitizing*

1. John Almendinger and others at DNR's resource assessment shop will now be doing this interpretation. Tim Loesh, a GIS programmer at the DNR, has developed some new Arcview tools for digitizing the line-note data. All of the original Microfilms will be scanned and will become available on CD's. John has hired students to do the work, and they will start May 15.

### *C. Air Photo Analysis Contract*

1. The contract will go to J.W. Sewell inc. in Maine. We have acquired enough funds for all 42 plots and 3 time periods.

2. Selected Plots, after some discussion. Sent plot info. to National Archives in Maryland, where 1930's photos are located. Following the May 1 Meeting, we determined that 1930's photos are unvailable for approximately 12 plot locations, mostly in the Border Lakes Subsection. We are looking for other potential locations for photos for this time period.

3. Tech team will need to meet with J.W. Sewell staff in May--June to develop an air photo interpretation key and visit sites in the field.

### *D. Future Modeling*

1. LANDIS modeling contract is in place, split by Lee Frelich and Tim Jones.

2. Harvest Schedule Model (Hoganson) --contract nearly completed.

## II. Discussion about Synthesis/Interpretation Component

### *A. Jim Manolis reviewed how this component has evolved:*

1. This component has been challenging since the start of the project— how do we interpret what changes in spatial patterns mean for wildlife, biodiversity, ecosystem processes, forest productivity etc?

2. We started with a "species group" white paper concept, using these white papers as a foundation for interpreting effect of changes in spatial patterns on species. (birds, mammals, herps, plants, insects & disease)

3. The strategy team didn't like the white paper concept—they felt it was basically a literature review and would not be the most productive use of resoruces.

4. We then moved to a taxonomic team approach—white papers would not be done, but several teams, based on taxonomic expertise, would pull together literature and use this information to interpret what results of other study components mean.

5. At Feb. 20th strategy team meeting, Jerry Niemi suggested that we didn't have enough funding to make this taxonomic group approach work—each group would get less than $8k and it would be hard to get good people to take the project on with this level of funding. He suggested that one research group write a background paper that focussed on basic concepts and processes related to how species respond to spatial patterns, and then they would use this as a foundation to interpret results.

6. At the March 6 Landscape Committee Meeting, members commented that it looks like we're short on funds for this component. They didn't have time for further comment. Currently, we have approx. $25k to do this work.

### *B. Current Developments and Technical Team Discussion*

1. Jim Manolis initiated conversations with 2 potential contractors for this component: Frank Thompson from the USFS North Central Research Station, and John Bissonette at Utah State University. Both expressed interest, and Bissonette is quite enthusiastic. Both need a more detailed description of what the project would involve. Jim Manolis developed a draft outline and provided this to the technical team.

2. Technical Team Discussion: The team reviewed Jim's draft and generally liked the framework. They had a number of suggestions that are incorporated into the attached draft. Jim will discuss this draft with potential contractors. Additional contractors were suggested, including: John Hagen in Maine, Mac Hunter, James Gibbs, Jiquan Chen, Kurt Pregitzer.

## III. Spatial Analysis/Metrics

### *A. George Host Presentation*

1. George presented a list of spatial metrics that he proposes to use as a starting point for spatial analyses. The team amended the list and the updated version is attached. The team will need to discuss this further as analyses are initiated. In particular, particular cover types and growth stages will need to be identified for analysis. This should be done in consultation with the contractors identified for the Synthesis/Interpretation component.

2. We walked through a timeline of steps that are included in the contract language, and made some modifications. The amended timeline is inserted here:

*1) Meet with Project Technical Team to agree upon a core set of landscape metrics and appropriate landscape classes that will be analyzed (May 2001).*

*2) Derive the core set of spatial metrics (determined in step 1) from classified LANDSAT images covering the Northern Superior Uplands and the Northern Minnesota Drift and Lake Plains ecological sections in Minnesota, using a minimum of two separate classifications (GAP and Wolter Classifications). Collapse classes where necessary to make meaningful comparisons between the two classifications. Compare results of the different classifications to determine sensitivity of spatial analyses to different classifications (Analysis to be completed by June 25, 2001).*

*3) Present results of LANDSAT analyses to the Project Technical Team (July 2001). Utilize feedback from technical team when conducting additional analyses and writing report described in step 4.*

*4) Compile report on LANDSAT analyses. Describe methods, results, limitations (Due October 30, 2001).*

*5) Derive the core set of spatial metrics, to the extent possible, from a set of digitized Public Land Survey line-notes, covering a minimum of 128 townships in northern Minnesota. The line-notes will be digitized in another component of the larger Forest Resources Council project, and will be available by January 30, 2001.*

*6) Derive the core set of spatial metrics from a set of interpreted aerial photos from northern Minnesota, covering 42 sample plots, each 9 square miles in size. The aerial photos will be interpreted in another component of the larger Forest Resources Council project, and will be available by January 30, 2001.*

*7) Conduct appropriate analyses to compare metrics across time periods, and compare LANDSAT and Aerial Photo analyses from the same time period.*

*8) Compile a detailed report covering methods, results, and limitations of results of LANDSAT, PLS-line note, and aerial photo analyses. Present report to Project Technical Team and revise based on feedback (Final report due June 1, 2002).*

## IV. Harvest Scheduling Model

### *A. Discussion with Howard Hoganson*

1. Howard discussed his modeling effort in the National Forests and capabilities of his modeling approach. The team got a much better understanding of differences between his models and the LANDIS model. Both modeling approaches are very different, but the two modeling teams will benefit from sharing ideas. Howard has developed stand prescriptions that will be useful as a starting point for prescriptions in the LANDIS model. Howard, Chris, Jim Manolis, and Lawson Gerdes will meet via conference call to begin to flesh out

scenarios that Howard will model. After this initial discussion, the Technical Team will present proposed scenarios to the Strategy Team.

## V. LANDIS Modeling

### *A. Timeline-developed in contract*

*1) Examine draft scenarios developed previously to determine technical feasibility of modeling each scenario using the LANDIS model. Where necessary, determine where variables and scenarios need to be more clearly defined and specified (May 2001).*

*2) Meet with Project Strategy Team (PST) to develop and agree upon modeling scenarios (May and June 2001).*

*3) Develop initial set of data layers and model input coefficients (May and June 2001).*

*4) Compile report that describes scenarios to be modeled, and lists initial input coefficients and GIS layers developed (By June 30, 2001).*

*5) Conduct test runs of the model (July and August, 2001).*

*6) Demonstrate model to strategy team, explain assumptions, and get input on refining modeling scenarios (August 2001).*

*7) Refine scenarios, data layers, and input coefficients, and update report developed for Step 4 (December 1, 2001).*

*8) Run full set of scenarios (January 2002).*

*9) Analyze results and conduct sensitivity analysis (February and March 2002). Summarized model output will consist of mean values (from multiple model runs) for selected landscape metrics, along with standard deviations. The number of runs will be determined by conducting preliminary analyses that assess variability of landscape metrics. Landscape metrics will be chosen in consultation with the technical team, and will be the same ones used for other components of the study (e.g., air photo analysis).*

*10) Write report on modeling exercise, including methods, assumptions, results, limitations, and strengths (March-May 2003, Report due May 1). Results will be illustrated with graphics and maps to the extent possible.*

*11) Present final results to the Project Technical Team and others (May 2002).*

### *B. Next Steps*

1. Tim Jones, Lee Frelich, and Smita Mheta will meet to carry out Step 1. Following this, we will schedule a meeting or conference call with the Strategy Team to discuss and agree upon scenarios.

**Potential Landscape Metrics for Spatial Analysis**
**5.14.01**

| | Overall Landscape | Cover Type/Growth Stage |
|---|---|---|
| **Patch Size Metrics** | | |
| Number of patches | • | • |
| Patch density | • | • |
| Mean patch size | • | • |
| Standard deviation | • | • |
| Coefficient of variation | • | • |
| Size distribution of patches | • | • |
| Lacunarity (forest/non, conifer) | • | • |
| Patch Interior (60 m?) | • | • |
| | | |
| **Edge Metrics** | | |
| Total edge | • | • |
| Edge density | • | • |
| Total edge contrast index | • | • |
| Mean edge contrast index | • | • |
| Contrast-weighted edge density | • | • |
| | | |
| **Shape Metrics** | | |
| Landscape shape index | • | |
| Mean shape index | • | • |
| Fractal dimension | • | • |
| | | |
| **Diversity Metrics** | | |
| Patch richness | • | |
| Patch richness density | • | |
| Shannon diversity | • | |
| | | |
| **Adjacency relationships** | | |
| Contagion | • | |
| Angular second moment | • | |
| Electivity analysis of adjacency | • | • |
| Nearest Neighbor | | • |
| Landscape connectivity | • | |

Synthesis and Interpretation of Spatial Analyses Conducted in the Broader Spatial Analysis Project: Concept Paper

Prepared by Jim Manolis and the Project Technical Team

4 May, 2001

DRAFT

# I. Background Paper: Effects of Forest Spatial Patterns on Wildlife and Ecological Processes

This background paper will be the foundation for interpreting relationships between spatial patterns and wildlife and other ecological processes. The paper will outline basic conceptual models of how plant and animal species and ecological processes are or are not impacted by changes in spatial patterns, and will describe current evidence and gaps in knowlege related to these conceptual models.

For wildlife, the GEIS wildlife model and derivatives can be used as a starting point for development of such conceptual models. The paper will suggest how the GEIS wildlife model would need to be modified in order to incorporate spatial considerations.

The conceptual models could be a foundation for developing computer models that would be developed if funding becomes available in the future.

## *A. Describe types of changes in vegetation patterns that have the greatest impacts on wildlife(plant and animal species), and distinguish between forest management effects and permanent conversion effects.*

1. Habitat Loss
2. Habitat Isolation
3. Habitat perforation
4. Area Effects
5. Edge Effects

***B. Define species and process response types—e.g. groups of species that likely respond similarly to changes in landscape spatial patterns. For example (not necessarily all of these; may include others):***

1. Species

    **a) Interior species**

    **b) Poor dispersers**

    **c) Area sensitive species**

    **d) Mature forest species**

    **e) Conifer dependent species**

    **f) Species that require more than one habitat in close proximity**

    **g) Species that are not sensitive to changes in spatial patterns**

2. Processes

    **a) Fire**

    **b) Wind**

    **c) Spread of insect pests and disease**

***C. Describe conceptual models for how species may be affected by such changes***

1. Aspatial models, such as the GEIS model, or patch scale habitat suitability models

2. Models that charcterize spatial variables or processes such as:

    **a) Movement patterns**

    **b) Patch/habitat choice**

    **c) Predator-prey interactions (e.g., increases in predators near edges)**

d) **Dispersal**

e) **Source-sink dynamics**

f) **Genetic issues**

Note: technical team discussed the need to define the different scales at which these processes operate; whether they operate at single or multiple scales.

## II. Use foundation developed in background paper to interpret results of spatial analyses and change analyses.

### *A. What changes in spatial patterns likely mean for species groups and processes*

1. Changes seen in the past

2. Potential changes given different scenarios modeled in the future

Note: the level of detail needed/expected here needs more discussion.

## III. Conceptual models developed in background paper can be used as foundation for computer modeling effort, if funding becomes available, or in collaboration with other efforts.