General Planning Issues:
- 2 symposia are planned for the project – early to mid 2003 (potentially at the International Rangeland Congress – July 2003 – Durban, South Africa), end of project (2006)
- There is a small amount of money available for consultancy related to project.
- More socio-economic data is needed from Inner Mongolia (research money) – we’ll need to talk to Chuluun about this.
- We may want to produce a glossy paper showing how this project leverages funds from other projects (Fig. 8). This may help to leverage more funds.
- We may also want to consider short policy briefs (short updates on project written for a lay audience) to help leverage more money. This will be a big job. We may want to use consulting money to write them, or someone like Future Harvest who can help with press releases.
- Changes from the original proposal – research objectives 6 and 10 are now out

Specific Discussions of Research Objectives (Fig. 9):
RO2: global level analyses
- Complexity framework and analysis – indices (spatial data)
- Between site comparisons – vegetation, elevation, NDVI (temporal variation)
- Pastoralist pathways – do pastoralists/animals move to more/less complex areas
- Cluster analyses – measure complexity
- Defining boundaries will be a challenge – we need to do this for every site
- Key question – where and when are herbivores not responding to complexity?

RO3: NE Queensland Ranches
- Infrared analysis of fecal matter
- Large landowner (Haightsburg – sp?) – alternative paddocks stratified by heterogeneity and scale
- Ask Jerry Stuth about NIRS database applicable to SCALE
- Heather Blackburn will do her PhD research related to this RO

RO4: herbivore movements
- Fragmentation (excision) in NCA
- Model analysis
- Data collection, data already available – model results
- Literature review
- Needs a lot more thought/planning for other sites (other than Kajiado)

RO5-7: land use/land tenure (generally)
- Movement of animals critical to RO5
- RO5 and RO7 - paired closely with RO8
• RO4 and RO5 paired, RO7 and RO8 paired – we should only do land use patterns for places where we have animal movement data
• For sites a table could be constructed which shows who owns resources, water points, etc. – land tenure doesn’t quantify easily though
• Exclusivity is on a gradient, a sliding scale of individual control (Fig. 10)
• Time will be an important factor – changes happen in a particular order over time (Fig. 11)

RO5
• May need more data collection for this one
• May also need another meeting of people involved to hammer out guidelines

RO7: contemporary land use change (Fig. 12)
• Evaluate processes of change (large scale) or household land use decision-making?
• Survey used is the same as for RO8
• Group or individual interviews – cross-checking for both
• Land use decision-making – 3 levels with different constraints
  o Administrative group – inherit rules they need to implement
  o Local community – leaders of communities
  o Household
• Roy Behnke tasks
  o One page summary of sites
  o Protocol for case studies
  o Look for secondary sources

RO8: economic surveys and analysis
  ▪ Will feed RO9
  ▪ Data coming out of RO8 will help explain RO7
  ▪ Shauna Burnsilver will type and circulate economic data needed for PHEWS model: household typology, for each type (size, age-sex ratios, resources and land holdings), livestock herd sizes and age-sex ratios, expenditures, income, household diet, livestock prices, maize and other agricultural commodities prices
  ▪ General data needs: grazing (when, where), livestock supplements, agricultural production, livestock purchases, livestock sales, what happens to excess cash, what happens in a drought
  ▪ Problem for Central Asia – this type of information has not been collected (it is not what they are looking for)
  ▪ For different areas Philip Thornton will need to advise

RO11: spatial complexity, temporal variability, and population patterns
  ▪ Heterogeneity – selectivity may reduce effects of variability
  ▪ Tom Hobbs will circulate NCEAS database to use
  ▪ Livestock population data
RO12-13
- RO12 – extant populations
- RO13 – theoretical applications
- We have current applications for about 10 sites (NREL)
- other sites – SAVANNA applications, not SCALE sites
- other fragmentation analyses
- could we get at RO10 (trade-offs research objective that is now shelved) through RO13? Include economic analysis (PHEWS) to do this?

Specific Discussions of Research Sites (Table 1):

NCA
- Research objectives – RO2, 4-5, 7-9
- Shauna Burnsilver will send copies of NREL surveys (hers, Kathy’s, Stacy’s, Nicole’s) to Roy Behnke.
- Survey needs/compatibility – Roy Behnke will send a write-up to Kathy Galvin by June 1, 2002. Kathy will send it out to Philip Thornton, Mark Stafford-Smith, and Stacy Lynn by June 24, 2002. The survey questions will be finalized by September 1, 2002.

Kajiado
- RO4 – needs more work
- RO5 – Shauna will collect more data on subdivision (late this year)

Tarangire
- Spatial databases
- RO5 and RO7 – Stacy Lynn
- RO4 – mostly done
- RO8 – not in the works now for this site

Meru
- May not get anything (maybe will have something by January ’05)
- Thinking of fencing area
- Dependent on CRSP

Mara
- May not get anything (maybe will have something by January ’05)
- Dependent on CRSP

LGCA (Loliondo – greater Serengeti area)
- RO5, RO7, RO8
- Intact ecosystem now
- Some info on RO4
STEP (South Turkana)
- No wildlife movement data
- RO5, RO7, RO8
- Demonstrate how climate dynamics influence spatial/temporal dynamics

Serengeti
- Not sure what we can do with fragmentation
- Mike Coughenour – ecosystem application

NWP – Australia
- Not much to be done here
- SAVANNA application, multiple-goals model
- RO8 and RO9

LV/SA
- Mike Peel may be have data for this site

Balkash and Moykium – Kazakstan sites
- More important sites now than Turkmenistan sites
- Livestock production component
- Livestock enterprise economics
- Change in land tenure and livestock populations
- Need to expand RO4 for sites – livestock movement is more extensive (radio collars)
- Information on the informal economy will need to be collected (significance of livestock herd to family, and survival techniques if a family does not have enough TLU’s to survive)
- May use of subset of interviewees to make a generic model (qualitative model)
- Roy will send the questionnaire already used at sites to Shauna, Kathy, and Philip.
- A new site was proposed in Kazakstan. We will not pursue this now.

Bayramali and Gokdepe – Turkmenistan sites
- Not included right now

Yellowstone National Park (YNP)
- Is park large enough to be a self-regulated ecosystem? Is it a complete ecosystem?
- Meet with Mike Coughenour to discuss with him how to get this done.
- Also meet with Mike to discuss Victoria River District (Australia) opportunities with John Ludwig.

Australia Sites (Northern Queensland, Victoria River District)
- We may need more funding for certain sites.
  - Desertknowledge.com (grants may be available, letter of support)
- RO8 and RO9
• RO11 – can probably do
• John Ludwig could probably run simplified model (SAVANNA application) for Australia.
• Steve Douglas (Davis?) – political history
• John Gross – population models

2003 Symposium/Book:
• Maybe we could have a joint SCALE-CRSP symposium.
• If we don’t already have a cross-site synthesis at the symposium, we need to discuss it at the symposium.
• We will probably only have six case studies done. Some cross-comparisons should be done.
• Case studies can be organized around locations.
• The book will focus on RO1.
• A paper should be written first to distribute as a template to encourage similar papers for an edited volume. Diversity also needs to be accommodated.
• The synthesis could be done after the symposium when people have their case studies done.

General Notes/Tasks:
• NSF likes nuggets. The program officer should be kept up-to-date.
• We will need to produce a list of suggested questions for new surveys (needed information). Data comparability will be an issue.
• Establish list of main contacts for each site.
• Refine and publish paper on conceptual model.
• We could contract with historians to write about China/Asia, Africa, and Northern Great Plains/Australia. It could be a synthesis of the three areas.
• Which sites are important from a fragmentation standpoint? We may not have SAVANNA for all of them.
  o We could make a simple model that fits specific objectives. Use an adaptation of Hobbs’ Jackson model (population response needed).
  o Randy Boone will convene a meeting to discuss this. Also, send results of planning meeting to Philip Thornton and Mark Stafford-Smith.
Fig. 1

Effects of Fragmentation (identify, quantify)

Ecological
- Production (RO3)
- Habitat Use (RO4)

Socio-cultural
- Populations (RO11)

Political

Economic
- RO8-10
The same goals are achieved by moving to b2 or c2.

* There is a point of diminishing return for increased exclusivity.
Fig. 3

social complexity (cooperation)

resource

low  high  low  high
Fig. 4: Roy Behnke’s water point example

Figure 1
Water point ownership in Bedouin Libya

<table>
<thead>
<tr>
<th>Water points</th>
<th>Tenure system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively small watering</td>
<td>Cisterns</td>
</tr>
<tr>
<td>points</td>
<td>• on mountain</td>
</tr>
<tr>
<td></td>
<td>• on steppe—mountain</td>
</tr>
<tr>
<td></td>
<td>• on steppe (local drainage)</td>
</tr>
<tr>
<td></td>
<td>• on steppe (located in major</td>
</tr>
<tr>
<td></td>
<td>floodplains)</td>
</tr>
<tr>
<td>Relatively large watering</td>
<td>Wells</td>
</tr>
<tr>
<td>points</td>
<td>water shared</td>
</tr>
<tr>
<td></td>
<td>water shared, sold and ‘stolen’</td>
</tr>
<tr>
<td></td>
<td>water shared</td>
</tr>
<tr>
<td></td>
<td>water shared</td>
</tr>
<tr>
<td></td>
<td>water sold</td>
</tr>
</tbody>
</table>

Private ownership and exclusive use

Communal ownership and unrestricted use

Figure 2
Pasture and arable land ownership in Bedouin Libya

<table>
<thead>
<tr>
<th>Land type</th>
<th>Tenure system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stably productive</td>
<td>Irrigated garden plots</td>
</tr>
<tr>
<td>Unirrigated field sites</td>
<td>• on mountain plateau or in major</td>
</tr>
<tr>
<td></td>
<td>floodplains on steppe</td>
</tr>
<tr>
<td></td>
<td>• on steppe—mountain boundary</td>
</tr>
<tr>
<td></td>
<td>• on steppe (local drainage)</td>
</tr>
<tr>
<td>Erratically productive</td>
<td>Pastures</td>
</tr>
<tr>
<td></td>
<td>bought and sold</td>
</tr>
<tr>
<td></td>
<td>permanent ownership &amp; inheritable</td>
</tr>
<tr>
<td></td>
<td>ownership dependent on regular use</td>
</tr>
<tr>
<td></td>
<td>rights to crop, not field site</td>
</tr>
<tr>
<td></td>
<td>legal open access; some de facto</td>
</tr>
<tr>
<td></td>
<td>restrictions</td>
</tr>
<tr>
<td></td>
<td>Irregularly used and unrestricted</td>
</tr>
<tr>
<td></td>
<td>access</td>
</tr>
</tbody>
</table>
Fig. 5: Philip Thornton’s ‘tree’ idea for looking at commonalities among sites
Fig. 6

- diversification
- intensification
- excision

- Prices
- Cultural change – aspirations, preferences
- Military/political power

- ecological
- climate

Cost/benefits of land use exclusivity/communal use (see Fig. 2)

1) Technical factors
2) Scarcity
3) Commercial value
4) Political/legal considerations
5) Population/demography
6) Climate dynamics
**Goal of diagram:** divide drivers into ultimate and proximate (will be different at different scales) – need 3 diagrams for 3 scales

**ultimate**
- net migration
- intrinsic increase
- degradation
- natural resource base
- Climate change → climate
- global → market access (connectivity)
- local → policy
- technology
- access to labor

**proximate**
- land tenure
  - degree of exclusivity
  - intensification
  - diversification
- livelihood strategies
  - livelihood goals/aspirations
    - cultural
      - costs
      - prices
- resource value
  - scale of resource use

These things need to be included somewhere…

Household livelihood (relative to goals)
- access to labor
- commodity prices
- pressures to diversify/intensify
- wealth
Fig. 8

SCALE Leveraging

- NRI (NREL)
- GL-CRSP (NREL, ILRI)
- NSF MMIA (NREL, KU)
- ILRI Programs
- DARCA (MLURI)
- National Park Analyses (NREL)
- Oz Ranch Analysis (CSIRO)
Fig 9: non-linear connections among research objectives
Fig. 10

As exclusivity increases, more resources are captured.

Question: How does the distribution of resource use in time and space influence processes?
Fig. 11

degree of fragmentation

- 

+ 

time

Fragmentation and land use change

Reaggregation (no land tenure change, different aspirations, divergent regional economy)

pre-industrial

post-industrial

damage to ecosystem/wildlife/etc. – if you know trajectory can something be done?

Excise good land – less desirable land reaggregated
Fig. 12

- Research sites will fall in different areas of this diagram.
- Human welfare (food security) could also be plotted on this diagram (should be on an upslope).
a. ultimate drivers
- population
- natural resource base
- climate
- market access (connectivity)
- policy
- technology
- access to labor
- historical legacy

b. proximate drivers
- land tenure
- degree of exclusivity
- livelihood strategies
- intensification
- diversification
- livelihood goals/aspirations
- cultural costs
- prices

c. land resource use change

f. Long-term human and ecological consequences
- institutions
- animal population changes over time
- animal disease
- biodiversity
- human welfare

d. landscape fragmentation (pattern)

e. short-term human and ecological responses (outcomes)

net migration
intrinsic increase
degradation
climate change
global
local

climate change
market access (connectivity)
population
natural resource base
climate
Philip Thornton’s ‘tree’ idea for looking at commonalities among sites