

Executive Summary

Evaluation of the State and Transition Model Activity Society for Range Management January 2006 Meeting

State and transition models have recently emerged as a new paradigm for examining ecological dynamics. Compared with the traditional linear perspective of ecological change, this new approach allows for a more flexible and realistic understanding of non-linear landscape dynamics, which in turn permits more effective management strategies. Organizations such as the USDA Natural Resources Conservation Service and University of Arizona's Cooperative Extension seek to bring this new paradigm into common practice. As a step toward meeting this goal, the UA Cooperative Extension created a workshop activity to provide participants with an opportunity to explore the utility of state and transition models and their connection to climate variability and change within decision making scenarios. The UA Climate Assessment of the Southwest, a workshop organizing partner, addressed questions relating to the activity's effectiveness and gauged the climate-related perceptions of the participants with a series of interviews and surveys.

The evaluations were conducted in January 2006, when the activity was first introduced to the public during the meeting of the Arizona Section of the Society for Range Management (SRM) in Show Low, Arizona. The evaluation design included four pre-activity key informant interviews, pre-activity surveys of the entire participant population, digital recordings of three table conversations, note-takers of conversations at four additional tables, post-activity surveys of the entire participant population, and four post-activity key informant interviews.

This document presents the methods and abbreviated results from the first two phases of the activity evaluation. More specifically, the results include data from the pre-activity key informant interviews and the pre-activity and post-activity surveys. The results suggest that the state and transition model activity appears to have had a positive effect on the participants' self-perceived knowledge level and comfort level with state and transition models. The activity also appears to have impacted the participants' perceptions of climate and expanded their awareness of the types of climate data that they could use. Evaluation results highlight differences in the perceptions of climate behavior between sectors and positions, and underscore the existence of unclear messages regarding the expected behavior of winter and summer precipitation.

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**Evaluation Report of the State and Transition Model Activity
Society for Range Management January 2006 Meeting**

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Introduction and Background

State and transition models have surfaced in recent years as a new paradigm in the understanding of ecological succession. Whereas the traditional understanding of landscape-change dynamics views a linear succession between well-defined ecological states, the new paradigm envisions a greater degree of complexity between climate, culture, and ecology. Such a paradigm gives natural-resource managers a more nuanced and flexible understanding of landscape dynamics, allowing them to develop more-effective coping and management strategies. Landscapes can be purposefully managed to achieve and maintain desired states rather than trying to achieve some idealized linear cycle or ecological apex.

Organizations, such as the USDA Natural Resources Conservation Service and the University of Arizona's Cooperative Extension, seek to bring the new paradigm into common practice. As a step toward meeting this goal, the University of Arizona's Cooperative Extension created an activity to provide the activity's participants with meaningful and educational exposure to state and transition models. Yet, numerous questions emerged concerning the activity's effectiveness and the perceptions of the participants. To satisfy these questions, the University of Arizona's Climate Assessment for the Southwest, developed a research plan that would be carried out during the activity's first exposure to the public at the January 2006 meeting of the Arizona Section of the Society for Range Management (SRM) in Show Low, Arizona.

This document presents the methods and abbreviated results from the first two phases of the activity evaluation. More specifically, the results include data from the pre-activity key informant interviews and the pre-activity and post-activity surveys. The results suggest that the state and transition model activity appears to have had a positive effect on the participants self-perceived knowledge level and comfort level with state and transition models, as well as impacting the participants' perceptions of climate and expanding the participants' awareness of the types of climate data that they could use. Evaluation results highlight differences in the perceptions of climate behavior between sectors and positions, and the existence of unclear messages regarding the expected behavior of winter and summer precipitation.

Research Design and Methods

Research Goals

The specific goals of the evaluation were to determine

1. The general perceptions of climate change
2. The ways in which each group interacts with climate data provided in the activity
3. Ways to better present climate information to range managers
4. How range managers use state and transition models
5. The range managers' level of understanding and comfort with state and transition models
6. The range managers' view of landscape change as either linear or non-linear
7. To obtain suggested changes to the activity.

Methods

The evaluation of the state and transition model activity at the SRM meeting involved collecting pre and post-activity qualitative and quantitative data on a longitudinal scale.

The pre-activity phase, the first phase of the activity evaluation, began a few weeks prior to the start of the SRM meeting and concluded at the start of the activity at the SRM meeting. This phase involved four key informant interviews and a pre-activity survey. The key informants were selected from the SRM meeting registration list and were chosen based upon the sector in which they worked. One key informant was selected for each of the following sectors: tribal, ranching, federal, and state. The availability of the informants for the interviews limited the ability to obtain more interviews for each sector. The interviews were semi-structured, with general topic-related questions providing the starting point for the conversation. The flexible structure of the interview questions allowed the informant to discuss other related topics as well. The interviews took 20 – 60 minutes to complete.

The pre-activity surveys contained 17 questions that elicited demographic information, planning windows, perceptions relating to various climatic events, use of climate information, and knowledge and comfort levels with state and transition models. The participants for the pre-activity and post-activity surveys were selected based upon their participation in the activity. All the participants in the activity were surveyed. 42 respondents comprise the survey population. The final number of participants was obtained after matching the pre-activity surveys and post-activity survey to a specific participant. The matching was completed by comparing handwriting and demographic information on the surveys. The surveys that did not have a pre-activity or post-activity counterpart were excluded from this analysis. The post-activity phase, or second phase of the activity evaluation, began immediately after the activity at the SRM meeting and is still in process. This document presents the post-activity phase results from the post-activity survey only. The same 17 questions on the pre-activity survey were on the post-activity survey along with question that asked specifically about the usefulness of the data presented in the activity. There were 42 matched post-activity surveys that were included in this analysis.

The research design also allowed for data collection during the activity. This data collection occurred in the form of 4 note-takers that were placed at 4 different tables and 3 digital voice recorders that were placed at three additional tables. 7 tables in all were monitored either by note-takers or digital voice recorders. The notes have been collected and type-written and the voice files have been transcribed into typed documents. The findings from these notes are also included in this document.

Planning Windows: Current Timeframes, Expansion of Timeframes (did info broaden planning windows?)

The following questions were asked to elicit the respondents' planning windows for making plans regarding the use and/or management of rangelands, to determine if they could reasonably expand their planning window, and to determine if the activity expanded the respondents' view of the potential length of their planning windows.

Questions 4-5

Question 4: When you make plans regarding the management/use of rangelands, what is the planning window for those plans?

Question 5: Do you think it is reasonable to expand the time frame on your planning window? If so, which of the following time frames would be best?

Questions 4-5 Findings

General Findings

1. The activity did not have an effect on the planning window of the participants.
2. 15/42 participants on the pre-activity survey and 12/42 of the participants on the post-activity survey acknowledged that they could reasonably expand their planning windows. *But, they still use their shorter planning window.*
3. 16/42 respondents described their planning windows in terms of both short-term and long-term ranges.
4. With the exception of two responses (they stated planning over a lifetime), ten years is the maximum length cited for planning windows.
5. Planning windows appear to be influenced by external forces such as funding deadlines, aid deadlines, and federal guidelines.

Sector-Specific Findings

1. 4/6 Ranchers emphasized making both long-term and short-term plans; this is the highest percentage of all sectors.
2. 11/22 Federal employees cited planning windows that involved short and long-term plans, with the exception of two answers, the length of time state was 1-10 years. 9/22 Federal employees cited only a single number as the planning window (i.e. a respondent that only checked "3 years"). 2/22 Federal employees wrote that planning windows were not applicable to them.
3. 2/7 State employees wrote that they have long and short-term planning windows. 5/7 cited only a single number as the planning window.
4. 0/2 of the Tribal employees cited long and short-term planning windows.
5. The sole Non-profit respondent cited long and short-term planning windows.

Attitudes and Beliefs Regarding Climate Change Impacts to Rangelands: general perceptions, most useful climate change info, and use of climate info

Note: The findings in this section are presented with respect to each question on the SRM survey. There are four questions that belong under this subheading.

Questions 6-9:

Question 6: Have You Noticed Any of the Following Trends Occurring? (Trends listed: Changing Weather Patterns, Increasing Regional Temperatures, Increasing Precipitation Variability, Increasingly Severe Drought Conditions)

Question 7: Are the following trends likely to increase, decrease, or stay the same? (Trends listed: Variability in Winter Precipitation, Variability in Summer Precipitation, Amount of Winter Precipitation, Amount of Summer Precipitation, Average Winter Temperatures, Average Summer Temperatures)

Question 8: Which of the following trends will likely impact range management decisions? (Trends listed: increase variability in precipitation, high intensity precipitation, decreased precipitation, increase in average temperature, high maximum temperatures, changes in seasonal patterns of precipitation)

Question 9: Which of the following types of climate information do you use now? Which of the following types of climate information will you consider using in the future? (Trends listed: seasonal temperature forecasts, historical temperature information, seasonal precipitation forecasts, historical precipitation information, departure from average – precipitation, departure from average–temperature, other)

Question 6 Findings

Question 6: Have You Noticed Any of the Following Trends Occurring? Please check all that apply.

The choices/trends listed were: Changing Weather Patterns, Increasing Regional Temperatures, Increasing Precipitation Variability, and Increasingly Severe Drought Conditions

Changing Weather Patterns

The activity appears to have had a minor affect on beliefs regarding changing weather patterns. There was a gain of two responses on the post-activity survey. However, unlike some of the responses to other questions in this section, there was a negligible loss of one response on the post-activity survey. Most

participants (74% of responses) recognized changing weather patterns, including *all ranchers and tribal participants*.

Increasing Regional Temperatures

Tentatively, the activity seems to have had a strong influence on “noticing” regional temperature increases. Almost half of the “no” answers changed to “yes” answers on the post-activity survey (5/12 “no” answers, excluding the “newly arrived” individuals). A little less than two-thirds (64%) of the responses on the pre-activity and post-activity surveys showed that participants have noticed increasing regional temperatures. *However, that means over a third of the participants do not cite increasing temperatures as a trend.*

The individuals who did not cite increasing temperatures as a trend occupy federal and state research (n=3), consulting (n=3), and management positions (n=3). *This suggests that global warming may be a hard concept to sell to officials/agents who work in positions (such as providing information to range managers) that may not have them dealing with the land on an on-the-ground-level.*

Increasing Precipitation Variability

The activity appears to have had a moderate effect on “noticing” increasing precipitation variability, 4/11 “no” answers changed to “yes”. Nearly three-quarters of the respondents (74%) on the pre-activity survey cited increasing precipitation variability and on the post-activity survey over three-quarters of the respondents (78%) cited that they noticed increasing precipitation variability.

Those who *did not* check this trend on the post-activity survey were a rancher (n=1), federal management professionals (n=2), and newly arrived individuals (n=4). Those who changed their answers to “yes” on the post-activity survey were state extension agents (n=2) and federal management professionals (n=2).

Increasingly Severe Drought Conditions

Seventy-one percent of the respondents cited “increasing severe drought conditions” on the pre-activity survey and on the post-activity survey 76% of the respondents cited this trend. Those who did not cite this trend on the post-activity survey were a state researcher, a federal management professional, and a federal planner/consultant.

With regard to the responses of all categories, the results suggest a division in beliefs and/or experiences between those who work “on-the-ground” and those who work at a more removed level, such a state and federal management.

Question 7 Findings

Question 7: Are the following trends likely to increase, decrease, or stay the same?

The choices/trends for this question were: Variability in Winter Precipitation, Variability in Summer Precipitation, Amount of Winter Precipitation, Amount of Summer Precipitation, Average Winter Temperatures, and Average Summer Temperatures

Variability in Winter Precipitation

The activity appears to have had a moderate impact on the belief that variability in winter precipitation will increase. 62% of respondents on the pre-activity survey and 71% of respondents on the post-activity survey believed that variability in winter precipitation will increase. 35% on the pre-activity survey and 32% of respondents on the post-activity survey believed that variability in winter precipitation will stay the same. There does not appear to be a relationship between sector-affiliation and responses.

There was movement of three responses from “stay the same” to “increase” from the pre-activity survey to the post-activity survey, and minimal movement (n=1) from “increase” to “stay the same” and from “decrease” to “stay the same.” *The logical movement between the categories on the pre to the post-activity surveys suggests a clear message regarding the variability in winter precipitation.*

Variability in Summer Precipitation

The activity appears to have had a moderate impact on the belief that variability in summer precipitation will increase. 63% of the respondents on the pre-activity survey and 71% of the respondents on the post-activity survey checked that variability in summer precipitation will increase. 34% of the respondent on the pre-activity survey and 29% of the respondents on the post-activity survey checked that variability in summer precipitation will remain the same. There does not appear to be a relationship between sector-affiliation and responses.

There was movement of three responses from “stay the same” to “increase” from the pre-activity to the post-activity surveys. And a minimal movement (n=1) from “decrease” to “stay the same”. *The logical movement between the categories on the pre to the post-activity surveys suggests a clear message regarding the variability in summer precipitation.*

Amount of Winter Precipitation

It is difficult to gauge the type of impact the activity had on the respondents' beliefs regarding amount of winter precipitation. The category “increase” gained four responses overall, it also lost two responses. And, the category “decrease” gained three responses and lost seven responses. Finally, the category “stay the same” gained two responses and lost two responses.

Although it appears that the activity did motivate people to change their answers (11 changed their answers), the movement did not occur in a logical manner. This suggests that the respondents did not receive a clear message regarding the expected amount of winter precipitation.

Amount of Summer Precipitation

It is also difficult to gage the type of impact the activity had on the respondents' beliefs concerning the amount of summer precipitation. The category “increase” lost all three of its answers and gained four answers. The category “decrease” lost six responses and gained five responses. Finally the category “stay the same” lost five responses and gained five responses.

So, as with the finding regarding the amount of winter precipitation, it appears that although the activity did motivate people to change their answers (14 changed their answers), the change in the answers did not occur in a logical manner. This suggests that the respondents did not receive a clear message regarding the amount of summer precipitation.

Average Winter Temperatures

The activity appears to have had a minimal effect on the respondents' beliefs regarding average winter temperatures. However, 85% of the respondents on the pre-activity survey and 88% of the respondents on the post-activity survey believed that average winter temperatures will increase.

The high percentage on both the pre and post-activity surveys suggests that this belief was widely established before the activity. Additionally, the minimal movement between categories suggests that the respondents have received a clear message regarding the anticipated behavior of the average winter temperatures.

Average Summer Temperatures

The activity appears to have had a minimal effect on the respondents' beliefs regarding average summer temperatures. 91% of respondents on the pre-activity survey and 83% of respondents on the post-activity survey checked that average summer temperatures will increase. The only losses from the categories occurred within the "increase" category, which lost 3 responses.

In spite of the losses to the "increase" category, the high percentage of respondents still believed that average summer temperatures will increase. Additionally, the minimal movement between the categories suggests a clear message regarding the anticipated behavior of average summer temperatures.

Question 8 Findings

Question 8: Which of the following trends will likely impact range management decisions?

The choices/trends for this question were: increased variability in precipitation, high intensity precipitation, decreased precipitation, increase in average temperature, high maximum temperatures, changes in seasonal patterns of precipitation

Increased Variability in Precipitation

The activity had minimal effect on the beliefs regarding the impact of increased precipitation variability on range management decisions. 87% of respondents on the pre-activity survey and 90% of respondents on the post-activity survey (an increase of one response) checked increased precipitation variability as impacting range management decisions.

Though the activity does not appear to have had much of an impact, the high percentage of respondents who cited this trend suggests that this belief was

previously widely accepted. There also does not appear to be a correlation between responses and sectors.

High Intensity Precipitation

The activity appears to have had an impact on the belief that high intensity precipitation will affect range management decisions. There was a gain of eight responses on the post-activity survey and a loss of two. The net percentage of people who checked this trend on the post-activity survey was 66% and on the pre-activity survey the number of people who checked this trend was 51%.

Although two-thirds of the respondents believed that high intensity precipitation will impact range management decisions, one-third of the respondents still do not believe that range management decisions will be impacted by this trend. There does not appear to be a correlation between the responses and sectors.

Decreased Precipitation

The activity had minimal impact on the respondents' beliefs regarding the impact of decreased precipitation on range management decisions. 90% of respondents on the pre-activity survey and 92% of the respondents on the post-activity survey checked this trend as impacting range management decisions.

The high percentage of respondents who selected this trend and the fact that there does not appear to be a correlation between responses and sectors suggests that this belief was widely accepted before the activity occurred.

Increase in Average Temperature

A little over two-thirds of the respondents (69%) on the post-activity survey believed that this trend will impact range management decisions. This leaves nearly one-third of the respondents who did not check this trend as impacting range management decisions.

The activity had an impact on the respondents' beliefs regarding this trend. However, the nearly equal loss and gain, 4 and 3 respectively, suggest that there was an unclear or contradicting message regarding the influence of this trend on range management decisions.

High Maximum Temperature

A little over half of the respondents on the pre and post-activity surveys (51% and 56%, respectively) checked this trend as impacting range management decisions. This means that nearly half of the respondents do not believe that this trend will impact range management decisions.

The responses do not appear to be correlated to sectors. The activity had a minimal effect on the respondents' answers. In fact, the gain of four and loss of two, might suggest that the respondents received contradictory messages from/during the activity regarding the impact of this trend.

Changes in Seasonal Patterns of Precipitation

The activity appears to have had a minimal negative impact on the respondents' beliefs regarding the impact of this trend on range management decisions. 92% of the respondents on the pre-activity survey and 87% of the respondents on the post-activity survey checked this trend as impacting range management decisions.

In spite of the loss of responses, the high percentage of respondents who believed that this trend will impact range management decisions, suggests a previously held belief regarding the impact of this trend. Additionally, there appears to be a minor difference in sector responses, the only people who did not check this trend on the pre-activity survey were federal employees (planners/consultants (2) and a resource specialist).

Question 9 Findings

Question 9: Which of the following types of climate information do you use now? Which of the following types of climate information will you consider using in the future?

The choices for types of climate information were: seasonal temperature forecasts, historical temperature information, seasonal precipitation forecasts, historical precipitation information, departure from average – precipitation, departure from average – temperature, and other

The exposure to climate information in the activity had an overall strong impact on the respondents' use or considered use of climate data. The findings for each type of climate information are discussed below.

Seasonal Temperature Forecasts (total 41)

The activity had a strong positive impact on the number of respondents who either use or would consider using seasonal temperature forecasts. 56% of the respondents on the pre-activity survey wrote that they either used (n=20) or would consider using (n=5) seasonal temperature forecasts. 80% of the respondents on the post-activity survey wrote that they either used (n=23) or would consider using (n=10) seasonal temperature forecasts. Of all sectors, Federal employees had the lowest percentage (73%) of people that use or would consider using seasonal temperature forecasts.

Historical Temperature Information

The activity also had a strong positive impact on the number of respondents that either use or would consider using historical temperature information. On the pre-activity survey, 59% of respondents wrote that they either use (n=18) or would consider using (n=6) historical temperature information. On the post-activity survey, 76% of the respondents wrote that they either use (n=20) or would consider using (n=11) historical temperature information. The lowest sector-specific percentage for use/considered use belongs to ranchers and academic researchers at 50%.

Seasonal Precipitation Data

The activity appears to have had a moderate impact on the number of respondents that either use or would consider using seasonal precipitation data. 78% of the respondents on the pre-activity survey wrote that they either use (n=29) or would consider using (n=3) seasonal precipitation data. 88% of the respondents on the post-activity survey wrote that they either use (n=31) or would consider using (n=5) seasonal precipitation data. There are no major differences between sectors and use/considered use of this type of information.

Historical Precipitation Data

The activity appears to have had a minor impact on the number of respondents that either use or would consider using historical precipitation data. 80% of the respondents on the pre-activity survey wrote that they either use (n=30) or would consider using (n=3) historical precipitation data. 85% of the respondents on the post-activity survey wrote that they either use (n=32) or would consider using (n=3) historical precipitation data. There do not appear to be any major differences between sectors and use/considered use of this type of information.

Departure from Average (Precipitation)

The activity appears to have had a minor impact on the number of respondents that either use or would consider using precipitation departure from average data. 76% of the respondents on the pre-activity survey wrote that they either use (n=25) or would consider using (n=6) precipitation departure from average data. 80% of the respondents on the post-activity survey wrote that they either use (n=25) or would consider using (n=8) precipitation departure from average data. The two lowest sectors percentage-wise are ranchers (67%) and academic researchers (50%).

Departure from Average (Temperature)

The activity appears to have had a strong impact on the number of respondents that either use or would consider using temperature departure from average data. 66% of the respondents on the pre-activity survey wrote that they either use (n=15) or would consider using (n=12) temperature departure from average data. On the post-activity survey, 80% of the respondents wrote that they either use (n=18) or would consider using (n=15) temperature departure from average data. Ranchers were the lowest sector percentage wise on the pre-activity survey at 17% (n=1), however their score improved on the post-activity survey to 50% (n=3). Additionally, a little over half (5/9) of the respondents that changed their answers to use or would consider using on the post-activity survey were federal employees.

View of Landscape Change: Linear vs. Non-linear

Questions 10-11

This topic was addressed on the pre-activity survey only. The following questions were designed to elicit the types of changes to rangelands and the length of time in which these changes occurred. The responses from the questions would hopefully highlight the respondents' overall view of landscape change; is it linear or non-linear.

Question 10 (pre-activity): Have you observed rapid changes in rangeland conditions? If so, what types of rapid changes occurred?

Question 11 (pre-activity): Over what time period did these rapid changes occur? (Choices were 1-6 months, 6-12 months, and 1-2 years.)

Questions 10-11 Findings

Ten people wrote that they did not observe any rapid changes to rangelands either due to the lack of time working in the area (n=7) or to not believing that changes have occurred (n=3). The remaining 32 respondents cited changes that fall into two categories: public encroachment and drought impacts. Public encroachment was cited by itself as a change, but drought impacts had the following events linked to it:

1. grass death/ loss of herbaceous cover
2. cactus death
3. fire
4. increase in invasive species
5. increased soil movement/erosion
6. woody species encroachment
7. decreased health of riparian areas
8. insect infestation
9. tree death (juniper, manzanita, ponderosa, cypress, and mature oak)

The length of time given by the respondents for which these events occurred can be seen in Table 1. This table shows the number of responses per category of time. Some respondents selected more than one period of time, while others only selected one category. In Table 1 this activity is depicted in the columns along the top row. So, for example, 1-2y only is designated for the people who selected only 1-2 years for the length of time, and 1-6m, 1-2y both is designated for people who selected both 1-6 months and 1-2 years as the length of time that an event occurred.

Table 1

<i>1-6m only</i>	<i>6-12m only</i>	<i>1-2 y only</i>	<i>1-6m, 6-12m both</i>	<i>1-6m, 1-2y both</i>	<i>6-12m, 1-2y both</i>	<i>1-6m ,6-12m, 1-2y</i>
3	4	15	0	4	0	2

MIKE: WE NEED TO TALK ABOUT WHAT THIS COULD MEAN. I AM STILL UNCLEAR ON LINEAR VS. NON-LINEAR CHANGE.

State and Transition Models and Activity: Knowledge Level, Comfort Level, Use, Interaction with Climate Data, Needed Changes to Activity

Questions 12-17

This section discusses the results from the following survey questions:

Question 12 (pre-activity): Have you heard of state and transition models?

Question 13: Do you use state and transition models?

Question 14: Would you use state and transition models? Please explain why you would or why you would not use state and transition models.

Question 15: On a scale of 0-5, how much do you know about state and transition models?

Question 16: On a scale of 0-5, what is your comfort level with state and transition models?

Question 17: What would increase your comfort level with state and transition models?

Questions 10-13, and 19 (Post-Activity Survey Only):

Question 10: The handouts from this exercise contained precipitation data, this information was: (check all that apply)

Question 11: The handouts from this exercise also contained temperature data, this information was: (please check all that apply).

Question 12: The information about departures from average contained in the handouts from this exercise was: (please check all that apply)

Question 13: Did you encounter any problems when using the climate information provided in the handouts? If so, what problems occurred?

Question 19: What changes would you suggest to make this exercise easier to participate in and/or understand?

Findings for Question 12, 13, and 14

Question 12: Have you heard of state and transition models?

Question 13: Do you use state and transition models?

Question 14: Would you use state and transition models? Please explain why you would or why you would not use state and transition models.

The pre-activity survey contained a question that asked the respondents if they had heard of state and transition models (Question 12 on the pre-activity survey). This question was only asked on the pre-activity survey, since after the activity, all of the respondents would have heard of state and transition models. 69% (n=29) of the respondents had heard of state and transition models before the activity. 67% of ranchers, 75% of state employees, 73% of federal employees, 75% of academic researchers, and 0% of tribal employees had previously heard of state and transition models.

38% of the respondents reported using state and transition models on the pre-activity survey. 50% of the ranchers, 25% of state extension agents, 67% of state researchers,

67% of federal planners/consultants, 44% of federal management, and 50% of academic researchers reported using state and transition models on the pre-activity survey.

On the post-activity survey, 55% of the respondents reported using state and transition models. The following categories changed on the post-activity survey for this question: 100% non-profit management, 50% state extension, 100% state researcher, 67% federal researcher, 83% federal planner/consultant, 67% federal management. There was a loss in one sector, academic researcher changed from 50% to 25% on the post-activity survey.

The jump in “yes” responses to this question supports the idea that the activity had a strong impact on the number of people who use state and transition models. The question remains as to whether now, after nearly six months, these individuals would still say they use state and transition models.

The respondents cited several reasons for the use and barriers to the use of state and transition models on the pre and post-activity survey. There was no significant difference in the responses to this question from the pre-activity survey to the post-activity survey. *The majority of the respondents (8/13) wrote that they would use state and transition models to help them develop management strategies through comparing the models to current monitoring data and project to potential future scenarios. The other reason cited for using state and transition models involved the ability to visually represent vegetation processes to others. The barriers to the use of state and transition models involved the lack of time available to the respondent to develop or implement state and transition models, the lack of accurate or well-defined data, and the lack of eco-site data for tribal rangelands.*

Findings for Question 15, 16, and 17

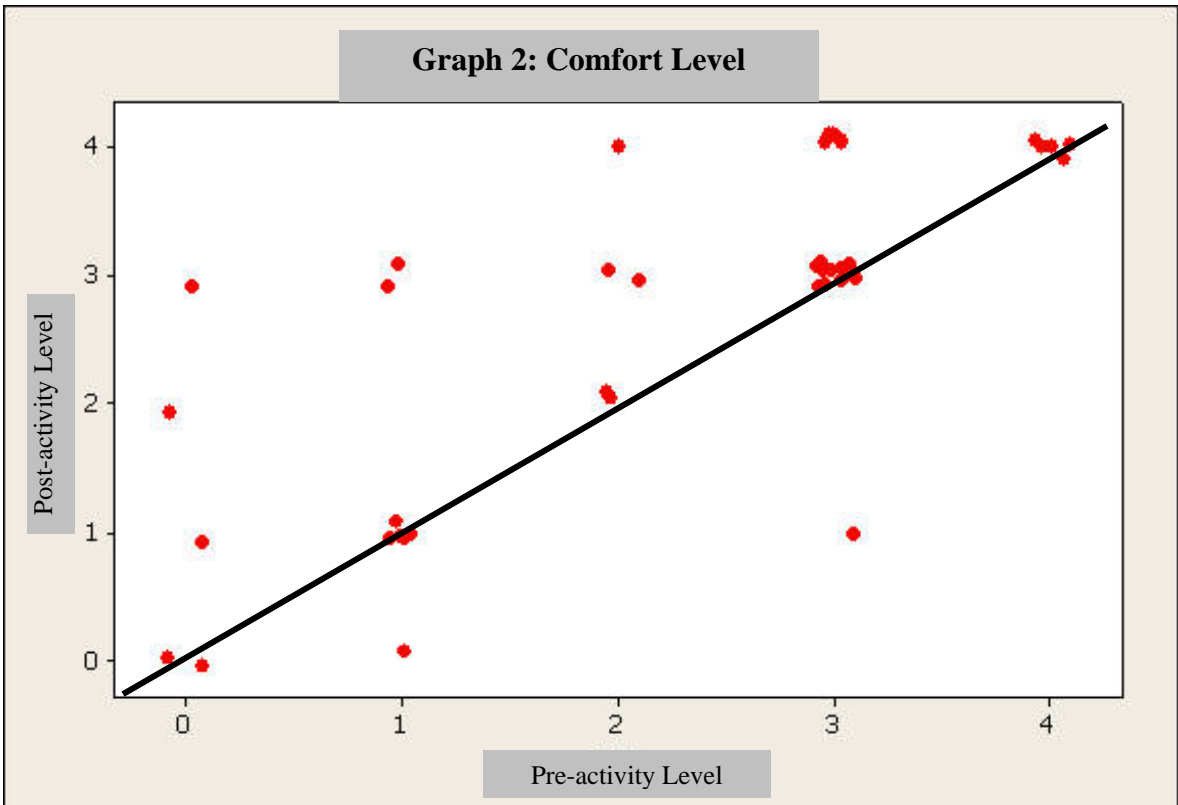
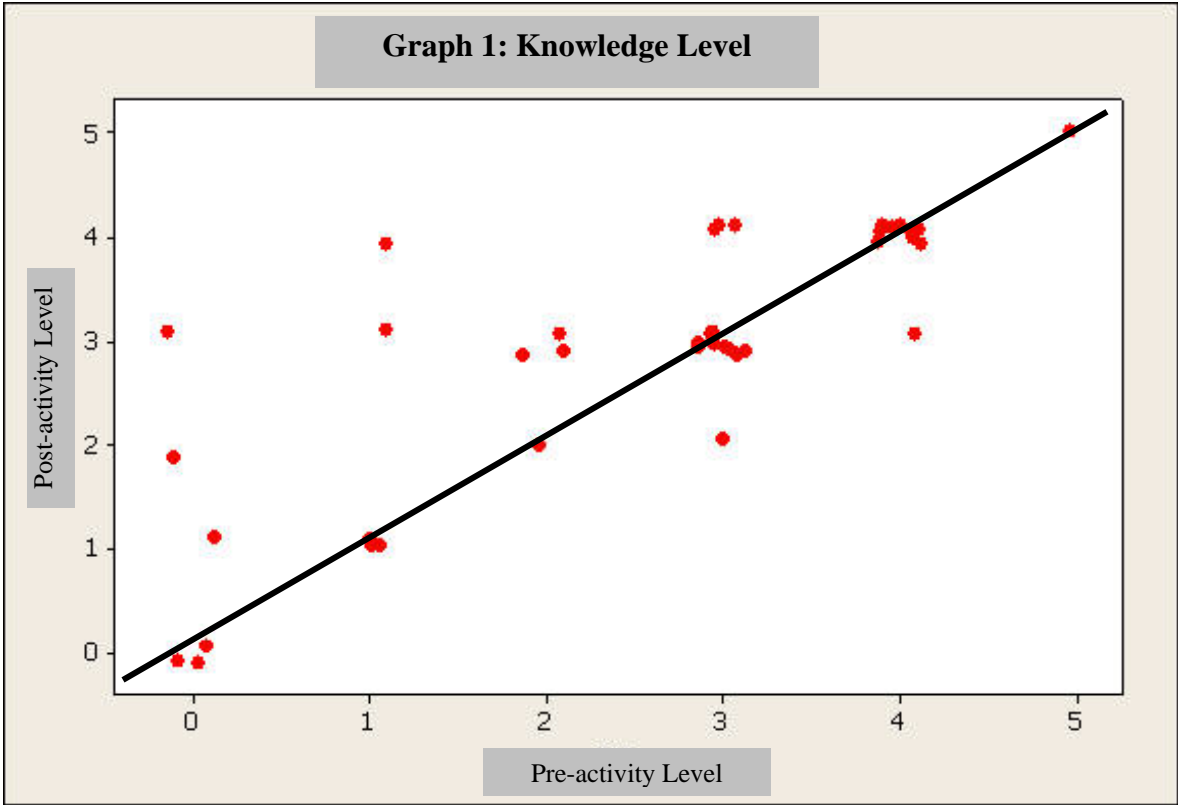
Question 15: On a scale of 0-5, how much do you know about state and transition models?

Question 16: On a scale of 0-5, what is your comfort level with state and transition models?

Question 17: What would increase your comfort level with state and transition models?

The activity did have a positive impact on the self-perceived level of knowledge about state and transition models. Graph 1 shows a scatterplot of the upward trend in knowledge level, with the dots above the black diagonal line reflecting the positive change in knowledge level responses, and the dots below the black line reflecting the negative change in knowledge level responses. (Note that the dots that are clustered together are the same value.) *The greatest percentage of respondents on the pre-activity (62%) and post-activity survey (74%) ranked their knowledge level at a 3 or a 4.*

The activity appears to have been most beneficial to those who ranked their knowledge level at 3 (little above average) or below. The respondents from the federal sector appear to have been impacted the most. Of the 15 respondents who scored themselves at a zero, one, or two on knowledge level, 11 were federal employees. 7 of these 11 federal employees changed their knowledge level on the post-activity survey.



The activity also had a positive impact of the respondents' self-perceived comfort level with state and transition models. Graph 2 shows the upward trend in comfort level, with dots above the black diagonal line reflecting the positive change in comfort level responses, and dots below the black line reflecting the negative change in comfort level responses. (Note that the dots clustered together are the same value.) On the pre-activity survey, the greatest percentage of respondents (45%) ranked their comfort level at a 3, followed by the percentage of respondents (19%) who ranked their comfort level at a 1. On the post-activity survey, the greatest percentage of respondents (40%) still ranked themselves at a 3, followed by the percentage of respondents (29%) who ranked themselves at a 4.

As with knowledge level, the activity seems to have been most beneficial to the comfort level of respondents who had ranked themselves at a 3 or below. And, as evident in the responses to knowledge level, the respondents regarding comfort level from the federal sector once again appear to have been impacted the most by this activity. Of the 18 respondents on the pre-activity survey who scored their comfort level at a zero, one, or two, 11 were federal employees. Of the 9 respondents who changed their comfort level from a zero, one, or two on the post-activity survey, 7 were federal employees.

When asked what would make the respondent feel more comfortable with state and transition models, the overwhelming response (n=22/37) was more hand-on experience and additional practice with state and transition models. Respondents also cited the need for more site-specific models (n=8), more information about state and transition models (n=3), and "more exercises like this one" (n=2). Two academic respondents stressed the need to be cautious and to emphasize that state and transition models are just models of potential outcomes, not predictable future certainties.

Findings for Questions 10-13, and 19

Question 10: The handouts from this exercise contained precipitation data, this information was: (check all that apply)

Question 11: The handouts from this exercise also contained temperature data, this information was: (please check all that apply).

Question 12: The information about departures from average contained in the handouts from this exercise was: (please check all that apply)

The possible choices for questions 10-12 were: consulted during the course of the break-out group, helpful when making management decisions, too complicated, not specific enough, and other.

Question 13: Did you encounter any problems when using the climate information provided in the handouts? If so, what problems occurred?

Question 19: What changes would you suggest to make this exercise easier to participate in and/or understand?

Figure 1: Responses Regarding Climate Data Provided in the Activity

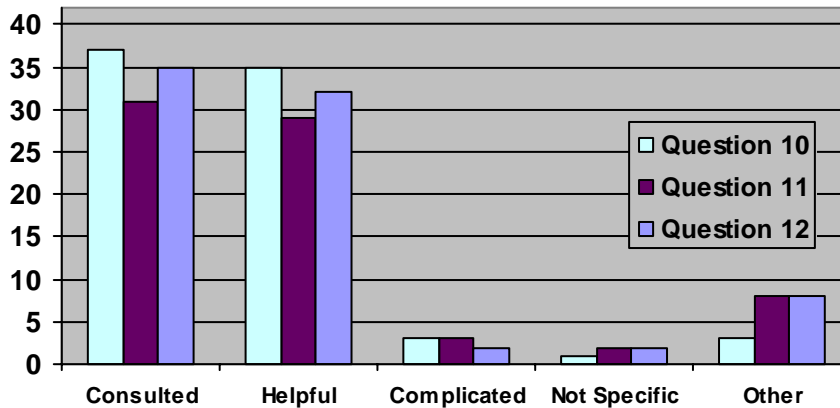


Figure 1 depicts the answers given on the post-activity survey regarding the climate information presented in the activity. *The responses to questions 10 and 12 compared to the responses from question 11 highlight the respondents' greater use of precipitation data and lesser use of temperature data.* The actual numbers related to the options of each question are as follows:

Information was consulted during the course of the break-out group
 Question 10 (n=37) Question 11 (n=31) Question 12 (n=35)

Information was helpful when making management decisions
 Question 10 (n=35) Question 11 (n=29) Question 12 (n=32)

The information was too complicated
 Question 10 (n=3) Question 11 (n=3) Question 12 (n=2)

The information was not specific enough
 Question 10 (n=1) Question 11 (n=2) Question 12 (n=2)

Other
 Question 10 (n=3) Question 11 (n=8) Question 12 (n=8)

The respondents also gave numerous written responses under the “other” option on the survey. The “other” responses relating to the precipitation data (question 10) include the fact that the tables were too busy, the need for duration information, and the idea that it is unrealistic to have data so far ahead of time. On a positive note, the graphs were “good.”

The “other” responses relating to the temperature data (question 11) highlighted the fact that the temperature data was not likely to be available so far ahead in the future, was not relevant enough, not really used, and was treated like a constant. On the same positive note as with question 10, the graphs were “good.”

The “other” responses relating to the departure from average information cover some of the same issues mentioned in question 11. The departure from average information was

seen by the respondents who selected “other” as being not relevant enough, being a duplicate of information from the other data types, and difficult to understand and integrate. On a positive note, one respondent thought the descriptors were easier to understand and another thought the graphs were “good.”

Additional problems encountered while using the climate information in the activity were elicited in question 13. Twenty-six out of forty-two respondents wrote that they did not encounter any problems when using the climate information during the activity. Seven respondents cited some problems when using the climate information. Some of the problems were related to the lack of specific information such as the need for temperature high and lows (not averages), and the need for the duration and intensity of the precipitation event. The other comments asked questions about how the climate would interact with other disturbances and how the ecosystem would respond to other drivers of change.

Question 19 asked the respondents to suggest changes to the activity. 24 respondents wrote in suggested changes that range from no change needed to additional information needed to activity format changes. Six respondents wrote that the activity did not require any changes and cited that the activity “was not complicated” and that it was a “good exercise” and they “really liked it.”

The responses that focused on the need for more information with the activity included the need for more specific information relating to each state, more text information relating to state and transition models, text background about the assigned ecological site, have the Palmer drought severity index charted for temperature and precipitation, a history of the land and other anecdotal information, case studies, and more clarity about the rules.

The responses that suggested changes to the game format included rolling the dice for weather conditions, simplify the rules, having more management choices, more information about financial standing and the financial costs of management options, having the columns on the game worksheet correlate with the “look-up” table, and incorporate into the exercise a field trip to visit an actual site. The changes that were cited the most (n=7) was the need for more management options and the financial costs associated with each management option.

Conclusions

Although one cannot be completely certain that the results from the activity evaluation point directly to changes or impacts caused by the state and transition activity itself, the results do suggest that changes in perceptions about climate and knowledge of state and transition models did occur during the activity. Some of the most important findings revealed in this evaluation point to a possible division in the beliefs regarding climate change and in the planning windows between individuals who work with rangelands directly in an on-the-ground situation (i.e. ranchers) and individuals who work with rangelands at a more removed level (i.e. federal/state management). Additionally, the results elucidate beliefs held in common across sectors such as increasing variability in summer and winter precipitation and increasing average winter and summer temperatures. The results also highlighted areas where the message regarding the expected behavior of specific trends is unclear, such as the amount of summer and winter precipitation. Along with isolating beliefs and perceptions, the results suggest that the activity or the process of interacting with others during the activity introduced the respondents to new types of climate information that they could use. The number of respondents that checked that they either use or would consider using various types of climate information increased dramatically from the pre-activity survey to the post-activity survey, often by 15% or more.

The activity did provide the respondents with more exposure to state and transition models. This exposure had a real, but subtle impact on the respondents' knowledge and comfort level with state and transition models. The results from the evaluation imply that the respondents' who had the least knowledge of and comfort with state and transition models benefited the most from the activity. When asked about the activity itself, the respondents praised the activity for the practical exposure to state and transition models. Several respondents wrote that continued hands-on exposure would increase their comfort level with state and transition models. The primary suggested change to the activity involved increasing the management options available and implementing more financial structure regarding the amount of money they get and the costs associated with each management option. This suggests that the respondents want the activity to closely mirror their management experiences regarding strategies and finances.