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DISSERTATION

DETERMINING RECEPTIVITY AND RESPONSIVENESS FOR CONSERVATION: MEASUREMENT, MODELS AND IMPLICATIONS FOR STRATEGY

Submitted by

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Natural Resource Recreation and Tourism

In partial fulfillment of the requirements

for the Degree of Doctorate of Philosophy

Colorado State University

Fort Collins, Colorado

Spring 1999

COLORADO STATE UNIVERSITY

April 7, 1999

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY DIXIE LYNN SHERROD ENTITLED *DETERMINING RECEPTIVITY AND RESPONSIVENESS FOR CONSERVATION: MEASUREMENT, MODELS AND IMPLICATIONS FOR STRATEGY* BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTORATE OF PHILOSOPHY.

Committee on Graduate Work

Co-Advisor

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Department Head/Director

ABSTRACT OF DISSERTATION

DETERMINING RECEPTIVITY

AND RESPONSIVENESS FOR CONSERVATION:

MEASUREMENT, MODELS AND

IMPLICATIONS

FOR STRATEGY

This dissertation is based on two articles. The first, *Using the Stages of Change Framework to Measure Water Conservation Behavior,* examines the stages of change construct as a framework to measure individual's beliefs about water resources, usage habits, receptivity and attitudinal responsiveness to conservation issues. The second, *Using the Norm Activation Model to Describe Behavioral Change for Conservation* investigates the feasibility of combining the constructs of the norm activation model within the stages of change framework to guide the development of strategic management action, advocacy and communication efforts.

Data for the studies were collected using a simple random sample of 411 non-metered homes in a Colorado municipality of 106,000. Homes within the sample were mailed an 8-page survey on two occasions, with a follow-up postcard sent 10 days after the first mailing. The response rate was 51 percent.

Response rate was not considered a problem because support for conservation had been demonstrated in an earlier study (Maritz, 1991). The salience, and economic sensitivity, to impending water meter installation by state mandate was most likely attributable for the low response. Since our questions were about conservation, it was not likely that the low response accounted for non-response.

In the first article, *Using the Stages of Change Framework to Measure Water Conservation Behavior*, a questionnaire operationalizes a behavioral change continuum ranging from no intention to change to adaptive coping for sustained change. It was comprised of four valid and reliable scales: precontemplation (α .63), contemplation (α .86), action (α .77) and maintenance (α .74). Results indicate that individuals can be located along the stages of change continuum.

In the second article, *Using the Norm Activation Model to Describe Behavioral Change for Conservation*, the stages of change framework is successfully integrated with a complimentary model, norm activation. The constructs of norm activation: 1) awareness of consequences and 2) ascription of responsibility, provided insight onto the cognitions occurring within each of the three dimensions within the stages in change. By combining these theoretical approaches, a better understanding is gained of how behavior is changed, and predicted, for the conservation of natural resources, in this instance water.

The integration of these paradigms implies that individuals can be encouraged within the change process to make incremental steps to adopt change for natural resource issues by the manipulation of normative variables. Implications for message design,

communication planning and management action for natural resource communication and intervention programs are discussed.

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INTRODUCTION

The overall goal of this dissertation was to determine if the stages of change framework can be applied to natural resource issues, and if so, how might richer sources of information be made available for community leaders, resource managers and communication practitioners for decision-making. It is composed of two articles: 1) *Using the Stages of Change Framework to Measure Water Conservation Behavior*, and 2) *Using the Norm Activation Model to Describe Behavioral Change for Conservation.*

The framework has been used by health-related researchers to determine the status of individuals as they work independently to change behaviors.[1] Stages of change is one construct with four dimensions: 1) precontemplation, 2) contemplation, 3) action, and 4) maintenance. Individuals often progress through the stages as they adopt new or alternative behaviors. They may also regress and not consider change, or begin contemplating change again.

The first article, *Using the Stages of Change Framework to Measure Water Conservation Behavior,* extends the framework from health behaviors to behaviors taken for the environment, specifically water conservation. Four Likert-type scales are used to measure an individual's location along the stages of change continuum ranging from no intended change to adaptive coping for sustained change. The measures identify beliefs about water resources, usage habits, attitudinal receptivity and responsiveness to conservation issues.

Since the framework depicts cognitive processing related to behavioral change, it was hypothesized that other complimentary models should assist in elaborating on the

information generated by the stages of change indices. Here, complimentary means a cognitive processing model that is used to predict the behaviors being examined; in this case, water conservation.

The norm activation model was chosen because of its predictability for environmental action.[2] Individuals also take contemplative steps in determining whether they will take action.[3] This model has two constructs: 1) awareness of consequences (AC), and 2) ascription of responsibility (AR). Individuals first become aware of situational needs and the consequences of inaction (AC) before they take responsibility (AR) for acting on behalf of another, or the environment.

The second article, *Using the Norm Activation Model to Describe Behavioral Change for Conservation*, integrates the norm activation model within the stages of change framework. This particular combination clarifies how cognitions and behaviors vary in the adoption of new or alternative conservation behaviors. Blending the framework with the model was demonstrated to provide prescriptive information for strategic planning.

ENDNOTES

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USING THE STAGES OF CHANGE FRAMEWORK TO MEASURE WATER CONSERVATION BEHAVIOR

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ABSTRACT

This paper examines the applicability of using the stages of change construct to measure individual's beliefs about water resources, usage habits and attitudinal responsiveness conservation issues. Data for the study were collected using a simple random sample of 411 non-metered homes in a Colorado municipality of 106,000. The questionnaire operationalized a behavioral change continuum ranging from no intention to change to adaptive coping for sustained change. It was comprised of four valid and reliable scales: precontemplation (α .63), contemplation (α .86), action (α .77) and maintenance (α .74). Results indicate that the stages of change framework can be applied to natural resource issues.

Keywords: stages of change, water conservation, questionnaire

Monitoring the adoption of attitudes and behaviors which support community conservation initiatives is often difficult for resource managers and community leaders. In this paper, we will adapt a measurement instrument used by health-related researchers to determine if individuals align themselves along a behavioral change continuum, which measures their attitudes and behavior, regarding natural resource issues. Specifically, we will determine if individual's support for conservation can be recorded along a behavioral change continuum for the adoption of water conservation behaviors.

BACKGROUND

The stages of change framework views an individual's readiness for the adoption of conservation behaviors as occurring within a distinct sequence of change over time. The framework assumes behavioral change is a series of incremental steps. Modified behaviors, or change in daily habits, can occur as a result of interventions (Marcus et. al., 1992), promotions (Perko and Cowdery, 1994) or other personal and social influences.

Stages of change originated through empirical analyses of smoking cessation programs (Prochaska and DiClemente, 1982). The researchers discovered stages which they believed people progressed through to quit smoking. Prochaska, DiClemente and Norcross (1992) suggest behavior is best conceptualized as spiral in nature, or a series of overlapping stages (Figure 1). Although individuals may progress through the stages, they also have setbacks and need to work through some stages again.

Insert Figure 1 about here

McConnaughy, Prochaska and Velicer (1983) designed an empirical test to measure the stages within a change process for addressing addictive behaviors. They delineated five separate and distinct stages (or dimensions) in behavior change: 1) *precontemplation* is the time when a person is unaware that behavior change is desirable, 2) in *contemplation* a person considers what it would mean to make a change, 3) *decision making or preparation* occurs when a person actually decides to change and is preparing to fully adopt the change, 4) *action* occurs when a person is actively trying to implement the new behavior, and 5) *maintenance* involves maintaining the change after the initial behavioral change has been accomplished. The decision-making, or preparation, stage was eliminated after principal components analysis demonstrated only four distinct components.

Subsequent studies over a period of seven years, found four separate scales (precontemplation, contemplation, action and maintenance) using continuous measures (McConnaughy et. al., 1989). The measurement instrument was found to be successful in tracking smoking cessation behaviors, and guiding the development of interventions.

The most recent description of the framework describes five stages, which includes preparation (Prochaska, DiClemente and Norcross, 1992). The transitory nature of the preparation stage often makes it difficult measure.

Researchers in other health disciplines have applied the framework to a variety of health behaviors. Four stages have been used to describe behaviors such as weight loss (Prochaska, Norcross, Fowler, Follick and Abrams 1992), psychotherapy (Satterfield, Buelow, Lyddon and Johnson, 1995), and many others. While five stages have described

condom use (Schnell, Galavotti, Fishbein and Chan, 1996) and the promotion of exercise (Potvin, Gauvin and Nguyen, 1997).

Researchers in an array of health disciplines have used this model extensively, but there has been no known application within the field of natural resources. The present study evaluates whether the stages of change framework can be applied to natural resource issues. If resident water conservation beliefs can be tracked and sample estimates made, managers would have the potential to delineate if community initiatives are being effective, and better integrate communication and intervention strategies with individual's readiness for change.

Application to conserving behaviors

In applying the stages of change framework (Figure 1), personal decision-making can be viewed as a continuum ranging from precontemplation to maintenance behavior. Each of the four dimensions contained within the stages of change construct may be viewed as separate and distinct events through which behavior change may come as a result of cognitive and affective processing. Three of the four dimensions (contemplation, action and maintenance) are the stages in which change can occur. These three dimensions will be known as the stages *in* change.

In *precontemplation*, individuals are not in the change process. They could be in denial and actively resistant to conservation communication or simply unaware that behavioral change is desirable. There is no intention of changing behaviors. Conservation issues may not be salient, and individuals could be unconcerned about of the need for conservation practices.

In *contemplation*, or the first stage *in* change, individuals have not yet committed to taking action, but are curious about how others are conserving. They are, however, collecting information about the costs and benefits of taking action. Contemplators are beginning to develop specific beliefs and outcome expectancies about adopting new conservation behaviors. The amount of water, and the way in which it is consumed, remains relatively the same. Individuals may, however, be open to methods and technologies which would reduce personal and household consumption.

In *action*, or the second dimension *in* change, individuals are practicing conserving behaviors. New consumption habits are starting to develop. Where an individual once automatically watered his/her lawn the same amount on a daily basis, he/she may now experiment with timing the amount of water laid according to weather conditions. They may also reduce the household's number of wash loads or install water saving devices such as low-flow toilets. These people may find interpersonal communication with others in similar circumstances desirable, and if given the opportunity, may begin to help others reduce their consumption. This may also be the time when acting individuals explore xeriscaping, soil enhancement or other alternative landscaping practices.

In *maintenance*, the third dimension in change, individuals have refined and habituated conservation behaviors until they have become routine. They contemplate and take actions to conserve water, more than any other group. Their commitment to the concept of conservation is strong, and they are the most likely to volunteer to help others conserve. Beliefs toward conserving behaviors have solidified, but can still change as new information becomes available. Individuals in maintenance have developed coping

abilities for managing new obstacles to conservation behaviors. A variety of conservation methods can be demonstrated.

The stages in change describe behavioral aspects of the change process. Given the lack of change in the precontemplation stage, precontemplation is predicted to have a negative relationship with all stages in change because individuals would not be taking steps to change.

The intent of this study is to: 1) determine if the stages of change framework can be applied to natural resource issues, in this case water conservation, and 2) determine how individuals progress within the stages in change toward the adoption of maintenance behaviors.

Study context

Fort Collins is a metropolitan area of about 106,000 residents in Northeastern Colorado. A previous study (Maritz, 1991) indicated that residents strongly supported reducing the need for new water supplies by implementing water restrictions if necessary (85%). The residents also favored other conservation measures, if needed: a noon-to-five watering ban (80%); a sliding rate structure (78%), and rebates for low-flow toilets (78%).

In 1990, the State enacted a water metering act which requires all existing non-metered homes to be metered by the year 2005. The City instituted a voluntary compliance procedure to ease phasing in of installation. About 40% of the owners of non-metered homes voluntarily had a meter installed. The remaining 60%, or about 12,000 non-metered customers, were sampled for exploring their beliefs about conservation behaviors.

METHODS

Procedure

The study population consisted of the 12,000 non-metered customers of the Fort Collins Water Utilities in 1996. A simple random sample of 850 homes were mailed an 8-page survey. Three separate mailings were used with a reminder postcard following 10 days after the first mailing and a second survey to non-respondents 10 days after the reminder postcard. Of the 850 surveys in the initial mailing, 828 were deliverable. A total of 411 usable surveys were returned, for a response rate of 51%.

Instrument

A single concept was examined in this paper: stages of change. Questions for this study were developed using a modified version of the stages of change questionnaire derived by McConnaughy, et. al. (1983), with items composed according to their pertinence to conservation. The early researchers operationally defined the four theoretical dimensions of the stages of change construct (precontemplation, contemplation, action, and maintenance) with 32 items, with eight items representing each of four scales. A confirmatory factor analysis verified the four dimensions of the stages of change.

The present study used 19 belief statements regarding water resources, usage habits and conservation. The reduction in belief statements, from 32 to 19, was due to converting the items to have a relationship with conservation. Oversight of item construction was provided by experts within the municipal water utility. Two items, however, were deleted because of reliability and validity problems. Four scales were

constructed to operationally define the stages of change in the adoption of water conservation behaviors: 1) precontemplation, 2) contemplation, 3) action, and 4) maintenance.

Precontemplation: Three variables were used to measure the precontemplation dimension. Respondents indicated their level of agreement with the following statements: a) I'm not the person who overuses water, it doesn't make sense for me to conserve, b) My living habits may impact water resources, but it's not enough to worry about, and c) All this talk about conserving water is useless. Why can't the City just take care of it?

Contemplation: Five variables measuring contemplation asked respondents to identify their level of agreement with each of the following: a) I'm open to trying ways to conserve water, b) I hope someone will help me better understand my water usage habits, c) I'd like to see how other people conserve water, d) I'd like to find more effective ways of conserving water, and e) I've started working on conserving water, but would like some help.

Action: Five variables represented the action dimension. These included: a) I like to talk with people about ways to conserve water, b) When I can help other people learn to conserve water, I do, c) I've gone to places specifically to learn about water conservation, d) I've helped other people reduce the amount of water they use, and e) I've recently tried new ways to conserve water.

Maintenance: Four variables measuring commitment to conservation asked respondents to indicate their level of agreement with: a) I'm committed to conserving water and will do what it takes to reduce my consumption, b) Anyone can talk about

conserving water, but I'm actually doing something about it, c) When I find myself overusing water, I stop and I modify what I'm doing to conserve, and d) I can demonstrate a variety of water conservation methods.

Variables operationalizing each of the four dimensions were coded using 7-points ranging from "strongly disagree" (1) to "strongly agree" (7). Likert-type scales were constructed using summated scales.

Analysis

A confirmatory factor analysis tested whether the precontemplation, contemplation, action and maintenance dimensions provided a good fit for the data. LISERAL 8 (Joreskog and Sorbom, 1993) was used for this analysis based on the maximum likelihood estimation procedure and the correlation matrix of the 17 items measuring the four dimensions of the stages of change construct. The analysis required each item, or belief statement, to load on one of the four latent variables (dimensions). Chronbach's alpha reliability coefficients measuring internal consistency were computed for each set of items composing the four scales.

The stages in which individuals do change, or better conceptualized as the stages in change, consist of contemplation, action, and maintenance. The model as proposed by McConnaughty et al. (1983), and again by Prochaska, et al. (1992), suggests that action mediates the relationship between contemplation and maintenance. "A given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion" (Baron and Kenny, 1986, p. 1176).

To demonstrate the mediation role of action, two separate structural equation models were analyzed. The first model provided a test of whether the action dimension

was in a full mediation relationship with contemplation and maintenance. In this model, maintenance behavior was predicted to be influenced by contemplation indirectly, through its effect on the mediator (action). The second model tested the concept of maintenance in a partial mediation relationship with action and contemplation. Contemplation was permitted to influence maintenance directly and indirectly through its effect on the mediator (action).

Mediation would occur if the paths between contemplation and action (the mediator), and between the mediator and maintenance (the dependent variable) are significant in both the full and partial mediation models. Full mediation occurs when the change in chi-square statistics indicates that the full mediation model fits better than the partial mediation model. Partial mediation occurs when the change in chi-square statistics show that the partial mediation model fits the data better than the full mediation model (Baron and Kenny, 1986).

RESULTS

Scale Reliability and Validity

The confirmatory factor analysis demonstrated that the data provided an acceptable fit to the precontemplation, contemplation, action and maintenance dimensions of the stages of change construct (Table 1). Each of the variables in the four dimension scales had standardized factor loadings greater than .45, with relatively small standard errors ($SE < .06$ in all cases). Additional support for combining the specific variables into their associated constructs is evident from the reliability coefficients, although one is below the internal consistency level of .70. The Cronbach alpha for the

precontemplation scale was low (α .63). The coefficients for the other three dimension scales were within the desirable range. Contemplation had a Cronbach alpha of .86, action at .77, and maintenance had a coefficient of .74.

Table 1 about here

Scale Correlations

The confirmatory factor analysis also produced a correlation matrix from which we can examine the relationship between precontemplation and the stages *in* change (Table 2). Each correlation between the scales was significant with a $p < .001$.

Table 2 about here

Negative correlations exist between precontemplation and each of the stages *in* change (contemplation, action and maintenance), or those dimensions receptive to change. The highest was between precontemplation and contemplation (-58). When an individual is in precontemplation, they are not likely to engage in contemplation. This negative correlation represents the greatest difference between all the stages. The strength of the correlation between precontemplation and contemplation demonstrates the complexity of bringing precontemplators to contemplation for communication practitioners and managers alike.

As expected, action (-.38) and maintenance (-.52) also had a negative relationship with precontemplation. The relatively high negative correlation between precontemplation and maintenance is understandable, since they represent opposite ends of the continuum. If the content meaning within the questions composing the

precontemplation scale were reversed, the statements would make sensible maintenance items, and vice versa.

Structural Model

Having established the reliability of the constructs, the two structural equation models were examined. To compare and assess the overall fit of the models, four indicators were used (χ^2, χ^2/df, $\Delta\chi^2$, GFI, RMR).

The chi-square (χ^2) should be evaluated in relation to the model's degrees of freedom (Marsh and Hocevar, 1985); a χ^2/df ratio of between 2:1 to 5:1 indicates an acceptable fit. Both models examined here were within this range (Table 3). The full mediation model had a ratio of 4.0 ($\chi^2 = 264.43 \div 67$ df), and the partial mediation model's ratio was 3.7 ($\chi^2 = 242.84 \div 66$ df). The value for the Goodness of Fit Index (GFI) was .91, indicating an acceptable fit of the model (Bollen, 1989). The Root-Mean-Square-Residual (RMR), which measures the average discrepancies between the observed and the model generated covariances, was <.07 for both models, suggesting a close fit of the data (Church and Burke, 1994).

Insert Table 3 about here

Given all these indices suggest that either of these two equations could be used to describe the data, the selection of the "best" model was based on the change in chi-square statistic ($\Delta\chi^2$). In structural equation analysis, models are nested if they contain the same variables and can be constructed from one another by adding or deleting paths (Hayduk, 1987, pp. 163-167). "The difference between the χ^2s of two nested models is distributed as a χ^2 with degrees of freedom equal to the difference between the degrees of freedom

for the two models. This change in χ^2, or $\Delta\chi^2$, is unaffected by sample size and can be used as a test to determine which model fits the data better. The model with the significantly smaller χ^2 is the better fitting model" (Fulton, Manfredo, and Lipscomb, 1996, p.35). The partial mediation model ($\chi^2 = 242.84$, $df = 66$, $p < .001$) had a significantly better fit than the full mediation model ($\Delta\chi^2 = 21.59$, df = 1, $p < .001$). For this reason, the partial mediation model was used to describe the data.

Figure 2 about here

Figure 2 shows the partial mediation model as it describes how individuals build favorable cognitions and skills as they move toward sustained conservation behaviors, characteristic of the maintenance dimension. Contemplation ($\beta = .57$, $p < .001$) explained 32% of the variance in action. Seventy percent of the variance in maintenance was explained by both contemplation ($\beta = .29$, $p < .001$) and action ($\beta = .64$, $p < .001$). According to this explanation, individuals in maintenance are more likely to engage in action behaviors, like helping others, while contemplating behaviors they will take for conservation.

Individual movement toward the adoption of maintenance behaviors is attained through building on cognitions within contemplation and action. Action is the best predictor of maintenance ($\beta = .64$, $p < .001$), however, it is not the only predictor. Individuals in maintenance spend time contemplating their actions for conservation.

DISCUSSION

Results of this study indicate that a stages of change framework can be applied to natural resource issues.

The stages of change questionnaire was comprised of four valid and reliable scales measuring: precontemplation (α .63), contemplation (α .86), action (α .77) and maintenance (α .74); although the precontemplation scale falls below the desired .70 reliability. The reliability of a summated scale might be improved through the addition of items which reflect the latent variable (Babbie, 1992). Since each of the four scales are composite measures, future research might assess additional scale items to determine how the reliabilities might be increased.

Precontemplative items such as: a) I don't concern myself with water conservation; and b) I have no intention to save water for conservation purposes; may improve the precontemplation scale. The action scale might also be improved. In its current composition the scale captures what may be conceived as "opinion leadership" because of the helping behaviors. Items which address the actual "act" of doing or performing actions for conservation may improve this scale's reliability.

Adjusting scale items was anticipated because of the way the questionnaire was developed. The decision rule for scale items stated that belief statements needed to be closely aligned with items used in the stages of change questionnaire derived by McConnaughy, et. al. (1983).

Initially it was anticipated that the stages of change construct would have five dimensions. Four were found. The decision-making, or preparation, dimension may have been elusive to measurement because it represents a transition in thinking and believing, rather than actual behavior change. As individuals move from contemplating action to taking action the transition involves gaining self-confidence, belief in ability to

change or, what is more appropriately referred to as, higher levels of self-efficacy occurs. The individual begins to believe, and agree, that they, too, can adopt change. Additional research in this area might fine-tune the questionnaire's design. Overall, the instrument constructed here provides satisfactory measurement for delineating individual's beliefs about water resources, usage habits and attitudinal response to conservation.

The low response rate of 51% was not a major concern. The customers surveyed had not volunteered for water meter installation despite reminders by the utility over the course of several years. Many customers could have been avoiding all communication with the utility because of the salience of the metering issue. While the response may have effected questions specifically about installation and the utility, it is not likely that it impacted the questions regarding conservation behaviors addressed here. The study by Maritz (1991) indicated that conservation within the community was highly desirable.

Avoidance of water metering also explains why this population has members in maintenance. In a final report to the utility (Sherrod/Knause, 1997), results indicated that many respondents were avoiding having meters installed because they perceived an increase in household water bills (59%).

Sample estimates used in a time-series analyses would identify trends, and may quantify the extent to which individuals are adopting and/or engaging in conserving behaviors. This information would assist managers in monitoring progress toward, or away from, the adoption of attitudes and behaviors which support community initiatives.

CONCLUSION

It seems clear that the stages of change framework can be applied within the field of natural resources. Defining to what extent audiences think about behavioral change, their salient beliefs, and attitudinal responses, would provide agency directors, managers and communication practitioners with richer sources of information for decision making.

The stages of change framework embraces individual's attitudinal and behavioral response to conservation issues, whether that be for water, land, flora or fauna. The questionnaire may be adapted for any of these purposes. What seems to be of most importance, however, is how the information is used, whether that be for policy making, management or communicating with constituents to bring about social change and acceptance.

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Figure 1 Stages Of Change Framework

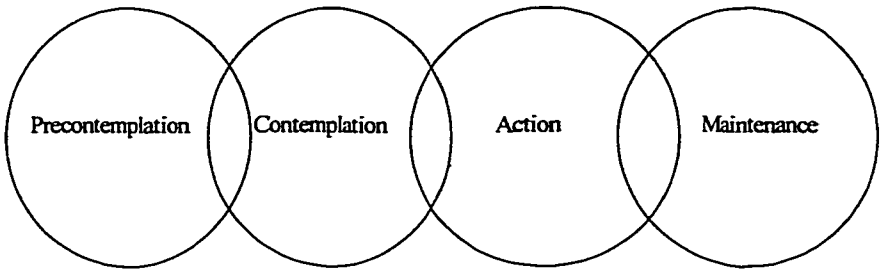

Figure 2 Partial Mediation Model - Stages In Change

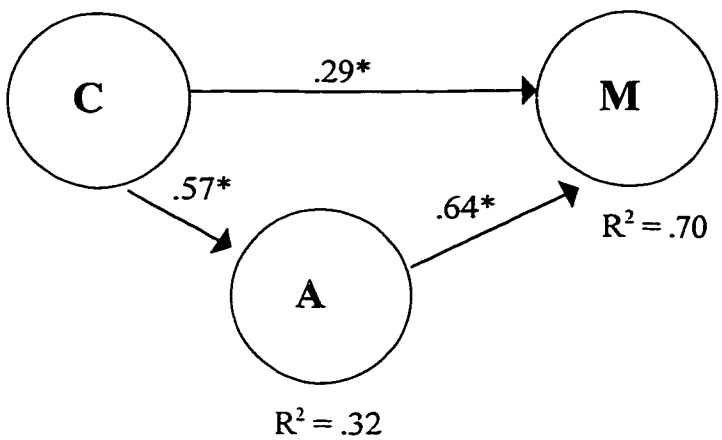

Table 1 Items measuring the four scales of the dimensions in the stages of change construct

Belief Statement[1]	Standardized Factor Loading	*SE*	*t*-value[2]	Cronbach Alpha
Precontemplation dimension (PC)				.63
1. I'm not the person who overuses water, it doesn't make sense for me to conserve	.70	.06	12.35	
2. My living habits may impact water resources, but it's not enough to worry about	.56	.06	9.95	
3. All this talk about conserving water is useless. Why can't the City just take care of it?	.58	.06	10.32	
Contemplation dimension (C)				.86
1. I'm open to trying ways to conserve water	.87	.05	17.38	
2. I hope someone will help me better understand my water usage habits	.52	.05	10.34	
3. I'd like to see how other people conserve water	.77	.05	16.09	
4. I'd like to find more effective ways of conserving water	.70	.05	15.12	
5 I've started working on conserving water, but would like some help	.72	.05	14.90	
Action dimension (A)				.77
1. I like to talk with people about ways to conserve water	.64	.05	12.36	
2. When I can help other people learn to conserve water, I do	.77	.05	15.97	
3. I've gone to places specifically to learn about water conservation	.45	.05	8.55	
4. I've helped other people reduce the amount of water they use	.64	.05	13.14	
5. I've recently tied new ways to conserve water	.61	.05	12.38	
Maintenance dimension (M)				.74
1. I'm committed to conserving water and will do what it takes to reduce my consumption	.78	.05	16.55	
2. Anyone can talk about conserving water, but I'm actually doing something about it	.63	.05	12.52	
3. When I find myself overusing water, I stop and I modify what I'm doing to conserve	.57	.05	11.28	
4. I can demonstrate a variety of water conservation methods	.54	.05	10.43	

[1] Variables on a 7-point scale from "strongly disagree" (1) to "strongly agree" (7)
[2] All t-values significant at $p<.001$

Table 2 Corrected correlation coefficients for the four scales

Dimension	PC
Precontemplation (PC)	---
Contemplation	-.58
Action	-.38
Maintenance	-.52

[a] $n = 395, p < .001$

Table 3 Mediation tests for the three dimensions of the stages in change

Mediation model*	χ^2	*df*	χ^2/df	GFI	RMR
Full mediation	264.43	67	3.95	.91	.065
Partial mediation	242.84	66	3.68	.92	.063

*$p<.001$

$\Delta\chi^2_{\text{(full vs. partial)}} = (\chi^2_{\text{(full)}} - \chi^2_{\text{(partial)}}) = (264.43 - 242.84) = 21.59$

USING THE NORM ACTIVATION MODEL TO DESCRIBE BEHAVIORAL CHANGE FOR CONSERVATION

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ABSTRACT

This paper integrates the stages of change framework with the norm activation model to understand and predict conservation of natural resources, in this instance water. Data were obtained from a survey of 411 non-metered homes in a Colorado municipality of 106,000. Measures of the normative constructs: a) awareness of consequences, and b) ascription of responsibility assisted in defining the location of an individual along a continuum describing responsiveness and receptivity to change. This "stages in change" continuum consists of three dimensions: 1) contemplation, 2) action, and 3) maintenance. Findings of the study focus on the cognitions and behaviors occurring within each of the three stages, and the "best" predictor of conservation behavior. Results indicated individuals can be encouraged within the change process to make incremental steps to adopt change for environmental issues by the manipulation of the normative constructs. The integration of these paradigms provides implications for message design, communication planning and management action for natural resource communication and intervention programs.

Keywords: stages of change, norm activation, message, communication

BACKGROUND

Stages of change is a framework which describes an individual's readiness for behavior change along a continuum from no intended change (precontemplation) to adaptive coping for sustained change (maintenance). The framework forms one construct with four dimensions: 1) precontemplation, 2) contemplation, 3) action, and 4) maintenance.

Precontemplation describes individuals who may be in denial, actively resistant to conservation communication, or simply not aware that change is desirable. In *Contemplation,* individuals have not yet committed to behavioral change, but are weighing the costs and benefits of taking action. *Action* describes individuals who are experimenting with, and practicing, socially desirable behaviors. While in *maintenance,* individuals have refined and habituated these behaviors (Figure 3). Stages of change has been used to guide public health intervention efforts and promotion programs (Brug, Glanz & Kok, 1997; Perko & Cowdery, 1994; Werch, 1997).

Figure 3 about here

The framework suggests that individuals engaged in self-change move through the stages in a linear fashion (DiClemente & Prochaska, 1982; Marcus et al., 1992). In reality, however, behavior demonstrates that change is best conceptualized as spiral in nature or a series of overlapping stages (Prochaska, DiClemente & Norcross, 1992). People do have setbacks and need to work through some stages again. Individuals may also exhibit characteristics from more than one stage, although their cognitions and behaviors are best described by one of the four stages.

Individuals are described by their cognitive receptivity to the adoption of new or alternative, behaviors (Prochaska et al., 1992; Sherrod Vaske & Donnelly, in review, 1999). The ability to reach individuals with a targeted communication, or intervention, regarding a specific issue, however, appears to lie in the constructs of other complimentary social psychological models (e.g., social cognition, theory of reasoned action, etc.) when they are integrated within the framework (Godin, Desharnais, Valois & Bradet, 1995; Slater, 1999). As a result of this integration, the cognitions occurring within each stage varies according to the influence and intensity of the complementary model's constructs.

By mapping out the influence of a complimentary model's constructs within the framework, a more comprehensive picture emerges. This broader base of information provides guidance for encouraging self-changed behaviors through the development of strategic messages, communication plans and interventions.

The process of self-change can be extended from health behaviors to behaviors taken for the conservation of natural resources. Individuals move through the stages of change when adopting, or modifying, behaviors for water conservation (Sherrod et al., in review, 1999). Constructs from complimentary models used to predict environmental behaviors should be able to be integrated within the framework to guide persuasive communication and facilitate behavior adoption for natural resources.

Environmental issues are often approached from a moral standpoint, which gives behavior a right or wrong implication (Dunlap & VanLiere, 1978; Heberlein, 1975; Hopper & Nielsen, 1991; Stern, Dietz & Black, 1986). Collectively, and individually,

people share conceptions about what is appropriate action or expected in a given situation or event. These shared conceptions are called norms.

Norms influence beliefs and behaviors taken for the environment (Heberlein, 1975) and health (Schwartz, 1975). They have been viewed as catalysts of behavior through generating a sense of obligation towards an individual, a community or the environment (Schwartz, 1977; Stern et al., 1986).

Schwartz (1977) developed the norm activation model to describe individual helping behaviors related to health issues (e.g., bone marrow donations). The conditions needed to activate norms are: a) a particular situation must have potentially harmful effects, and b) by taking personal action, a person can assist in preventing these harmful effects. The model contains two key constructs: 1) awareness of consequences, and 2) ascription of responsibility.

Individuals must have an awareness of the consequences that their action or inaction will affect others (AC). They must also ascribe responsibility for action to themselves or some other entity. Ascription of responsibility (AR) refers to the disposition of the individual to accept responsibility for the interpersonal consequences of his/her action. Denial of responsibility (RD) has the same definition as AR, but instead of accepting responsibility, the individual denies it.

The norm activation process has five steps (Schwartz & Howard, 1981). The first four steps match the cognitions occurring in the contemplation dimension of the stages of change.

In the first step, a person becomes aware that there is a need, and an awareness of consequences develops. Situational factors assist in defining the salience, or perceived

seriousness, of the need and also the associated consequences. The individual identifies ways they could possibly help, and assesses their personal ability to act. If the person does not recognize an ability to act, the process stops. Action does not take place. Individuals perceiving their ability to act continue to move through the process.

In the second step, the awareness of associated consequences is more thoughtfully processed. Consideration is given to the personal or social alternatives, costs and benefits, along with the associated implications of taking personal action. Values guide this consideration process, which directs the individual in determining the importance of the situation or issue.

In the third step, a person determines if they will accept personal responsibility to act. When a person enters the third step, they have not yet determined whether they will take responsibility for action. The individual is evaluating the costs, benefits and implications of acting. If the individual perceives acceptable outcome, the person will ascribe responsibility to themselves for action, and decision is completed. If ambiguity is present, the decision is delayed.

In the fourth step, an individual weighs their personal responsibility to engage in action. They may alter their perceptions by neutralizing, or denying, their feelings of obligation. In the case of water conservation, they could either accept responsibility for conservation (AR) or place responsibility for conservation on another source (RD), such as the government or others within the community.

In the fifth step behavior occurs, either action or inaction. If a person decides not to act, they may recycle through the steps again, contemplating action. The contemplation of action is a point where many people can remain stuck, indefinitely.

Schwartz's norm activation model was first applied to environmental issues by Heberlein (1975) in a study of energy conservation behaviors. Its application was later verified in studies on yard burning (Van Liere & Dunlap, 1978) and recycling (Hopper & Nielson, 1991). Each study confirmed that measures of AR and AC could predict environmental behaviors.

Stern et al. (1986) extended Schwartz's model from individual decision-making to collective action taken for the environment. The researchers viewed the adoption of collective change as a process in which dialectic "social-psychological forces...shape individual...judgment," and later through social groups to bring about change. They extended the model to predict behaviors for environmental protection.

The norm activation model illustrates that as awareness of consequences and ascription of responsibility increase, normative behavior increases (Figure 4). The more intense a need is perceived, the greater the probability for norm activation to produce responsiveness on the part of an individual (Schwartz, 1977). For activation to occur, individuals must be aware of the consequential effect that their personal behavior might have on others or the environment, and place responsibility on themselves for their behavioral actions (Hopper & Nielson, 1991; Van Liere & Dunlap, 1978).

Figure 4 about here

Individuals who are aware of situational consequences (AC), and accept personal responsibility for action (AR), are most likely to engage in conservation activities for the community good (Hopper & Neilson, 1991). Higher AC scores have been found to

correlate with a tendency to accept, rather than deny responsibility (Schwartz, 1975; Van Liere & Dunlap, 1978).

The norm activation model appears to have complimentary constructs to integrate within the stages of change framework. The integration should clarify the cognitions and behaviors engaged in the process of adopting new or alternative behaviors for the environment, or in this case water conservation. An implication of this combination is the precontemplation stage, where norms are not activated. Individuals would not be contemplating their personal responsibility (AR) nor the consequences of action or inaction (AC). If they were considering their responsibility, then the contemplation stage would best describe the cognitions occurring. Therefore, we will modify the stages of change continuum to include only those stages responsible for change, or what we call the stages *in* change. Measures of the AC and AR concepts are predicted to assist in defining where an individual places themselves along the stages *in* change continuum (Figure 5).

Figure 5 about here

Study Context

Fort Collins is a metropolitan area of about 106,000 residents in Northeastern Colorado. In 1990, the State enacted a water metering act which requires all existing non-metered homes to be metered by the year 2005. The City instituted a voluntary compliance procedure to ease phasing in of installation. About 40% of the owners of non-metered homes voluntarily had a meter installed. The remaining 60%, or about

12,000 non-metered customers, were sampled to describe their beliefs and intentions for adopting conservation behaviors.

In a previous study of the Fort Collins community (Maritz, 1991), residents strongly supported reducing the need for new water supplies by implementing water restrictions if necessary (85%). These findings suggest that a clearly defined norm for water conservation exists within the community, and that most residents had already contemplated behaviors for conservation, and were in either the action or maintenance stage. Since there is a clearly defined norm within the community for water conservation, it is predicted that as AR and AC increase, the tendency for maintenance behavior will also increase.

This paper will examine the potential for the stages of change construct to be more fully described using the norm activation model in an effort to develop a broader base of information for communication planning, message design and management actions. More specifically, our objectives are to: 1) determine if the norm activation model can be integrated with the stages in change framework to predict conservation behaviors, and 2) determine if the constructs of the norm activation model will clarify the cognitions and behaviors occurring within the stages in change to detail an individual's readiness for change and their potential receptivity to agency communications and management actions which would encourage behavioral change for water conservation.

METHODS

Procedure

A simple random sample of 850 non-metered home dwellers was mailed an 8-page survey. Three separate mailings were used with a reminder postcard following 10 days after the first mailing and a second survey to non-respondents 10 days after the reminder postcard. Of the 850 surveys in the initial mailing, 828 were deliverable. A total of 411 usable surveys were returned, for a response rate of 51%.

Instrument

Three constructs are examined in this paper: stages in change, awareness of consequences and ascription of responsibility.

Stages in Change: Three theoretical dimensions represent the stages in change: 1) contemplation, 2) action, and 3) maintenance.

Contemplation: Five variables measuring contemplation asked respondents to identify their level of agreement with each of the following: a) I'm open to trying ways to conserve water, b) I hope someone will help me better understand my water usage habits, c) I'd like to see how other people conserve water, d) I'd like to find more effective ways of conserving water, e) I've started working on conserving water, but would like some help.

Action: Five variables represented the action dimension. These included: a) I like to talk with people about ways to conserve water, b) When I can help other people learn to conserve water, I do, c) I've gone to places specifically to learn about water

conservation, d) I've helped other people reduce the amount of water they use, e) I've recently tried new ways to conserve water.

Maintenance: Four variables measuring commitment to conservation asked respondents to indicate their level of agreement with: a) I'm committed to conserving water and will do what it takes to reduce my consumption, b) Anyone can talk about conserving water, but I'm actually doing something about it, c) When I find myself overusing water, I stop and I modify what I'm doing to conserve, d) I can demonstrate a variety of water conservation methods.

Variables representing each of the four dimensions operationalized above were coded on 7-point Likert scales ranging from "strongly disagree" (1) to "strongly agree" (7).

Norm activation behavior was operationalized using two constructs: 1) awareness of consequences, and 2) ascription of responsibility.

Awareness of Consequences: Four variables were used to operationalize the AC concept. These include: a) conserving water today will enhance supplies for the future; b) some water resources may be lost forever if they are not conserved; c) protection of water resources is important to sustain life; and d) water resources must be conserved to preserve life for the future.

Responsibility Denial: Four variables were used to measure the RD concept. Respondents indicated their level of agreement with the following statements a) it's my responsibility to conserve water; b) I'm not the person who overuses water, it doesn't make sense for me to conserve; c) my living habits may impact water resources, but its

not enough to worry about; and d) all this talk about conserving water is useless. Why can't the City just take care of it? Items "b" through "d" were reverse coded for analysis.

Items within each of the three concepts were measured on a 7-point Likert scale ranging from "1" representing strong disagreement with the belief statement to "7" representing strong agreement.

RESULTS

Scale Reliability

The internal consistency was calculated for each of the three summated scales representing the contemplation, action and maintenance dimensions of stages in change, and the awareness of consequences and ascription of responsibility constructs in the norm activation model.

Stages in Change: For the five belief statements regarding *contemplation* of water usage and conservation, the average inter-item correlation was .56 and the reliability coefficient was .86. Similar analyses were performed on the other two sets of beliefs. The five belief statements representing *action* for conservation had an average inter-item correlation of .40 and a reliability coefficient of .77. The final set of four belief statements about *maintenance* behaviors had an average inter-item correlation of .53 and a Cronbach's alpha of .74 (Table 4). The mean scores on each scale were calculated for each respondent.

Insert Table 4 about here

Awareness of Consequences: Reliability analysis indicated that these four questions measuring AC had an average inter-item correlation of .66 and a Cronbach's alpha of .83. Deleting any item would lower the overall reliability of the scale (Table 5).

Responsibility Denial: Four variables were used to operationalize the concept of RD (Table 5). Three belief items were reverse coded: 1) I'm not the person who overuses water, it doesn't make sense for me to conserve, 2) my living habits may impact water resources, but it's not enough to worry about, and 3) All this talk about conserving water is useless. Why can't the City just take care of it? The measure had an inter-item correlation of .21 and a reliability coefficient of .65. Deleting any item would lower the overall reliability of the scale.

Insert Table 5 about here

The Conceptual Model

The structural equation model was tested using *SPSS* ordinary least squares regression techniques (Norusis, 1994) and the conventions of path analysis (Grim & Yarnold, 1995). Multiple regressions were conducted to examine the relationship and any influence that AC and AR have with the three dimensions of stages in change.

It was predicted that as AR and AC increase, the tendency for maintenance behavior will also increase. To test this theoretical prediction, each dimension within the stages in change was regressed on AR and AC and the stage occurring before the stage being predicted. For instance, if the action dimension was being predicted, AR, AC and contemplation would be used for explanation. The previous stage is used in the

prediction of behavior because a person must first contemplate before taking action, and act before maintaining behavior.

Both AC ($\beta = .30, p < .001$) and AR ($\beta = .31, p < .001$) were significant predictors of the contemplation dimension. Together these two variables explained 27% of the variance in contemplation (Figure 6).

When individuals begin to act, the data indicate that thought processes begin to change. AC is no longer significant ($\beta = .06, p = .26$) in predicting action. This suggests that individual's no longer focus on the consequences associated with inaction or action when they begin to act. Another explanation for this decrease in AC might be attributable to a shift in focus from considering action to practicing the alternative behaviors undertaken within action. AR was a significant predictor ($\beta = .13, p < .05$) for taking action, suggesting individuals do consider their personal responsibility when acting. Together, these findings suggest that an individual in action spends more time contemplating his/her own responsibility (AR) for performing action behaviors than the consequences (AC) of not doing the behavior.

The contemplation dimension demonstrated strong predictability for action behaviors ($\beta = .33, p < .001$), suggesting that the most important predictor of taking action is the act of contemplation. These three variables explained 20% of the action dimension.

Taking action for conservation was the strongest predictor of the maintenance of those behaviors ($\beta = .48, p < .001$). AC and AR were also significant predictors ($p < .001$) of maintenance ($\beta = .18$ and $\beta = .23$, respectively), with AR contributing slightly more

than AC. Figure 6 presents the standardized regression coefficients for the structural equation model.

Insert Figure 6 about here

DISCUSSION

The results of this research indicate that information gained from the norm activation model can be enhanced by integrating its constructs within the stages of change framework. The framework offers a unique opportunity to describe shifts in cognitions, attitudes, intentions and behaviors that may transpire during the course of a public communication campaign or intervention program. By understanding how individuals move toward maintenance behaviors, natural resource managers, environmental advocates and communications practitioners can take action to facilitate linear movement through the change process.

The norm activation model contributes to the stage-specific approach by clarifying the cognitions and behaviors occurring within each stage *in* change. The integration of these paradigms provides prescriptive information that can guide message design, communication planning and management action for water conservation.

When an individual contemplates behavior taken for conservation, they consider both the consequences of action and inaction, and their personal responsibility to act. Denial may occur within the contemplation dimension. Individuals also may get stuck contemplating and delay decision-making--sometimes indefinitely. The findings for contemplation uphold what Schwartz & Howard (1981) described as the first four steps in norm activation. They also support that collective action is occurring (Stern et al., 1986).

According to the explanations described for the action and maintenance stages in change, it is the previous stage in which norms *are* activated that best predicts an individual's location. Consistent with norm activation theory, the best predictors of the contemplation of conservation behaviors are awareness of consequences and ascription of responsibility. By integrating the norm activation model with the stages in change, the application of activating norms appears more prescriptive as Slater (1999) has suggested.

Individuals may be encouraged within the change process to make incremental steps toward the adoption of new behaviors by the manipulation of normative variables which address environmental issues. The belief statements comprising the AR and AC constructs are first examined for inconsistencies and falsities. Should any errors in beliefs be present, they are addressed in message design. Once measures indicate existing beliefs have been corrected, focus can then be placed on building and encouraging new beliefs which match the cognitions occurring within the appropriate stage in change.

Theories addressing the effects of media and the influence of persuasion also guide message design and communication planning within the stages of change framework. See Slater (1999) for a full review. Applying communication according to an individual's receptivity for self-change enhances the probability that the message will be processed and accepted.

The goal of precontemplation is to increase the salience of the consequences associated with not taking action, and encourage consideration of the issues involved (Table 6). According to Schwartz (1974), raising the salience of AC measures to a moderate level can assist in increasing helping behavior. The degree to which norms are

activated by AC depends on how well the negative consequences of the situation are revealed (Hopper & Nielsen, 1991).

Management actions in precontemplation may best be focused on communicating the consequences of inaction and, if applicable, demonstrating how non-participation has placed the community in its current situation. Communication for precontemplators should focus on the social and personal consequences of the dilemma impacting natural resources. Emphasis on the need for personal action may be beneficial, provided the levels of AC have been elevated. When the need for personal action is highlighted, the social disapproval of non-participation might also be integrated into the communication for maximum effectiveness.

The goals of contemplation are to raise salience of consequences, increase personal responsibility for helping and enhance individual's perception of their ability to contribute to a collective solution (Table 6).

Management tactics would include calling attention to the benefits/savings of action and the consequences of inaction. Customer incentives for water reduction would add to a cache of benefits/savings that could be used to promote persuasion, and still contribute to the overall goal of resource reduction.

Agency communications would address the benefits/savings of taking action, intensify the need for taking action quickly, and the personal responsibility for social consequences. Focus would also be directed at bolstering an individual's perceptions of alternatives, and emphasize a person's ability to contribute to the dilemma's solution.

Schwartz (1975) underscored the need for individuals to recognize their ability to become part of the solution. He believed this might be a threshold variable in the norm

activation process. When people experience feelings of the ability to succeed, above the minimum, it arouses overall feelings of competence and enhances the probability of helping behavior. Nowhere in the behavior change process is it more important for an individual to understand, and believe, that he/she can contribute to a collective solution than in the switch from contemplation to action. People can remain in contemplation indefinitely. If concerns arise after the obligation to act is felt, the possibility for denial increase. Denial neutralizes norm activation and relapse is immanent.

Feelings of self-efficacy facilitate movement toward action behaviors. This explains why the primary goal of action is to enhance self-efficacy. Other goals for action are to enable the ease of behavior change and encourage trial.

The level of AR ($\beta = .31, p < .001$) and AC ($\beta = .30, p < .001$) is elevated for contemplators in comparison to those individuals in action (AR: $\beta = .13, p < .05$, AC: $\beta = .06$, n.s.). This may indicate that within contemplation, individuals are considering their personal responsibility to take action, while those already in action have focused their attention towards other variables impacting their decision for behavioral change. These results seem to contradict Heberlein's (1975) suggestion that a sense of efficacy was part of the AC variable, along with outcome expectations. If self-efficacy is part of AC, then it would seem that AC should reflect an increase in the action stage. Self-efficacy may be an independent variable that can shed light on what actually occurs within the action dimension. This information, however, does underscore Slater's (in press) argument that the variables of other social psychological models need to be analyzed within the stages

of change framework to more fully describe the cognitions and receptivity taking place at each stage in change.

One of the primary objectives for many resource conservation interventions is to encourage experimentation, trial and acceptance of new or alternative behaviors until they become routine. Communication campaigns with these goals would best be aimed at those individuals in action because focus has shifted from contemplating AR and AC to acting. The use of audio and/or visuals which model social expectations for conservation behaviors should be effective. Management actions targeted toward individuals in action might focus on projecting demand for, and creating availability of, low-cost water savings devices (Table 6).

According to the initial research of Sherrod et al. (1999), individuals in contemplation and maintenance have the highest awareness about, or the greatest amount of thought given to, the expected outcomes associated with conservation (AC). As individuals progress from action to maintenance their agreement about those consequences (AC) seems to solidify. Since so much focus is placed on the expected outcome when people move into maintenance, coping strategies need to be well developed to meet, and overcome, any obstacles to conserving behaviors that an individual might encounter. This is the primary goal of strategies aimed at individuals in maintenance. Other goals are to reinforce normative action behaviors and promote volunteerism.

The data of Hopper and Nielsen (1991) suggested that informational brochures and reminders were not enough to influence environmental attitudes. Although both had an effect on behavior, they were not as great as when combined with an intervention by a

volunteer spokesperson. They found that the volunteer was successful in moving a group to higher normative standards for the group's behavior.

Volunteer programs offer highly-involved individuals the opportunity to help others, and to influence other's change through interpersonal communication. Management actions would benefit from offering volunteer programs to create models for those individuals in the action stage, and to persuade contemplators to action.

Communications to those in maintenance focus on promoting coping strategies for any obstacles encountered, and the personal and social benefits to helping the conservation effort (Table 6).

Insert Table 6 about here

CONCLUSION

The impact of this research suggests public intervention efforts for natural resource issues need well designed strategies to focus public attention, facilitate norm activation and/or attitude formation, and maximize effectiveness. Our data suggest that research-based interventions might better assist natural resource managers in targeting action and communication strategies to individuals moving through the processes of change by matching stage-appropriate action and communication mechanisms with the recipient's receptivity to normative variables.

The implication of these findings suggests that further research is needed to determine whether other predictive models of behavioral action for natural resource issues can be integrated within the stages of change framework. This would determine if

the stages of change framework could be applied to behaviors, other than conservation, taken for the environment.

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Figure 3 Stages of change framework

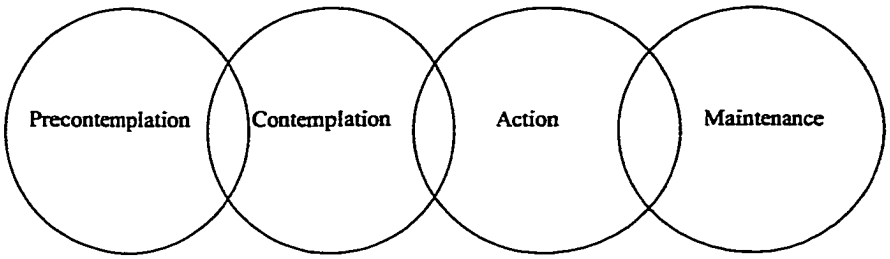


Figure 4 Norm activation model

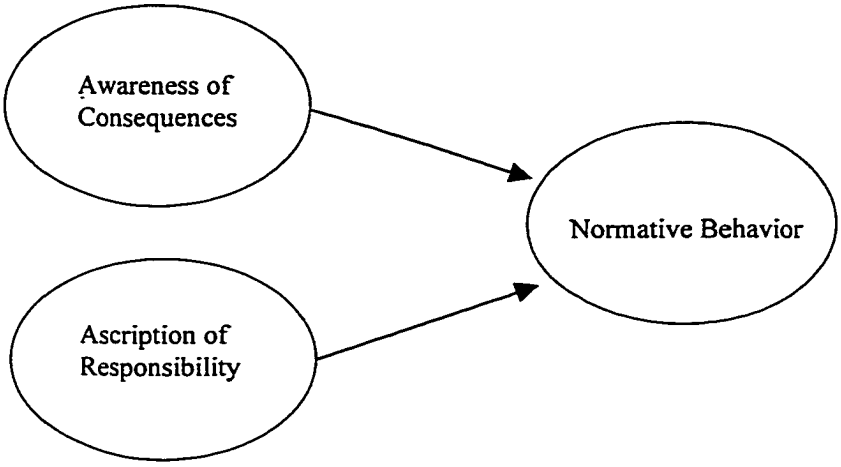


Figure 5 Predicted relationships among awareness of consequences, ascription of responsibility and stages of change

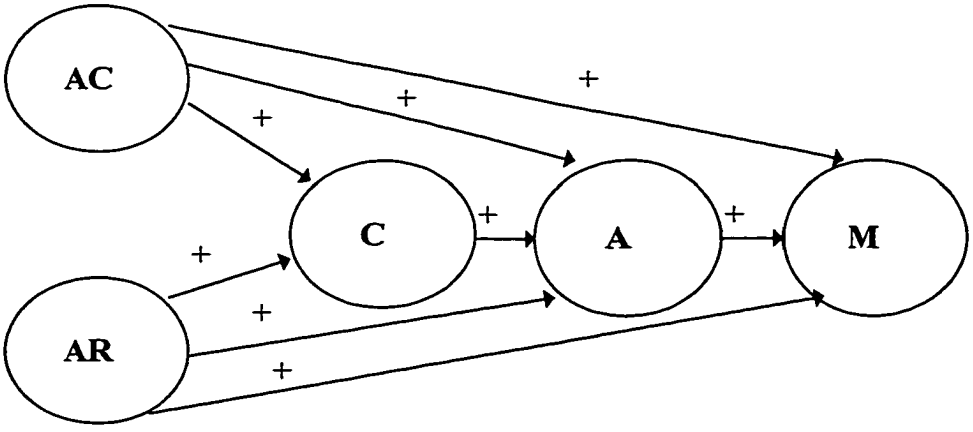
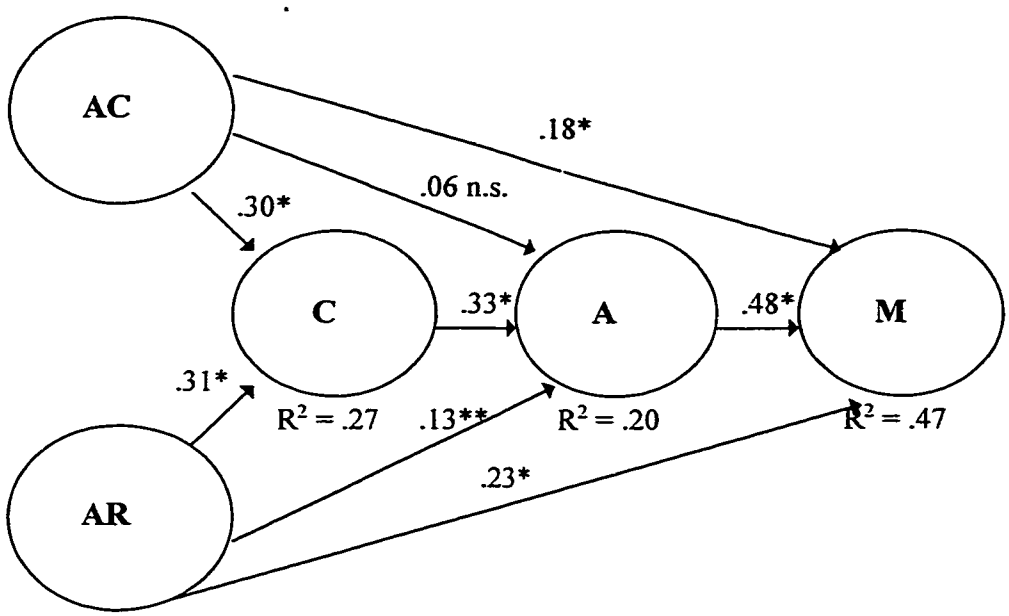


Figure 6 A norm activation model incorporating stages in change



* $p < .001$
** $p < .05$
AC = Awareness of consequences
AR = Ascription of responsibility
C = Contemplation
A = Action
M = Maintenance

Table 4 Reliability analyses for three dimensions of stages in change

Belief Statement[1]	Item Total Correlations	Alpha if Item Deleted	Cronbach Alpha
Contemplation (C)			.86
1. I'm open to trying ways to conserve water	.59	.86	
2. I hope someone will help me better understand my water usage habits	.73	.82	
3. I'd like to see how other people conserve water	.74	.82	
4. I'd like to find more effective ways of conserving water	.74	.82	
5 I've started working on conserving water, but would like some help	.73	.82	
Action (A)			.77
1. I like to talk with people about ways to conserve water	.55	.71	
2. When I can help other people learn to conserve water, I do	.58	.71	
3. I've gone to places specifically to learn about water conservation	.48	.74	
4. I've helped other people reduce the amount of water they use	.57	.71	
5. I've recently tied new ways to conserve water	.50	.73	
Maintenance (M)			.74
1. I'm committed to conserving water and will do what it takes to reduce my consumption	.61	.63	
2. Anyone can talk about conserving water, but I'm actually doing something about it	.57	.65	
3. When I find myself overusing water, I stop and I modify what I'm doing to conserve	.46	.72	
4. I can demonstrate a variety of water conservation methods	.49	.70	

Variables coded on a 7-point scale from "strongly disagree" (1) to "strongly agree" (7)

Table 5 Reliability analyses for the awareness of consequences and ascription of responsibility summated scales

	Corrected Item Total Correlation	Alpha if Item Deleted	Cronbach's Alpha
Awareness of Consequences (AC)			.83
Conserving water today will enhance supplies for the future	.63	.79	
Some water resources may be lost forever if they are not conserved	.67	.76	
Protection of water resources is important to sustain life	.56	.82	
Water resources must be conserved to preserve life for the future	.77	.71	
Responsibility Denial (RD)			.65
It's my responsibility to conserve water	.14	.63	
I'm not the person who overuses water, it doesn't make sense for me to conserve[1]	.27	.52	
My living habits may impact water resources, but it's not enough to worry about[1]	.18	.60	
All this talk about conserving water is useless. Why can't the City just take care of it?[1]	.25	.55	

[1] Items were reverse coded.
Variables coded on a 7-point scale ranging from "strongly disagree" (1) to "strongly agree" (7)

Table 6 Application of information derived from the stages of change framework hosting the norm activation model, for goals, management actions and communication

	Goal	Management action	Communication
Precontemplation	✓Raise salience, and encourage consideration, of social and personal consequences.	•Communicate social and personal consequences of inaction. •Highlight need for personal action.	•Build awareness of social and personal consequences. •Highlight need for personal action, and social disapproval of nonparticipation.
Contemplation	✓Raise salience of consequences. ✓Increase personal responsibility for helping. ✓Enhance perception of individual's ability to contribute to solution.	•Provide incentives for water reduction. •Call attention to benefits/savings of action and consequences of inaction.	•Address benefits/savings for taking action. •Promote intensity of need and personal responsibility for consequences. •Bolster perception of alternatives and ability to contribute to solution.
Action	✓Encourage trial. ✓Enhance self- efficacy. ✓Enable ease of behavior change.	•Provide low-cost water savings devices.	•Encourage experimentation and trial. •Model normative action behaviors, reinforce their social desirability.
Maintenance	✓Reinforce normative action behaviors. ✓Encourage coping strategies to sustain conserving behaviors; promote volunteerism.	•Offer volunteer programs to create models for action and encourage interpersonal communication.	•Promote coping strategies; helping benefits of volunteering for conservation.

CONCLUSION

The four dimensions shown to comprise the stages of change framework implies that individual's receptivity and responsiveness to change differs. These differences demand variations in management, messages and communication plans to increase the effectiveness of programs designed to bring about change.

Social change initiatives for the benefit of the environment usually rely on limited funding. Communication campaigns and management actions can be very expensive. Through research similar to what has been presented here, there is the potential to describe individuals in the population who are receptive to personal and social change. Without this research, a group contrived from secondary sources may be more intuitively appealing, yet not receptive or responsive to the methods and techniques being proposed. The right group with the wrong message, communication tactic or management action assures economic resources are not being utilized to full potential. One strategy for all groups will not, and can not possibly, be affective if people think and act differently when they make decisions about natural resource issues.

Groups of individuals can be identified according to their particular stage, salient beliefs, existing skills and perceived social pressures. Descriptive data of this nature would provide community leaders, resource and communication managers with even greater sources of information for identifying strategic management, communication, and intervention opportunities.

The information generated here allows for quantifying the extent to which individuals think about behavioral change, and the steps they may take to achieve it.

Assessments in the subtle shifts of cognitions and behaviors can be used to measure management and communication objectives for change. Effectiveness can be tracked through time-series analyses, and accountability achieved.

Combining other cognitive process models within the stages of change framework holds great promise. More research needs to be done to test which constructs have the greatest potential to influence behavior. The norm activation model is only one, of what could be many, models which could more fully describe the cognitions occurring within the stages of change.

Overall, these studies have demonstrated that natural resource issues can benefit from scientific approaches taken in health-related research. There may be a parallel between types of baseline research and strategic planning needed for both these social issues. Additional research in these areas is also encouraged.

APPENDICES

APPENDIX A

Water Metering in Fort Collins
Homeowner's Survey

The Fort Collins Water Utilities would like to learn about the viewpoints of its non-metered customers. As a homeowner without a water meter, you have been selected to be one of a small sample of customers to receive this survey. **In homes where there are two homeowners, the person who is most familiar with your home's maintenance activities should complete this survey.**

Your answers will be used to represent the views of other non-metered customers. Please take time to answer every question. Each missing answer will decrease the value of all your answers. The best answer is the one that most closely reflects your feelings, observations, or behavior.

First, we would like to ask you about water meter installation.

1. Do you ____own your home? ____rent your home?

2. Please circle the number which best indicates your level of agreement with the statements below.

Water meter installation:	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
Is my responsibility to initiate	1	2	3	4	5	6	7
is the City's responsibility to initiate	1	2	3	4	5	6	7
is something that I plan to do, but just haven't had time yet	1	2	3	4	5	6	7
is going to cost me *more* money	1	2	3	4	5	6	7
is going to cost me *less* money	1	2	3	4	5	6	7
will help our community manage its water resources	1	2	3	4	5	6	7
is the City's way of encouraging water conservation	1	2	3	4	5	6	7
can be used to conserve water for future generations	1	2	3	4	5	6	7
is something that I will do within the next 3 months	1	2	3	4	5	6	7
is something that I will do within the next 12 months	1	2	3	4	5	6	7
should be mandatory	1	2	3	4	5	6	7

3. Please indicate whether you believe the statements below are true or false.

Water meter installation:	**True**	**False**
is offered free to city homeowners	____	____
will *never* become mandatory	____	____
will become mandatory *soon*	____	____
will be completed in all Fort Collins homes:		
by the year 2000	____	____
by the year 2005	____	____

Next, we would like to find out about the condition of your home's water service lines and interior plumbing fixtures.

4. Please indicate the type of water service lines and the condition of your home's interior plumbing fixtures.

	No	**Yes**	**Don't know**
Type of water service line to your home:			
galvanized pipe	0	1	2
copper pipe	0	1	2
Condition of your home's interior plumbing:			
leaking pipe(s)	0	1	2
leaking toilet(s)	0	1	2
leaking faucet(s)	0	1	2

Next, we would like to understand the extent to which you agree or disagree with a series of statements.

5. Please circle the number which best represents your level of agreement with the following statements:	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
Conserving water today will enhance supplies for the future	1	2	3	4	5	6	7
When I can help other people learn to conserve water, I do	1	2	3	4	5	6	7
I've recently tried new ways to conserve water	1	2	3	4	5	6	7
It's my responsibility to conserve water	1	2	3	4	5	6	7
As far as I'm concerned, I only use as much water as necessary	1	2	3	4	5	6	7
Protection of water resources is important to sustain life	1	2	3	4	5	6	7
I've helped other people reduce the amount of water they use	1	2	3	4	5	6	7
I've gone to places specifically to learn about water conservation	1	2	3	4	5	6	7
I've been thinking that I might want to change my water usage habits	1	2	3	4	5	6	7

6. Please circle the number which best represents your level of agreement with the following statements:	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
Some water resources may be lost forever if they are not conserved	1	2	3	4	5	6	7
I like to talk with people about ways to conserve water	1	2	3	4	5	6	7
When I find myself overusing water, I stop and I modify what I'm doing to conserve	1	2	3	4	5	6	7
My living habits may impact water resources, but it's not enough to worry about	1	2	3	4	5	6	7
Water resources must be conserved to preserve life in the future	1	2	3	4	5	6	7
I can demonstrate a variety of water conservation methods	1	2	3	4	5	6	7
I'd like to see how other people conserve water	1	2	3	4	5	6	7
It's the City's responsibility to conserve water	1	2	3	4	5	6	7
I'm committed to conserving water and will do what it takes to reduce my consumption	1	2	3	4	5	6	7

7. Please circle the number which best represents your level of agreement with the following statements:	Strongly disagree	Moderately disagree	Slightly disagree	Neutral	Slightly agree	Moderately agree	Strongly agree
I'm open to trying ways to conserve water	1	2	3	4	5	6	7
I've started working on conserving water, but would like some help	1	2	3	4	5	6	7
I hope someone will be able to help me better understand my water usage habits	1	2	3	4	5	6	7
Anyone can talk about conserving water, but I'm actually doing something about it	1	2	3	4	5	6	7
I probably overuse water and should work on changing my water usage habits	1	2	3	4	5	6	7
I'd like to find more effective ways of conserving water	1	2	3	4	5	6	7
I'm not the person who overuses water; it doesn't make sense for me to conserve	1	2	3	4	5	6	7
All this talk about conserving water is useless. Why can't the City just take care of it?	1	2	3	4	5	6	7
I'm ready to have a water meter installed	1	2	3	4	5	6	7

Next, we would like to understand various factors which may affect water usage.

8. Please circle the number which best represents about how *often* you do the following activities:

	Never	Rarely	Occasionally	Frequently	Always
turn off sprinklers when it rains	1	2	3	4	5
water yard between the hours of 10 am and 6 pm	1	2	3	4	5
fix leaking faucets quickly	1	2	3	4	5
limit your amount of time spent in shower	1	2	3	4	5
limit the amount of time spent in shower by family members	1	2	3	4	5
check sprinkler direction	1	2	3	4	5
adjust water level to fit laundry load	1	2	3	4	5
have lawn mower set to highest cutting height	1	2	3	4	5
turn water off while you brush your teeth	1	2	3	4	5
water yard at night	1	2	3	4	5
use lower water-requiring plants in landscape	1	2	3	4	5
mulch around shrubs	1	2	3	4	5
hose driveway clean	1	2	3	4	5

Please describe a few characteristics of your home.

9. When was your house built? Year:_____

10. Is your lot size: ___small ___average (8600 sq ft.) ___large

11. Total number of persons in household _____

We would like to know how customer service can be improved to encourage water meter installation.

12. When would be the best time for the Water Utilities to ***call you*** should you decide to have a meter installed? Check all that apply.

Monday - Friday	**or**	**Saturday**
____ 7 am - 8 am		____ 8 am - Noon
____ 8 am - Noon		____ Noon - 4 pm
____ Noon - 4 pm		
____ 4 pm - 7 pm		

13. When is the best time for you ***to meet*** with service staff should you decide to have a meter installed? (It will take about 1-1/2 hours.) Check all that apply.

Monday - Friday	**or**	**Saturday**
____ 7 am - 8 am		____ 8 am - Noon
____ 8 am - Noon		____ Noon - 4 pm
____ Noon - 4 pm		
____ 4 pm - 7 pm		

Finally, we would like to ask some questions about you.

13. Are you _____ male? _____female?

14. What is your age? _____years

15. Zipcode: _____

16. How many years have you lived in Fort Collins? _____

17. What newspapers and/or newsletters do you typically read? Please check all that apply.

____ Inside Fort Collins ____ Collegian ____ Coloradoan
____ The Senior Voice ____ City News (city utility bill insert)

18. How many years of formal education have you completed?

____Grade 1 to 8 ____Some College
____Some high school ____Undergraduate college degree
____High school ____Graduate college degree

19. Please check the space which comes closest to your total family income before taxes.

_____under $10,000 _____$40,000 to $49,999
_____$10,000 to $19,999 _____$50,000 to $74,999
_____$20,000 to $29,999 _____$75,000 to $99,999
_____$30,000 to $39,999 _____$100,000 and above

Please share any additional comments.

Thank you for taking time to help the Fort Collins Water Utilities better understand its non-metered customers. Don't forget, to be eligible for the *Thank You Drawing* you must fill out the entry form on the back page.

Please return your completed survey in the enclosed self-addressed, stamped envelope.

Your assistance is appreciated.

Mail to:

Dixie Sherrod
CSU Ph.D. Student
1205 W. Elizabeth
E-169
Fort Collins, CO 80521