This is to certify that the

thesis entitled

Understanding an individual's perceived risk of recreating around Abandoned Mine Lands & its affect on an individual's willingness to support options to reduce their exposure to that risk

presented by

Connie Lynn Stump

has been accepted towards fulfillment
of the requirements for

Master's degree in Resource Development

Scott Witter
Major professor

Date 5-23-00

UNDERSTANDING AN INDIVIDUAL'S PERCEIVED RISK OF ABANDONED MINE LANDS AND AN INDIVIDUAL'S WILLINGNESS TO SUPPORT RISK REDUCTION

A THESIS

By

Connie Lynn Stump

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

DEPARTMENT OF RESOURCE DEVELOPMENT

2000

ABSTRACT

UNDERSTANDING AN INDIVIDUAL'S PERCEIVED RISK OF ABANDONED MINE LANDS AND AN INDIVIDUAL'S WILLINGNESS TO SUPPORT RISK REDUCTION

By

Connie Lynn Stump

With the cessation of the small scale mining rushes of the late 1800's came the abandonment of large numbers of mines in western America. Long forgotten and abandon, these mining operations have come into the public view recently because of the increase in the number of individuals who are participating in off-highway-vehicle (OHV) recreation around these areas. Land managers need to make decisions regarding how to allow access to these potentially dangerous areas. Reclamation of both the physical and chemical hazards of abandon mines is costly, but not taking action could be even more costly for the individual, potentially even fatal. OHV users are obviously willing to accept a certain amount of risk but it is unknown why they accept that risk or what their perception of risk is with regard to abandon mine lands. This research is concerned with a statistical analysis of surveys given to OHV users in the Fivemile Pass area of Utah. Questions focused on perception of risk by the OHV user and how that correlates with a number of other factors regarding willingness to support risk reduction through reclamation and foregoing use.

ACKNOWLEDGEMENTS

Acknowledgement for this work goes to the Bureau of Land Management, who accommodated my desire for further education, and provided an opportunity for me to conduct my research in conjunction with my other duties. Many thanks go to my advisor, Scott Witter, who was always supportive of my ability to complete this work, and my other committee members, Dan Stynes and Pat Norris, who took time to review, edit, and ask good questions.

Copious amounts of gratitude are due my husband Mark, who was relentless in his encouragement to finish, and to finish well. He also took great efforts to assist in any way possible. I couldn't have asked for a better shoulder to lean on.

To my son David, thanks for inspiring me to get on with my real job. And to my parents, Dan and Ellie Dotson, who lovingly cared for him in the last weeks that were required to get to this point, more loving care could not have been found.

Finally, to my LORD, who makes and keeps promises, Matthew 6:33-34, thanks for keeping the door open.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLES

FIGURES

Chapter 1

INTRODUCTION

Background to the Problem

The Salt Lake Field Office of the Bureau of Land Management oversees management of Off Highway Vehicles on public lands in the west desert of Utah. These lands are managed under the Pony Express Resource Management Plan[1] (RMP), which was signed in 1990. The plan stated that the Pony Express Resource Area would establish OHV designations for the affected area. The OHV Plan amendment[2] was completed in 1992 and provided two different OHV designations for the Fivemile Pass area. A large portion of the Fivemile Pass area was designated, "Open," which allows for cross-country travel. The remainder of the area was designated, "Limited to Existing Roads and Trails." In the spring of 1995, the State of Utah, Division of Parks and Recreation, approached the Salt Lake Field Office of the Bureau of Land Management, requesting lands to be designated as an Off Highway Vehicle recreation area. The State preferred lands within the Fivemile Pass area. This area includes approximately 41,000 acres of public, private and state owned lands, and overlaps Tooele and Utah Counties (Appendix A). The area is currently a dispersed recreation area that receives heavy Off Highway Vehicle (OHV) use, as well as target shooting, horseback riding, and camping; however, the area was once a heavily operated mining district and has a large number of abandoned mining related features.

---

[1] Pony Express Resource Management Plan, January 1990
[2] OHV Plan Amendment, 1992

In 1992, the U.S. Department of Interior, Bureau of Land Management (BLM), was directed by the Office of Management and Budget, "...to submit a report identifying major potential hazardous material sites on public land by September 30, 1993. ...Additional Mines (active and inactive) having lower potential risks will be inventoried until all are completed in FY98."[3] In 1993 the proposed inventory was expanded to include all abandoned solid minerals mine sites.[4] The pilot project for inventorying these sites was completed in San Juan County, Utah. The purpose of this inventory was to identify all abandoned mine sites, document their locations, and record all features associated with the sites to determine the immediate and long-term reclamation needs. These inventories will be the basis for prioritizing Abandoned Mine Land (AML) remediation and estimating the necessary financial commitments required to adequately reclaim these sites. The results will be used as a guide for allocation of future funds based on risk associated with the sites. The Office of Surface Mining adopted the pilot project as the model for standard AML inventories in all 50 states.

Cooperative Agreement was formed between the State and the Salt Lake Field Office of the BLM[5], which resulted in the BLM receiving a $158,000 grant to develop the Fivemile Pass area into a designated Special Recreation Management Area (SRMA). Of the $158,000, $96,000 was for maintenance over 5 years, and the remaining $62,000 was for one-time facility development. BLM informed the Utah State Division of Parks and

---

[3] BLM, Washington Office, FY 1992 PAWP Directives - General Directives Bureauwide Inventories to Identify Possible Hazardous Materials Situations Item 2: Solid Minerals (Subactivity 4130—Mining Law Administration and Subactivity 4140—Other Mineral Resources Management)

[4] Washington Office Information Bulletin No. 93-235, February 5, 1993

[5] Cooperative Agreement (MOU -BLM-UT020-9709, V#34037B, CC#96102000000) between the Utah Division of Parks and Recreation and the Bureau of Land Management for the management of OHV opportunities at Fivemile Pass, signed September 1, 1997

Recreation that an inventory of all the abandoned mine lands was required to determine the need for reclamation. The inventory would also determine the financial requirements necessary to reduce the risk and hazards to the public.

There was an intensive Abandoned Mine Lands (AML) inventory of the Fivemile Pass area completed during the summer of 1996. This inventory identified 147 total abandoned mine sites that accounted for 196 openings including shafts (vertical openings), adits (horizontal openings) and open pits.[6] In addition, the inventory identified 440 other features such as waste dumps, tailings, prospects and other mining related features. Many of the sites are in heavy use areas of this proposed recreation area.

The BLM, Utah State Office AML coordinator, Teresa McParland, reported in 1996, "Of the 147 total abandoned mine sites which were identified, 38 abandoned mine sites contain one or more unmarked hazards that pose a significant safety hazard to the public. An additional 26 sites contain unmarked minor hazards or major hazards with inadequate mitigation measures that pose a hazard to the public."

There appear to be two different types of risk associated with the AML sites. One risk is the physical hazard of having open holes and highwalls in a high use recreation area. Over the last seventeen years there have been twenty-eight incidents and five deaths related to abandoned mines in Utah.[7] Two of the deaths and six of the incidents occurred near the Fivemile Pass area. Many of the incidents around the State and near this area

---

[6] Abandoned Mine Hazards at Proposed Fivemile Pass Off-Highway-Vehicle Area, Terry McParland, February 11, 1997

[7] Deaths and Incidents at Abandoned Mines in Utah, Summary: From 1982 to June, 1998 – Collected by Utah Abandoned Mine Program

[8]Preliminary Assessment of the Manning Reclamation Program

occurred when people either became lost while exploring the shafts and adits or accidentally drove their OHV into an opening.

The second risk is the toxicity of the tailings. The tailings have high concentrations of toxic elements, such as mercury and arsenic. The hazard potential increases when these elements become airborne, allowing them to be inhaled or ingested. When these elements are inhaled into the lungs or are ingested they quickly enter the blood stream, putting the public at greater risk from the toxins. This risk occurs when OHVs ride across and up the tailing piles, creating dust. There is also risk from walking through and around the tailings, particularly when people camp in the tailings areas.

The level of actual risk has not yet been determined. The State of Utah Emergency Response and Remediation originally tested the tailings in August 1997. The four samples that were taken were tested for eight heavy metals, which indicated that toxicity levels were above regulated levels in every metal except silver and lead (Appendix B).

In July, 1998, the BLM's National Applied Resource Science Center (NARSC) conducted extensive soil sampling throughout all of the tailings, including background samples, to begin characterizing the extent, toxicity, and hazard of the tailings. Approximately 106 samples were taken, at 325 foot intervals. Dr. Karl Ford was the lead scientist on the sampling and testing of the samples. The samples were measured with an X-Ray Fluorescence (XRF) instrument at the NARSC. "The Preliminary Assessment of the Manning Canyon Tailings",[8] was submitted on December 14, 1998, and recommended that the site be further characterized to better understand the risk, and to

[8]Preliminary Assessment of the Manning Canyon Tailings, December 14, 1998, Karl Ford, PhD, National Applied Resource Science Center for the Bureau of Land Management

recommend methods of removal through an Engineering Evaluation/Cost Analysis (EE/CA).

Even with these unknown physical and chemical risks the Fivemile Pass area was chosen as the site for the OHV recreation area by the Utah Division of Parks and Recreation and the State OHV Council, and is strongly supported by OHV users. This site was chosen because it is already a traditional use area for OHV users, and it is within a one hour drive of the Wasatch Front, allowing OHV users to go after work or for short day trips. A final reason for choosing the Fivemile Pass area is because of the large proportion of "Open" designation, indicating low levels of regulation and a wide variety of opportunities.

The perceived risks of recreating around abandoned mine lands by OHV users and OHV advocates and the increased risk exposure due to higher volume of visitors associated with designating this area as an OHV recreation area has not yet been determined. The grant administrators for the Utah Division of Parks and Recreation are aware of the historic mining area, and the OHV clubs frequently visit the area to ride their OHVs, so it may be assumed that OHV users have some awareness of the abandoned mine lands in the area.

In order to identify people who have a vested interest in the management of the lands around Fivemile Pass and the risk associated with OHV play, known as stakeholders, a set of criteria was developed by the BLM. One of the criterion involves parties that own land within the Fivemile Pass OHV planning area, including many private land owners, as well as BLM and the State of Utah. Another criterion is parties that hold some liability for OHV play in the Fivemile pass area. Again, the above land owners meet this criterion as well as the individual OHV riders. A final criterion for being a stakeholder is that they would be affected by the development of the Fivemile pass area. This group includes the above listed groups of landowners within the area, as well as OHV users. Many of the activities that visitors engage in while visiting the Fivemile Pass area are bound by a common activity, OHV play. For this reason, all activities were combined into one user group, OHV users, because OHV play is the number one activity that users engage in, although they do engage in other activities such as camping and target shooting, while on a visit to the area.

With the above criteria considered, there are four stakeholder groups in the Fivemile Pass area: BLM, Utah State Parks, OHV users, and Private Land Owners. The first three groups are supporting this project, hoping that it will not only enhance the experience of existing users of the area, but also attract other users from the area within a one-hour drive. The fourth stakeholder, private land owners, have mixed concerns about development of the area for recreation, primarily liability of accidents occurring on their property, followed by concern for degradation of private lands and property.

The population within this target area is approximately one million people. Among this one million population, there are approximately 40,000 licensed OHVs.[10]

Early estimates from the Utah Division of Oil Gas and Mining (UDOGM), which is responsible for abandoned mine reclamation, were that it would cost a minimum of $1000 to reclaim each open shaft and adit. The cost of reclaiming highwalls of a pit could be upwards of $5000, and mitigating the tailings would be a minimum of $15,000, which would only include fencing and restricting access.

State Parks expressed concern over the use of OHV grant development monies being used to fund reclamation. Due to the concerns over the cost of reclamation, the UDOGM pursued independent funding for mine closure in this area. The preliminary cost estimate of reclamation, assuming the tailings are benign and only require stabilizing and drainage controls, is $403,750.[11] The closure of all of the openings at Fivemile Pass area, not including any tailings reclamation, was completed in the fall of 1999. The final cost of this project was $358,209.00.

Importance of the Problem

The concern for human health risk and safety as well as liability associated with this risk is important to agencies that manage areas with Abandoned Mine Lands, particularly lands that receive a high number of visits from the public. Abandoned mining areas typically have a high number of roads, making them attractive for OHV users and additionally exposing them to risks associated with Abandoned Mine Lands.

The use of Off Highway Vehicles is typically associated with areas that have a high density of roads. Often, these road networks are a result of abandoned mine lands from historic mining districts, which have been expanded through OHV exploration and play. Due to the road features that are common to both mining and OHV recreation, it follows that in areas that were mined prior to enforced reclamation laws, there would be a higher than average volume of mining related hazards such as open shafts, adits and pits. Because many of these historic mining districts are on federally managed lands, or surrounded by federally managed lands, the federal government is potentially exposing

---

[10]State of Utah, Division of Parks and Recreation, statistics for 1998

[11] Fivemile Pass OHV Area Abandoned Mine Study, December 31, 1996, Prepared by Utah Division of Oil, Gas and Mining Abandoned Mine Reclamation Program.

the recreating public to hazards that the public, and possibly the managing agency as well, may not be aware of.

It is important for managers to determine whether educating the public about the risk of recreating around AML sites will increase their willingness to support reclamation and potentially increase funding from outside sources, either the state budgets, grant money, or redirected money from the Washington offices(Smith, VK, WH Desvousges, FR Johnson, and A Fisher, 1990 and 1995).

Support of reclamation is indicated through a number of means that are of value to land managers needing to make decisions concerning workload and budget for areas with AML sites. Understanding the kind of support that OHV users are willing to give managers can be a crucial factor. Some examples of the importance of this knowledge are in identifying whom users believe should bear the financial burden of reclamation, and if they are willing to support reclamation through paying a user fee or special fees with licensing that go directly to reclaiming these areas. In like manner, it may be useful to know if users are willing to support closure of more dangerous areas, or if they do not want any reclamation to occur at all. OHV users may already be reducing their risk exposure through their own behavior modification and communication network with other users, via identification of hazards. If this is the case, it may be of less importance for managers to reclaim the hazards for immediate safety from the physical hazards.

If managers can understand the answers to the above questions, it will help them better strategize where to look for sources of funding and what types of reclamation will be more acceptable to the public. If the public thinks reclamation is a waste of time and money, then managers can expect resistance and possible vandalism to attempts at reclamation. In addition, if this research reveals that the public is supportive of reclamation through a variety of schemes, then managers will be better equipped to pursue funding and provide justification for remediation projects and requests for increases in budget and grant proposals.

Abandoned Mine Lands reclamation has only recently been established as a priority at the national level. Land reclamation is often a very expensive project and budget dollars have been shrinking over the last several years. As a result, few managers have considered emphasizing AML reclamation in their work plans. Realizing the risk perceived by the public would help land managers to understand the level of liability that exists for the sites around recreation areas. This knowledge could propel more immediate action, or help managers to prioritize land reclamation in their annual work plan.

This problem is important to the BLM and other land management agencies because these agencies have no baseline information regarding users' awareness of risk. They also do not know what type of programs, if any, would help OHV users understand the risks associated with AML sites. It is also unknown if users in AML areas have a low, medium or high sense of risk seeking.

This research may pave the way to gain support for reclamation funding in recreation areas. It may also be useful to gain public support of user fees and licensing fees specifically designated for abandoned mine land reclamation in recreation areas. Reduction of hazards and risk in recreation areas through abandoned mine reclamation will not only provide more safety for the public, but it will protect the United States Government from suits in liability cases due to accidents associated with abandoned mine lands in designated recreation areas.

Research Questions:

1. Does the level of perceived risk associated with Abandoned Mine Lands affect an individual's willingness to use Abandoned Mine Lands?

2. Does the level of perceived risk associated with Abandoned Mine Lands affect an individual's willingness to support reclamation of these sites to reduce exposure to risk?

In order to answer the above questions, the following questions must be answered through the research instrument:

1. Are OHV users aware that there is a potential health risk associated with exposure to pollutants contained in abandoned mining areas?
2. What is the individual's level of perceived risk when recreating in an abandoned mine area?
3. What is the individual's personal level of acceptable risk when recreating around abandoned mine sites?
4. What level of reclamation would the individual support to increase his or her safety when recreating in an abandoned mine area?
5. What methods of support would the OHV user be willing to give to reduce his or her exposure to risk while recreating in an abandoned mine area?
6. What access would the individual be willing to give up to reduce his or her risk of exposure while recreating in an abandoned mine area?

Hypotheses

The following hypotheses have been developed in regard to the above research questions:

H_0. There is no relationship between an individual's familiarity with the area and their perception of risk.

H_1. There is a relationship between an individual's familiarity with the area and their perception of risk.

H_0. There is no relationship between an individual's gender and their perception of risk related to recreating around abandoned mine lands.

H_2. There is a relationship between an individual's gender and their perception of risk related to recreating around abandoned mine lands.

H_0. There is no relationship between an individual's knowledge of abandoned mine hazards and their perception of risk related to recreating around abandoned mine lands.

H_3. There is a relationship between an individual's knowledge of abandoned mine hazards and their perception of risk related to recreating around abandoned mine lands.

H_0. As an individual's perceived risk associated with Abandoned Mine Lands increases, their willingness to support reclamation of these sites in order to reduce their exposure to risk does not increase.

H_4. As an individual's perceived risk associated with Abandoned Mine Lands increases, their willingness to support reclamation of these sites in order to reduce their exposure to risk increases.

H_0. As an individual's perceived risk associated with Abandoned Mine Lands increases, their willingness to forego using these sites to reduce their exposure to risk does not increase.

H_5. As an individual's perceived risk associated with Abandoned Mine Lands increases so does their willingness to forego using these sites to reduce their exposure to risk.

Definitions

In order to ensure that there is consistency in the reporting and interpretation of the data that is reported in this research, the following definitions have been used for several key words. These definitions were used by the State of Utah, Division of Parks and Recreation and the Bureau of Land Management, Abandoned Mines Program.

Off Highway Vehicle (OHV) *- All motorized vehicles that are designed for cross country traveling. These vehicles include motorcycles, three wheelers, four wheelers, 4 X 4 vehicles, dune buggies.*

Abandoned Mine Lands *–Lands that formerly had mining operations but the mines are no longer being worked.*

Shaft *– A vertical excavation through which a mine is worked*

Adit *– A horizontal or nearly horizontal passage from the surface into the mine.*

Tailing Piles *– Residual materials after the ore-grade materials have been washed, concentrated, or treated.*

Hazard – *Abandoned mine feature that could pose some danger or risk.*

Risk – *Chance of harm or loss resulting from a hazard or dangerous situation.*

Population Bias

The study is limited to OHV users visiting the Fivemile Pass area. One hundred percent of the OHV users contacted through this study were users who have chosen to visit the area, therefore this study cannot be generalized to represent attitudes of all OHV users in the general population. Some OHV users may choose to not visit the area due to their level of perceived risk, and as result will not be represented by this study.

Chapter 2

LITERATURE REVIEW

Perception of Risk

As has been outlined in the previous chapter, the physical hazards associated with OHV play around abandoned mine hazards are fairly obvious: falling into a shaft, driving off a highwall on a pit, or becoming lost or injured while exploring shafts and adits. What is less obvious is the risk to health that an OHV user may incur while recreating on abandoned mine tailings. However there is still a large number of OHV users who accept this risk and participate in OHV activities.

Because of the large numbers of OHV users recreating in historical mining districts, it must be assumed that these users are willing to expose themselves to the level of risk that they perceive. Understanding how lay people form their perception of risk and how that perception of risk impacts personal behaviors in different decision and policy-making situations has long been the focus of many risk scholars. The problem of perceived risk and pubic hazards has been looked at from a number of different vantage points, including perceptions of risk associated with nuclear power, radon gas in homes, and automobile accidents.

There are a number of theories on how risk perception is formed, which could be applied to perception of risk related to abandoned mines. Slovic[12] states that,

> "Whereas technologically sophisticated analysts employ risk assessment to evaluate hazards, the majority of citizens rely on intuitive risk judgments, typically called 'risk perceptions.'"

This research is looking at the public's perception of risk rather than actual risk. One of the reasons that "perception of risk" was used rather than actual risk is due to the difficulty of quantifying a single score for actual risk as a result of individual choices involved in an experience. For instance, several of the variables involved in calculating the actual risk might include intuitive judgments such as: the length of stay, the amount of personal caution used while in the area, the speed and reaction time of the individual, the level of familiarity of the area, and knowledge of the existing mining related hazards. Each visitor makes a different choice or has a different experience than another in regard to each of the above variables, changing their level of actual risk during the visit. As a result, individual actual risk scores would be necessary rather than a generic actual risk score. An additional reason for looking at perception of risk instead of actual risk is that many scholars such as Fischhoff et al. believe that even an "experts" assessment of the risk is biased by their own perspective, often narrowly looking at the number of fatalities associated with the risk.

According to Slovic, most of the information used by lay people to form risk perceptions comes from the news media. This research is interested in understanding the impact on willingness to support risk reduction or potential actions of an individual, based on their level of perceived risk and understanding of the existing hazards.

---

[12] *Perceptions of Risk* (1987, p. 280)

The news media in Salt Lake City, Utah has done several spotlights on the evening news regarding the hazards of OHV play around abandoned mines. There have also been sporadic newspaper articles warning people about the high number of hazards on public lands in the west.[13] These measures have contributed to the formation of perception of risk related to abandoned mines.

One factor that may play into the forming of risk perceptions is the degree of benefit that the individual receives compared with the risk. OHV users may believe that the benefit they receive from having the opportunity to recreate on public lands is greater than the risk they perceive of the hazards associated with the abandoned mines. Slovic[14] states,

> "...voluntariness of exposure was the key mediator of risk acceptance, expressed preference studies have shown that other (perceived) characteristics such as familiarity, control, catastrophic potential, equity, and level of knowledge also seem to influence the relation between perceived risk, perceived benefit, and risk acceptance."

For instance, people typically rate the risks associated with nuclear power much higher than they would the risks associated with driving a car. This is surprising and frustrating to scientists because far more people die each year related to automobile accidents than have ever died related to a nuclear power accident.

This may be a product of the lay person's limited knowledge concerning nuclear power, compared with their high level of familiarity and perceived ability to control the

[13] Salt Lake Tribune, the Associated Press, "*Abandoned Mines Pose Threat to Public Safety*", Sunday, January 30, 2000

[14] Slovic, (1987, p. 283)

use of automobiles and ability to avoid automobile accidents. The individual benefit experienced by being able to use a car as transportation also weighs in their perception of the risk. OHV users may be taking personal measures that they believe provides them the control they need to protect them from their perceived risk. Slovic, additionally adds,

> "An accident that takes many lives may produce relatively little social disturbance (beyond that experienced by the victims' families and friends) if it occurs as part of a familiar and well understood system."

This may be the case with accidents and deaths that occur in abandoned mine lands because they occur in areas with which individuals have a high degree of familiarity, and are related to an activity that the individual assessing the risk is comfortable with.

The level of risk associated with the openings has not been calculated to determine the actual level of physical risk that occurs when someone recreates in abandoned mine areas. Renn (1992), in his chapter on "Concepts of Risk: A Classification", referred to a Technical Risk Analysis, looking at the physical harm to humans and the ecosystem.[9] Renn points out many of the pitfalls of this method of risk analysis. Because of the variability of the types of use, the frequency of exposure, and the ability of the individuals to "self protect" through communication and awareness, it is difficult to gauge the level of actual risk. For this reason, this study looked at the level of perceived risk that users have recreating around these sites, and what types of reclamation they would support, as well as whether or not they are already engaged in some type of behavior modification that is reducing their exposure to risk. This type of risk analysis is classified by Renn as Psychological Perspectives on Risk meaning, the focus is on personal preferences for probabilities and attempts to explain why individuals do not base their risk judgments on expected values.

One might ask why OHV users continue to recreate around abandoned mines when they have been warned through the media or by onsite encounters of the potential risks. According to Nisbett and Ross,[15] people are quick to incorporate new facts about risks if they are consistent with their current beliefs about the risk situation. Similarly, they are equally quick to disregard information that is contrary to their belief about a risk situation.

OHV users have been longtime visitors to many of these high use areas like Fivemile Pass. Due to their personal record of safety, they may not assimilate the contrary information about hazards and risks associated with abandoned mines and continue with the perceptions based on their own experience and skill.

Slovic[16] further states that the disparity between actual risk and perception of risk may not change quickly merely through information exchange regarding the facts associated with a risk. This may make an argument for land managers to be careful in the delivery of facts and information concerning risks, to better alter a person's perspectives and actions.

In order to effect change in public behavior or willingness to support risk reduction, land managers must involve OHV users in the development of risk reduction measures. Slovic gives this warning to risk managers,

---

[9] "Concepts of Risk: A Classification", Social Theories of Risk, 1992, Renn, Ortwin

[15] Nisbett and Ross, *Human Inference: Strategies and Shortcomings of Social Judgment* (1980)

[16] Slovic (1987, p. 281)

> "...risk communication and risk management efforts are destined to fail unless they are structured as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insight and intelligence of the other."

When looking at another way that people form their perception of risk and subsequently make behavior decisions associated with abandoned mines, Johnson, Fisher, Smith, and Desvousges [17]suggest that people take risks based on either actual or explicit consent. The individual takes in information and makes a decision based on that information, or implicit and hypothetical consent, as is the case for regulatory agencies such as the U.S. Food and Drug Administration's role in regulating appropriate formats for medications.

The overriding attitude of the risk manager is that an introduction of an information program will allow people to choose the amount of risk they are willing to expose themselves to. Johnson, Fisher, Smith, and Desvousges disagree, stating that the content, format, and tone of information plays a large role in affecting how people understand and use the information.

One concern of this research however, is that people have enough information to understand the consequences of taking or not taking action. In addition, who the individual believes to be responsible for the risk may play a large role in affecting whether or not the person takes action to reduce the risk. If the individuals assume some responsibility, they are more likely to take action than if they believe it is the government's or industries' responsibility.

---

[17] Johnson, Fisher, Smith, and Desvousges, *Informed Choice or Regulated Risk? Lessons from a Study in*

Managers may believe that the public is aware that the area has abandoned mines and understands the potential hazard/risk that these mines pose for users in the area. Smith and Desvousges[18] state that,

> " Unfortunately, most economic models for individual choice under uncertainty assume that individuals know the correct probabilities of the events at risk."

This may be the case with public land managers when determining sites and regulations for recreation areas. Smith and Desvousges' research in 1988, along with continued research with Johnson and Fisher in their article, *Can Public Information Programs Affect Risk Perceptions?* (1990), looked at the effect of different information tools on the public's perception of risk, specifically in relation to radon risks in residential homes.

The public's level of risk perception can be updated with different types of information. Identifying what methods of information disbursement is effective with OHV users will be important for land managers to understand how to get the support of the public in promoting risk reduction. Smith and Desvousges, (1988, p. 1116) stated that, "The specified determinants of the current risk perceptions at each stage are the prior risk perception along with variables describing the information received." They found that the public was particularly impacted by empirical data that was delivered in a manner that allowed them to compare their own radon levels with the empirical data of potential risk in a more generic format.

Radon Risk Communication (1988)
[18] Smith and Desvousges, *Risk Perception, Learning, and Individual Behavior*, (1988, p. 1113)

One of the most important factors to this piece of research is the failure of officials to disclose quantitative risk estimates, in an effort to reduce the opportunity for misinterpretation of data by the public, actually increased the perception of risk. The result of this lack of information exchange may be a false sense of security by the OHV public as they recreate in areas that have a high volume of hazards.

The overall conclusions of these scholars imply that some form of quantitative information program can impact the public risk perception and potentially cause some action or behavior modification related to the shift in the risk perception. This specifically relates to the hypothesis of this research which is concerned with the effect of risk perception on individual willingness to support reclamation of the abandoned mine lands to reduce their exposure to risk.

Since OHV users continue to recreate in areas that they have been told have a high level of risk, they must believe that the benefit they receive from recreating there provides enough compensation for their risk exposure. At what level of perceived risk of recreating around abandoned mine lands does an individual increase their willingness to forego use of an area, or willing to support some measures of reclamation. Kunreuther, Devousges, and Slovic,[19] proposed that if people know that there is a risk, but do not perceive it to be high, they will weigh the benefits of some form of compensation against the cost of something like a nuclear repository, when deciding if they will support or oppose this additional risk near their community.

Surprisingly, their research identified that people rated a similar, but known risk of a nuclear testing range lower than they did the introduction of a new, additional risk from a nuclear repository. This data supports the research from Slovic, which stated that people are more comfortable with known, familiar risks than they are with unknown risks.

Contingent Valuation

Examining an individual's willingness to support risk reduction is important to ensure public support and compliance with management efforts to protect OHV users from risks associated with abandoned mines.

In the article, *Is Accurate Understanding of Global Warming Necessary to Promote Willingness to Sacrifice?* (1997), Bord, Fisher and O'Connor, explore the link between expressed willingness to sacrifice to reduce risk, versus willingness to actually accept significant changes in patterns of everyday life. Their hypothesis appears to be that unless the expressed concern is related to a risk that the individual encounters on a virtual daily basis, the expressed willingness to sacrifice may not be as significant as the survey reveals.

This revelation may be important to this body of research, as most OHV users are frequent and return users of favorite areas, specifically the Fivemile Pass study area. Although a follow up survey has not been conducted to see if respondents did take any steps based on their willingness to support reclamation to reduce risk, it would pose an interesting extension of research in this area.

Another link that the Bord, Fisher, and O'Connor (1997) research provides for this body of research is their finding that, "Concerns about personal and family health and safety appear to motivate environmental sensitivity more so than ecological concerns."

---

[19] Kunreuther, Devousges, and Slovic, *Nevada's Predicament, Public Perceptions of Risk from the*

Since most of the visitors to the Fivemile Pass area come in groups of families or friends, their concern for the health and safety of others in their group should motivate them to act on their voiced willingness to sacrifice in regard to their perception of risk.

Bord, Fisher and O'Connor found that those who had a high level of concern, coupled with an accurate understanding of the risk's causes were more willing to accept personal cost to bring about some reduction in the cause of the risk. This discovery may lend support to this research's claim that the greater the understanding of the individual's risk exposure, the more likely they are to get involved in some capacity to reduce that risk. However, their research also revealed that individuals were much more likely to support restrictions or levied taxes on industry, before they were willing to accept a personal level of sacrifice.

In _Valuing Environmental Goods: An Assessment of the Contingent Valuation Method_ (1986), Cummings reviews some of the biases as well as strengths and weakness of the Contingent Valuation Method (CVM). One aspect that his review covered was the difference between the values that a respondent might give under different amounts of information. For instance, if a respondent was told that their response might influence a future tax, they were typically willing to pay less than if they were told that the federal government would be paying for whatever the issue was. This strategic bias is a common dilemma when using the CVM, because respondents often try to protect themselves financially and may not accurately reflect the true value that they place on a non-market good.

Proposed Nuclear Waste Repository (1988)

Another interesting bias that Cummings addresses is that sometimes it is more appropriate to assess a respondent's willingness to accept compensation to not have access to a communally owned good, such as public lands. His research found that although one might expect the maximum willingness to pay to be equal to or close to a person's willingness to accept compensation, the respondents often produced values that were three times that of willingness to pay, when asked about willingness to accept compensation to give up a communal good. For example in the case of this research, according to his theory, visitors would require three times the compensation to forego recreating in an area, than they would be willing to pay to have access to the area for recreation.

According to Cummings, the difficulty that a respondent has in providing a valuation measure for a nonmarket good, results in the respondent often looking for clues from the researcher to "pick" the appropriate value. They may assume that the middle of a scale is the "right" answer and choose that value since they do not have a predetermined value for the nonmarket good. Cummings' recommendation for future use of the CVM is that researchers need to be aware of their eliciting procedure to try not to bias or direct the respondent's valuation.

Abandoned Mines

Quite a bit of literature was found regarding toxic hazards and negative impacts of abandoned mines, specifically coal mines on water with acid rock drainage problems. However there appears to be a gap in the existing literature regarding either the actual or perceived risk of physical hazards associated with abandoned mines, particularly in regard to recreation.

Previous research has suggested that individuals make behavior choices based on their perception of risks, more than on factual information, particularly if the factual information is inconsistent with their perceptions of the risk. These intuitive judgments are often a culmination of many factors, not necessarily related to potential for death associated with the risk. Individuals often weigh the benefit associated with the risk as well as their familiarity with the risk and ability to control their exposure to the risk.

What this research adds to the body of literature is identifying the perception of risk for OHV users recreating around abandoned mines. This research also looks at the disparity between actual risks and perceived risk, and the concern that this disparity might pose for OHV users' safety, and liability of public land managers who invite the public to an attractive nuisance. In addition, this research looks at the behavior resulting from the individual's perception of risk on their willingness to support reclamation and foregoing use of these areas to reduce their risk exposure.

Chapter 3

RESEARCH DESIGN AND METHODS

The method used to research the perceived risk of abandoned mine sites and individuals' willingness to support reclamation of these areas, will be addressed in the following sections: Selection of Subjects, Instrumentation, Collection of Data, and Analysis of the Data.

Selection of Subjects

Although there are four different stakeholder groups involved in the Fivemile Pass project, this research only included the OHV users and their perceptions of risk related to recreating around Abandoned Mine Land sites. In order to access OHV users for this survey, contact was made with OHV users as they entered the Fivemile Pass staging area and by visiting other high use areas within Fivemile Pass that are traditionally accessed through a multitude of other points.

OHV users are an important stakeholder to pursue because they will be the group most impacted by decisions on development, reclamation, and fiscal management of the OHV grant at Fivemile Pass and in other high use OHV areas. Since they are the stakeholder most directly impacted by reclamation decisions, it is important for land managers to understand the level of concern and the type of support they can expect from OHV users.

The research was targeted at OHV users; however, in the course of the survey some responses were received from passengers in the vehicles who were not OHV users. These respondents would likely have a vested interest in this study because they are relatives or friends of users. They may be in an influencing position with OHV users, and they may be experiencing some risk due to toxins that are airborne from OHV play around them and physical hazards near their staging area.

Instrumentation

The instrument consisted of a cover letter explaining the purpose of the survey and the estimated time required to complete the survey. See Appendix C for a copy of the questionnaire. The questionnaire included sections on the following seven variables:

1. **Familiarity with Five Mile Pass Area - Q 1 – Q6 & Q12**(e.g., number of years visiting, frequency of visits, types of activities engaged in, areas within the Five Mile Pass area that they usually recreate in, number of mining features they are aware of, reason for coming to area)

2. **Perception of risk associated with abandoned mine lands – Q7 – Q11** (e.g., awareness of past accidents related to AML in the Fivemile Pass area, measures taken to reduce the chance of injury or risk to health associated with recreating around abandoned mining features, estimating the chance of several risk oriented events occurring due to recreating in AML sites, followed by an individual overall grading of risk)

3. **Responsibility for Risk – Q13** (e.g., liability for accidents and risk)

4. **Willingness to support – Q14** (e.g., support for restrictions on use, support of different methods of paying for reclamation, willingness to forego access)

5. **Risk level of their life style – Q15** (e.g., lifestyle choices that indicate tendency to seek risk such as helmet and safety gear use, riding OHVs alone, speeding while driving around town, drinking and driving, and tobacco use)

6. **Socio-Demographic Data – Q1, Q16 – Q21** (e.g., number of OHVs, area they live in, gender, age, education level completed, number of people in household, household income)

Collection of Data

In 1998, there were approximately 40,000 registered OHVs along the Wasatch Front. The Utah State Division of Parks and Recreation, which license the OHVs, estimates that most OHV users have more than one registered OHV in their home. The Bureau of Land Management, the agency responsible for keeping visitor statistics at the Fivemile Pass area, estimates use of the Fivemile Pass area to be approximately 4,000 visits per year. The BLM also believes that many of these visits are repeat visits, although the percent of repeat visitors is not known. In order to achieve a sample size that would provide a standard error of less than seven percent, a minimum of 215 completed surveys was needed.

Data from the OHV users were gathered by establishing a control point at the primary point of access, the Fivemile Pass staging area. The surveys were administered on weekdays, weekends, and a holiday to achieve a random sample of users. Distributors of the survey patrolled high use areas and attempted to capture every-other-group of OHV users in the remaining Fivemile Pass area. The surveyors at the staging area approached every other vehicle after it parked in the staging area. All surveyors approached the visitors by asking the passengers who were 18 years of age and older if they would be willing to participate in the survey. Each respondent was asked to fill out the survey on site, taking approximately 10 minutes. Participants were asked not to discuss their responses with each other until after they had returned the completed survey. The participant then returned the survey to the person who administered it. In appreciation for their time in completing the survey, respondents were given a map of the area provided by the Bureau of Land Management. This map identified the land ownership and roads and would help the user better navigate in the Fivemile Pass area, specifically by recognizing the private patented lands that had a high volume of mining related hazards. A total of 245 surveys were collected. Although the total number of distributed surveys was not recorded, the visitors had a very high compliance rate with participating in the survey.

Pilot Study

In order to ensure that the questionnaire was properly worded and understandable, as well as to test analytical capabilities after the questionnaire had been completed, the questionnaire was pre-tested on a pilot group of OHV users. A group of ten OHV users was selected to participate in the pilot study from two local OHV clubs. After the pilot group had completed the survey, concerns were discussed about the survey questions in general, and then the group went through each question to insure that the data collected was a fair representation of what the respondents intended. This exercise resulted in minor modifications of some of the scales that were ultimately used in the survey, as well as clarification in the wording of some of the questions.

Analysis of the Data

Analysis of the data was done by using the statistical package, SPSS + (Windows 95 version). The primary test used in this study was the Chi Square in crosstabulation and gamma to see if different factors were convergent or divergent in their relationship toeach other. Key measures are ordinal. Hypotheses will be tested using the Chi square statistic. The gamma statistic will be used to measure the strength of the relationship between the two ordinal measures. Gamma is an ordinal measure of association between two variables based on concordant and discordant pairs in rankings of the two variables. Like the

Pearson correlation it varies between -1 and +1 with zero indicating no relationship. Positive values in a gamma between X and Y indicate that as X increases Y increases. Gamma has a PRE (proportionate reduction in error) interpretation, that is, the value indicates the improvement in predicting Y when X is known.

In addition to the crosstabulations examined within the survey data, objective data was also studied. The objective data for physical risk came from the Fivemile Pass OHV Area Abandoned Mine Study[11]. The data for health risk is from the Preliminary Assessment of the Manning Canyon Tailings[8].

In order to categorize participants into groups of low, medium, and high perception of risk for data analysis, several variables were computed into single means and then recoded and grouped. The details of the procedure are outlined in Chapter 4.

Chapter 4

EMPIRICAL RESULTS AND ANALYSIS

This chapter outlines the descriptive data produced through frequency analysis of the different variables that arose out of the questions posed in the survey instrument. Additional data analysis was performed to identify relationships through crosstabulation and correlations among the variables.

Description of the Data

Data Collection

The data consists of 245 surveys that were collected on weekends, weekdays, and a holiday weekend in April 1998. Historically, spring is the busiest season of visitation at Fivemile Pass, and thus the broadest cross section of the population would be present during this time.

Demographic Data

A number of measures were used to assess the demographics of the survey participants. The typical visitor to the Fivemile Pass area is:

- Male – 72.8%
- Lives in the west valley of Salt Lake City – 38%
- Between the ages of 37 and 42 – 17.7%
- Highest education level completed is high school – 36%
- Has 4 people living in the home – 24.9%
- Household income is $60,000 – 13%

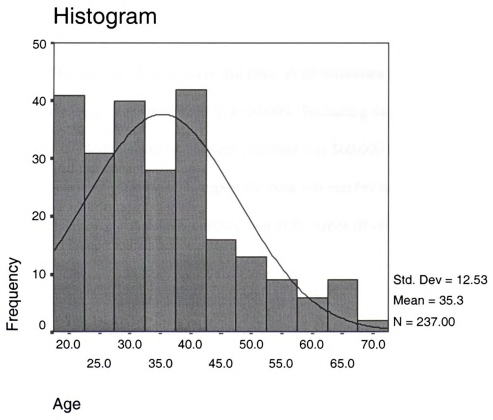
The population that participated in the study came from 53 different zipcode areas. Five of the participants reported that they were from zipcodes outside of Utah, and

an additional five participants reported zipcodes in Utah, but outside of the Wasatch Front (Appendix D).

Of the 245 survey respondents, 72.8% were male, and 27.2% were female. Six participants did not complete the gender question (Appendix E).

The most common age reported was 18 years of age, which was reported 15 times; however, the median age was 34 and the mean age was 35.27 (Figure 4.1).

Figure 4.1 – Age Distributions



The range of ages was from 18 to 72, with 8 incomplete responses. The standard deviation was 12.53 years (Appendix F).

Of the 236 completed responses for education level, 36% reported that the highest level of education they had completed was high school. This was followed by 12.7% and 31.8% having completed some trade school and college respectively. Bachelor degrees were held by 11.4% of the respondents, while only 8.1% had a graduate degree (Appendix G).

The number of people per household ranged from 1 to 13. The most common response was 4 people, with a mean of 4.17 and a median of 4. The standard deviation was 1.86. Again, eight participants did not respond to this question (Appendix H).

The income question only received 184 responses with 61 missing. In addition, there were three considerable outliers, beginning with $1 million, followed by $2 million, and finally $14 million. It is unlikely that these three responses were serious responses. The rest of the range was from $200 to $200,000. Excluding the three outliers, the mean income was $50,464. The most frequent response was $60,000 (Appendix I).

Respondents were asked to report the type and number of OHVs in their household (Table 4.1). A detailed breakdown of the types of vehicles and numbers in the household can be found in Appendix J.

Table 4.1 – Number of OHVs in Household

Type of OHV	Number of Vehicles in the Household	Percentage of Respondents
4 Wheeler	1-5	61.2%
Motorcycle	1-6	51%
3 Wheeler	1-6	18.8%
Sandrail	1	2.9%
Other	1-2	2.9%

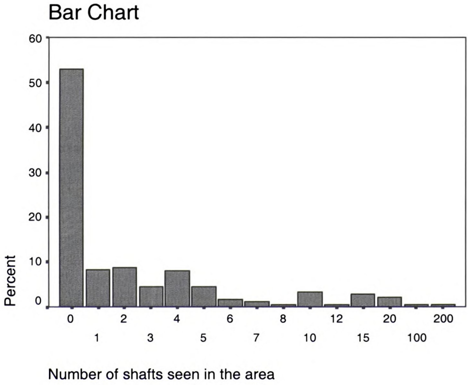
Perceptions of Risk

Several questions were used to gauge the participant's perception of risk. Since perception of risk is often a combination of knowledge, experience, and expectation, effort was made to acquire several different measures of these factors to be better able to categorize the participant's perception of the risk.

Perception of risk was gauged by first identifying the respondent's knowledge about the risk factors, (shafts, pits, tailings, and accidents), that were present or had occurred at Fivemile Pass. The second gauge assessed the respondent's perception of risk associated with physical and chemical abandoned mine hazards.

Participants were asked to report the number of shafts, pits, and tailings in the Fivemile Pass area (Figure 4.2). See Appendix K for the data results.

Figure 4.2 – Estimated Number of Shafts in the Area



The majority of respondents, 52.9% reported that there were zero shafts in the area. The overwhelming majority, 99.2% of the participants, estimated from 0 – 20 shafts, with one response of 100 and an additional response of 200.

The most common response for the number of pits was zero, representing 48.1% of the participants. Similarly, 99.2% of the responses included from 0-30 pits seen in the area, with one response of 50 pits and one response of 100 pits in the area.

Finally, respondents were asked about the number of tailings that they estimated in the area, with 49% reporting zero tailings in the area. Of the respondents, 10% reported having seen 1 tailings pile, with 6.2% and 7.5% reporting 2 and 3 tailings piles respectively.

The abandoned mine inventory reported that there were 196 openings-shafts, adits and pits, and two tailings piles. It appears that there may be some disparity between actual physical risk due to the number of mining related hazards and perceived risk.

Respondents were then asked if they were aware of any accidents related to abandoned mine lands. This data is available in Appendix L. Of the 239 participants that responded, 42.3% reported that they were aware of some accidents, with only 28 participants responding that they were aware of a specific number of accidents.

If participants answered "Yes" to being aware of accidents, they were then asked to report the types of accidents. Of the 50 responses received from this question, falling down holes was the most common type of accident they were aware of (Table 4.2). Because of the low response rate to the number of accidents and type of accidents, no statistical analysis was done with this question.

Table 4.2

Type of Accident

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	lost	2	.8	4.0	4.0
	falling down holes	38	15.5	76.0	80.0
	climbing in shafts	1	.4	2.0	82.0
	driving off cliffs	5	2.0	10.0	92.0
	alcohol related	2	.8	4.0	96.0
	Cave in	1	.4	2.0	98.0
	crashing	1	.4	2.0	100.0
	Total	50	20.4	100.0	
Missing	No response	195	79.6		
	Total	195	79.6		
Total		245	100.0		

Participants were asked to assess the chance that different events would occur as a result of riding OHVs in the Fivemile Pass area (Appendix M). There were four variables that assessed the participants' perception of physical risk and three variables related to the participants' perception of health risk. The scale that the participants used had six values: No Chance, 1 in 1000, 1 in 500, 1 in 250, 1 in 100, and 1 in 10.

The four physical risk perception questions to gauge the respondents' perception of the chance of personal injury occurring, and their subsequent perception of risk categories and response percentages are listed in Table 4.3. Responses were grouped into three categories, low, medium, and high due to small number o responses and for purposes of data analysis.

Table 4.3–Perceived Chance of Physical Injury related to Abandoned Mine Hazards

	Low Perception	Medium Perception	High Perception
	No Chance and 1 in 1000	1 in 500 and 1 in 250	1 in 100 and 1 in 10
Falling into a shaft	75.7%	15.7%	8.7%
Entering a horizontal opening	67.7%	18.6%	13.7%
Driving off into a pit	61.7%	20%	18.2%
Physical injury from riding accident	25.7%	35.4%	38.9%

The large majority perceives that there is either no chance or a very small chance, 1 in 1000, of a situation occurring which would cause physical injury. Interestingly, the results were different when participants were asked about the chance of a physical injury occurring, not specifying an abandoned mine hazard. The participants reported a higher perception of the risk with 21.2% reporting a 1 in 10 chance of the injury occurring, and 17.7% reporting their perception of risk at 1 in 100. Only 10.2% believed that there was no chance of physical injury from an accident.

The respondents were also asked to rate the chance of different health related risks occurring as a result of recreating in the Fivemile Pass area (Table 4.4).

Table 4.4–Perceived Chance of Health Injury related to Abandoned Mine Hazards

	Low	Medium	High
	No Chance and 1 in 1000	1 in 500 and 1 in 250	1 in 100 and 1 in 10
Riding Over the Tailings	36%	20.5%	43.5%
Coming in Contact with Toxic Chemicals	65.2%	17.6%	17.2%
Developing Cancer from Riding On The Tailings	83.9%	9.7%	6.4%

The perception of risk responses were again grouped into low, medium and high categories. This was necessary due to the broad range of responses that resulted in low frequencies occurring in several categories.

When participants were asked about their chances of riding over the tailings, 28.4% reported a 1 in 10 chance with 15.1% reporting a 1 in 100 chance. The tailings piles are the primary medium for visitors to come in contact with toxic chemicals. Although a high percentage of respondents reported that they had a high chance of riding over the tailings, they reported a low perception of chance of coming in contact with toxic chemicals. The overwhelming majority of respondents, 83.9% reported that there was little or no chance of developing cancer. Arsenic is a known carcinogen, and is found in the tailings piles in large quantities.

There again appears to be some disparity between the respondents' perception of the chemical hazards in the Fivemile Pass area, and the subsequent risk those hazards pose. During the risk assessment of the tailings piles in one section of Fivemile Pass, all of the samples within the tailings piles had over 1000 ppm of arsenic. Some of the

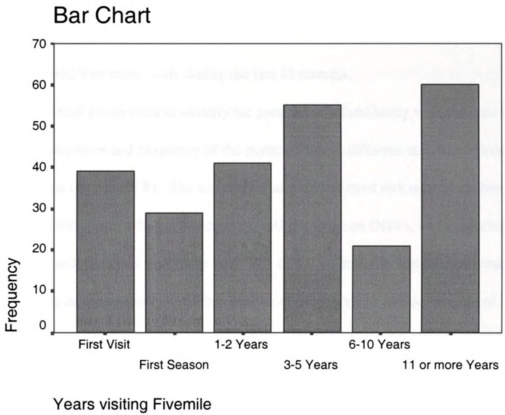
samples had between 7000 and 10,000 ppm of arsenic (Appendix B). Arsenic is a known carcinogenic element which is regulated at over 5 ppm..

Participants were also asked to rate the overall chance of any event occurring and resulting in injury. The largest percentage of participants, 54%, maintained that their overall perception of risk of injury was either no chance or only 1 in 1000 chance that they would receive an injury from recreating in the area.

Familiarity with Fivemile Pass Area

Familiarity with Fivemile Pass was gauged through three different questions. The most common response for years visiting Fivemile was 11 or more years with 24.5% responses, followed by 22.4% having visited the area for 3-5 years (Figure 4.3).

Figure 4.3 – Years Visiting Fivemile Pass



The first question asked the number of years they had been visiting Fivemile Pass (Appendix N). This was either the first visit or first season of visiting for 15.9% and 11.8% respectively. The balance of respondents, 8.6%, had been visiting for 6-10 years.

The second question to gauge their familiarity with the area was how many times in the last twelve months they had visited the area (Appendix O). This was an important question because a simple measure of how many years a person had been visiting the area could skew the interpretation of the individual's familiarity with the area. The problem with a single measure would be if the person had been visiting the area on the same holiday weekend for multiple years, but did not visit any other time of the year.

During the previous twelve months, the respondents who had visited the area 1-2 times had the most common response with 40.1%. This was followed by 26.2% visiting the area 3-4 times, 13.9% responded 5-6 visits, 5.9% had visited 7-8 times, and finally, 13.9% reported 9 or more visits during the last 12 months.

The third gauge used to identify the participant's familiarity with the area was the type of participation and frequency of the participation in different activities while at Fivemile Pass (Appendix P). The activities that pose the most risk related to abandoned mines for visitors are: riding cross-country, hill climbing on OHVs, and exploring. These three activities had well more than 50% of the visitors participating in these activities one or more times. For a breakdown of the activities and percentage of participation see Table 4.5. The purpose of this question was to identify how widespread their use of Fivemile Pass was and therefore add to the individual measure of familiarity.

Table 4.5 – Activities and Percentage of Participation

	Never	1-2 times	3-4 times	5+ times
Riding on Roads	5.5%	40.9%	19.6%	34%
Riding on ATV trails	9.7%,	39.4%	18.2%	32%
Riding Cross Country	43.5%	28.3%	8.4%	19.9%
Hill climbs with OHVs	25.5%	37.7%	21.2%	15.6%
Exploring on OHVs	12.8%	39.7%	18.7%	28.8%
Camping	37.3%	33.3%	10.4%	18.9%
Target Shooting	52.9%	29.4%	5.9%	11.8%

Perceived Level of Safety

Safety and need for risk reduction can be viewed personally or more globally. Whereas the questions on chance referred to personal injury, two questions were asked that regarded a more general view of the risk in the area. Understanding the perceived level of safety that was acceptable was an important factor to help gauge their potential willingness to support reclamation. Participants were asked to grade the overall physical safety with open mines and the overall health safety due to elements in the tailings.

The participants were asked to rank the risk to physical safety with open mines in the area, on a scale of 1 to 7, with 1 = Safe level of risk, and 7 = Need for risk reduction (Appendix Q). A safe level of risk, ranging from 1-3, was recorded by 71.8% of the participants, with 15.4% reporting a central or neutral value on the overall risk scale, and only 12.8% reporting some need for risk reduction.

Participants were then asked to give an overall rating of the safety and need for risk reduction in the area regarding health risk associated with elements in the tailings on a scale of 1 to 7, with 1 = Safe level of risk, and 7 = Need for risk reduction (Appendix R). Again, a large percentage, 75% of the participants, believed that there was an overall safe level of risk, ranking 1-3 on the scale. A central or neutral ranking was reported by 13.4%, with only 11.6% reporting that they believed there was some need for risk reduction.

Liability

Participants were asked if they believed OHV users were recreating at their own risk. If their answer was "No", they were then asked who they think is responsible for

accidents occurring. The overwhelming majority, 97% reported belief that the OHV users were liable for any accidents. This data can be viewed in Appendix S.

Risk Lifestyle

In order to better understand the relationship between the participant's perception of risk and support for risk reduction, the participant's risk lifestyle needed to be characterized. It was assumed that due to the nature of OHV play, all of the participants had at least some level of risk seeking. The risk seeking was gauged through three variables related to their OHV activities and three variables related to lifestyle choices. See Appendix T for the data.

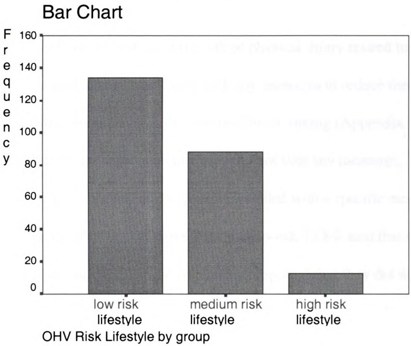
A mean was computed for all six of the lifestyle questions which participants ranked on a 1-5 scale with 1 = all the time and graduating to once a week, once a month, once a year, and finally 5 = never. Respondents also had the option of reporting not applicable if the question did not apply to them. The variables were recoded to reflect a scale with the lower score indicating a lower participation level in the risk activity. The variables were then recoded again into three groups for low risk seeking, medium risk seeking, and high risk seeking.

Only 1.7% of the participants were grouped in the high risk seeking category, with the majority, 74.8% showing up in the low risk seeking category. Due to some of the cultural attitudes in Utah that prohibit alcohol consumption and tobacco use, the risk lifestyle questions were recomputed by computing a mean for the three OHV risk-seeking questions.

This produced a shift in the amount of risk seeking, with 37.4% having a medium risk seeking lifestyle and 5.5% being grouped in the high risk seeking (Figure 4.4). This

revealed that some people were more risk seeking with OHVs then they might be with other life choices.

Figure 4.4 – OHV Risk Lifestyle Groups



Risk Reduction

Respondents were asked if they took any measures to reduce their chance of physical injury, and 60.5% reported that they did take some measure. If respondents answered "Yes" to the above question, they were then asked to report what types of measures were taken. Of the 144 participants that responded "Yes", 115 reported a specific measure they took to reduce their risk (Appendix U). Eight different types of risk reduction measures were reported. They were:

1) Staying away from mining related features - 41.7%
2) Staying away from places that are unfamiliar - 15.7%
3) Staying on the trails - 11.3%
4) Using some type of gear - 9.6%

5) Researching the area - 7%
6) Driving slowly - 7%
7) Accompanying someone who knows the area - 4.3%
8) Communicating with others - 3.5%

In addition to looking at the risk of physical injury related to the mining hazards, participants were also asked if they took any measures to reduce their chance of health risk due to the chemical hazards associated with mining (Appendix V). The majority of respondents, 74.2% responded that they did not take any measures. Of the 25.8% that responded "Yes", only 42 participants responded with a specific measure that they took to reduce their health risk. Of those that did respond, 73.8% said that they avoid riding in known dangerous areas. Three respondents reported that they did not touch the soil. Due to the small number of responses to this question, no further analysis was performed on the specific measures listed in this data set.

Support

Participants were asked to rank their willingness to support six different options that would reduce their risk exposure to abandoned mine lands. Four options involved some measure of enforced restriction on OHV use of abandoned mine areas, causing the OHV user to forego use of the area. The other two options were reclamation measures that would not directly impact the OHV users recreation opportunities.

Participants reported their support on a seven point scale, with 1 = very strong support and 7 = strongly not support. Data for willingness to support is available in Appendix W. The options included:

1. Losing access to an unsafe area.
2. Changing the OHV designation to no cross-country travel.
3. Restricting use to existing roads and trails.
4. Closing areas that have a high number of open shafts or pits.
5. Sloping the highwalls around the open pits.
6. Closing all the open shafts.

For purposes of data analysis, it was assumed that reporting a support level of 1-3 was an indication of support for the risk reduction measure. Similarly, reporting a support level of 5-7 was considered not supportive, with a support level of 4 being neutral in support.

Losing access to an unsafe area received fairly polar responses with 32.6% reporting that they were strongly not supportive of this option and 23.6% strongly supportive of the option. Overall, 39.9% fell into some level of support of this option while 45.9% were of some level of non-support of the option.

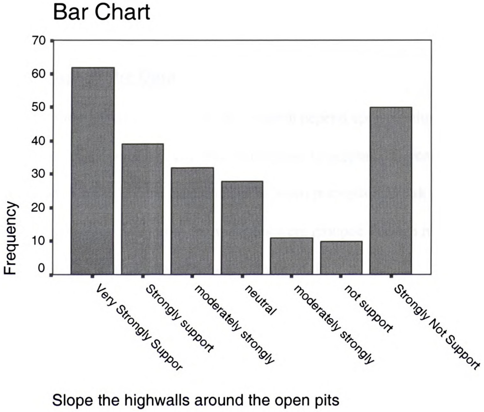
Only 22.2% of the participants were of some level of support for changing the OHV designation to no cross-country travel, with 67.4% reporting that they were not supportive of the option. Similarly, respondents were asked about their support of restricting use to existing roads and trails, which received some level of support from 27.2% of the respondents, with only 9.9% neutral and a majority of 62.9% not supportive of restricting use to existing roads and trails.

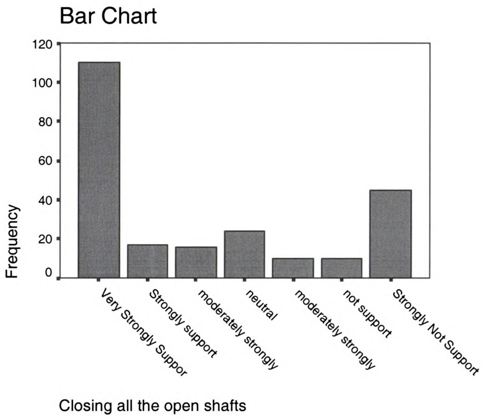
Surprisingly, there was again a fairly even split between support and non-support, concerning closing areas that had a high number of open shafts or pits. Some level of support could be expected from 47.2% of the participants, with 28.5% of them strongly supportive of closing areas with high numbers of open shafts or pits. Again, there were a

large percentage of participants, 40%, who were not supportive, with 26% of them strongly not supportive.

On options that did not directly impact OHV use, such as sloping high walls around open pits and closing all the open shafts, the majority of participants were supportive with 57.3% and 61.6% respectively (Figure 4.5). Despite the majority of participants supporting these two options, there were still a large number of respondents who would strongly not support either of the above options. Strongly not supporting the options was reported by 21.6% for sloping of high walls around open pits and 19.4% for closing of all the open shafts.

Figure 4.5





Relationships in the Data

The alternative hypotheses of this research depend upon relationships between individual's perception of risk and their willingness to support different measures of risk reduction. In order to test the relationships between perception of risk and willingness to support risk reduction, several of the variables were grouped through recoding to produce a category of low, medium and high perception of risk.

Perception of Risk

In order to categorize participants by low, medium and high risk perception, the responses to the seven questions regarding chance of personal injury were recoded. The eighth question, which asked the participant to rate the overall chance of any of the accidents resulting in injury, was recoded to provide one overall measure for perception of risk. The six values that were possible responses to the overall perception of risk question were grouped as follows:

1) No Chance and 1 in 1000 = low perception of risk
2) 1 in 500 and 1 in 250 = medium perception of risk
3) 1 in 100 and 1 in 10 = high perception of risk

There were two different types of risk perception measured, chance of physical injury and chance of injury to health. In order to get an overall rating for each type of perceived risk, the four questions related to chance of injury due to some physical hazard associated with mining were computed into one mean score for each individual, to give them an overall score for physical risk perception. A similar function was computed for the three questions regarding chance of health injury due to elements in the tailings.

Once a mean score was computed, the variable was recoded to group the perception of risk into categories, with 0 – 2.0 = low perception of risk, 2.1 – 4.0 = medium perception of risk, and 4.1-6.0 = high perception of risk (Appendix X). The different measures for perception of risk were then compared to each other to see if there was enough difference in the results to warrant comparing the different perceptions of risk with the various measures of support (Table 4.6).

Table 4.6 – Perception of Risk Grouped Categories

	Low Perception of Risk	Medium Perception of Risk	High Perception of Risk
Overall Perception of Risk	54%	26.1%	19.9%
Physical Perception of Risk	33.3%	51.9%	14.7%
Chemical Perception of Risk	41.6%	42.9%	15.6%

The results had enough spread to justify keeping the various measures for perception of risk separated during analysis.

Impacts on Perception of Risk

There was some interest in testing whether familiarity with the area, knowledge of the risks, and gender impacted an individual's perception of risk.

Familiarity

To be able to test the relationship between familiarity and perception of risk there needs to be an ordinal ranking of familiarity. The three variables used to measure familiarity were grouped and recoded to categorize the participant's familiarity with an overall ranking of low, medium or high. One of the hypotheses is that as a person's familiarity with the area increased, so would their perception of risk increase.

The responses for the number of years visiting Fivemile Pass were recoded, as follows: first visit or their first season = low familiarity, 1-5 years = medium familiarity, and 6+ years = high familiarity.

Because a person's familiarity with the area could not be sufficiently gauged by simply identifying the number of years they had been visiting the area, it was also important to know how often they visited the area in the course of a year to gauge their familiarity. The response for the number of visits in the last 12 months was also recoded into low, medium, and high categories. The new groups were formed as follows: low familiarity = 1-2 visits, medium familiarity = 3-6 visits, and the high familiarity = 7 or more visits in the last 12 months.

In addition to the number of visits to the area, it was also useful to know the types and frequency of activities they participated in. The activity variables were transformed into a single measure of familiarity by computing a mean of all the activities into one score. The score of this variable was then grouped into low, medium, and high familiarity categories. The grouping was done as follows: 0 - 1.0 = low familiarity, 1.1 - 2.0 = medium familiarity, and 2.1 – 3.0 = high familiarity.

By combining the scores of the three factors, a collective ranking on how familiar the participant was with the area, could be obtained. This was performed again, by computing a mean of the three measures and then grouping them into low, medium and high familiarity (Table 4.7). The data for the variables being grouped for familiarity with Fivemile Pass can be viewed in Appendix Y.

Table 4.7 – Overall Grouped Familiarity

Familiarity Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low familiarity	81	33.1	33.1	33.1
	medium familiarity	113	46.1	46.1	79.2
	high familiarity	51	20.8	20.8	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Familiarity and Perception of Risk

The null hypothesis that there was no relationship between familiarity and perception of risk was tested using crosstabulation and chi square. The results for the overall perception of risk variable are available in Table 4.8. The null hypothesis was not rejected because a significance level of .05 or lower did not occur.

Table 4.8 – Impact of Familiarity on Perception of Risk

	Overall Perception of Risk			
	Low	**Medium**	**High**	**Total**
Low Familiarity	43 61.4%	17 24.3%	10 14.3%	70 100%
Medium Familiarity	53 49.5%	26 24.3	28 26.2%	107 100%
High Familiarity	26 53.1%	16 32.7%	7 14.3%	49 100%

Chi square = 6.141, sig. = .189 Gamma statistic = .093

Crosstabulation was also performed with the physical perception of risk and the chemical perception of risk variables. The significance level for both measures was above the .05 level, and so the null hypothesis was not rejected.

Gender and Perception of Risk

The overwhelming majority of visitors to Fivemile Pass, and 72.8% of the people who participated in this survey, were men. One of the hypotheses was that a person's gender would impact their perception of risk. The null hypothesis was tested against all three measures of perception of risk through crosstabulation and the chi square test. The significance level was above the .05 level for gender and overall perception of risk as well as chemical perception of risk. For this reason the null hypothesis that gender does not impact overall perception of risk and chemical perception of risk was not rejected. However, the Chi square value was 8.530 with a significance level for gender and

physical perception of risk had a significance level of .014 (Table 4.9). The gamma statistic is .351, showing a concordant relationship.

Table 4.9 – Impact of Gender on Perception of Risk

	Physical Perception of Risk			
	Low	**Medium**	**High**	**Total**
Male	62 37.3%	86 51.8%	18 10.8%	166 100%
Female	14 22.6%	33 53.2%	15 24.2%	62 100%
Total	76 33.3%	119 52.2%	33 14.5%	228 100%

Chi square value = 8.530, sig. = .014
Gamma statistic = .351, sig. = .006

More men were ranked in the low physical risk perception than were expected, and more women ranked in the high physical risk perception than would have been expected if the null hypothesis were true. Therefore, we reject the null hypothesis that gender does not impact physical perception of risk.

Knowledge of the Hazards and Perception of Risk

The alternative hypothesis that knowledge of the hazards would impact the individual's perception of risk was tested using the Kendall's tau-b and the Spearman correlation. This test involved an interval by ordinal measure. The chi square test is not reliable for this hypothesis testing because of the broad spread in responses and subsequent low cell counts in over 20% of cells. As a result, the test was conducted with the Kendall's tau-b, which is primarily used for ordinal data, and the Spearman Correlation, which is used for data that is ranked. Both the Kendal-tau b and the Spearman show a significant correlation at the .05 level for shafts, pits and tailings related to chemical risk perception and overall risk perception. The overall risk perception has a

significant correlation with knowledge of shafts at the .01 level, whereas physical risk perception only correlated with knowledge of shafts (Table 4.10).

Table 4.10 – Knowledge of Hazards Correlated to Perception of Risk

	Shafts		Pits		Tailings	
	Kendall's tau-b	Spearman	Kendall's tau-b	Spearman	Kendall's tau b	Spearman
Overall Perception of Risk	.169** .003 223	.194** .004 223	.141* .013 224	.163* .015 224	.146* .010 224	.168* .012 224
Physical Perception of Risk	.130* .024 228	.149* .024 228	.084 .139 229	.096 .147 229	.038 .498 229	.044 .507 229
Chemical Perception of Risk	.141* .014 228	.162* .014 228	.133* .018 229	.157* .017 229	.127* .025 229	.150* .024 229

*Correlation is significant at the .05 level (2-tailed)
**Correlation is significant at the .01 level (2-tailed)

Therefore we can reject the null hypothesis that there is no relationship between knowledge of abandoned mine hazards and perception of risk.

The test was also performed with the Pearson R Correlation which is used for interval data; however, no significant correlations were observed by this test.

Perception of Risk and Willingness to Support Risk Reduction

Participants were asked to rate their willingness to support six different options that would reduce their risk exposure related to abandoned mine lands in the Fivemile Pass area. Two of the options would reduce their risk exposure through reclamation of the abandoned mine hazards, while four of the options directly impacted their use of the areas through restrictions and regulation.

In order to test the null hypothesis that there is no relationship between perception of risk an individual's support of risk reduction, crosstabulation was performed between the perception of risk measures and the options of risk reduction. The significance of the relationship was measured by the chi square test and using the gamma test identified the direction of the relationship.

Perception of Risk and Willingness to Support Reclamation

The three measures of perception of risk were tested against support for sloping the highwalls and closing the open shafts (Appendix Z). The only significant correlation that resulted between perception of risk and reclamation occurred with physical risk perception and sloping the highwalls, with a chi square significance of .046 and gamma showing a positive relationship with a significance level of .046. In this instance we reject the null hypothesis. Therefore the alternative hypothesis stating that as an individual's physical risk perception increased, so did their willingness to support sloping the highwalls to reduce their risk exposure, is not rejected. Due to the single correlation, the null hypothesis is not rejected stating that there is not a relationship between perception of risk and support of reclamation.

Perception of Risk and Willingness to Support Foregoing Use

The three measures for perception of risk were tested against the four options of foregoing use:

1. Losing Access to an Unsafe Area
2. Changing the OHV Designation to No Cross-Country travel
3. Restrict OHV use to Existing Roads and Trails
4. Closing Areas with High Numbers of Open Hazards

The null hypothesis states that there is no relationship between perception of risk and support for foregoing use to reduce their exposure to risk. This test was again performed with crosstabulation and the chi square test to identify significance (Appendix AA).

Two relationships were identified at the .05 significance level. The first relationship occurred with the overall perception of risk relating to closing areas with high numbers of open shafts and pits. The Chi square value is 10.512 with a significance level of .033. The gamma statistic is .005, with a significance level at .961. Due to the lack of direction in the relationship between overall perception of risk and closing areas with high numbers of open hazards, the null hypothesis is not rejected, indicating that there is no relationship between these two variables even though some relationship was indicated by the chi square test. No other relationships were identified with overall perception of risk and options to forego use, therefore the null hypothesis was not rejected.

The second relationship that was identified occurred with physical risk perception and losing access to unsafe areas. The chi square test revealed a Chi square value of 11.733 with a significance level of .019 indicating a relationship; however, the gamma statistic was .045 and has a significance level of .629, which is not significant enough to reject the null hypothesis which states that there is not a relationship between physical risk perception and losing access to unsafe areas.

There is also a chi square value of 8.415 with a significance level of .078 found between physical risk perception and closing areas with high numbers of hazards. Although the chi square significance level is higher than the required .05 or less level to

reject the null hypothesis, the gamma statistic is .224 with a significance level is .018 that shows a significance level for a positive direction to the relationship between physical risk perception and closing areas with high numbers of hazards. Technically the null hypothesis should not be rejected but the relationship is worth considering.

There are no relationships found with chemical risk perception and support to forego using areas. Therefore the null hypothesis is not rejected stating that there is no relationship between chemical risk perception and support to forego use.

While some relationships were identified to suggest that we can reject the null hypothesis regarding perception of risk and willingness to support specific options to reduce their risk exposure, it is somewhat troubling that there were not any relationships found with the chemical risk perception measure, and only one relationship found with the overall risk perception.

The low number of correlations may be the result of inaccurate understanding of the actual risks associated with abandoned mines as reflected in the low numbers reported for mine hazards in the area (Table 4.11).

Table 4.11 - Actual Number of Mining Features and Perceived Number of Features

	# of Shafts*	# of Pits	# of Tailings Piles	# of Other**
Actual # of Features	186 actual number of shafts	10 actual number of pits	2 actual number of tailings piles	440 other mining related features
Perceived # of Features	3.65 mean number of shafts	3.83 mean number of pits	8.32 mean number of tailings piles	

*Shafts refer to all shafts, adits and inclines
**Other refers to all waste piles, trenches, and prospects

The actual number of shafts was almost 49 times greater than the mean estimated number, including two considerable outliers in the responses. Ironically, only the two outliers reported numbers that were reasonably similar to actual numbers of hazards (Appendix K). The actual number of pits were more than two times the estimated number, while the mean estimated number of tailings piles was more than four times the actual. The overestimate of tailings piles is likely due to a lack of understanding by the participants on the difference between waste piles and tailings piles. Waste piles are usually benign piles of soil and rock that is excess from the mining operation. Tailings piles are processed ore that have usually been treated with some kind of chemical process. The tailings piles frequently have unsafe levels of chemicals or elements.

A reason for the limited ability to demonstrate a relationship between perception of risk and willingness to support foregoing use of abandoned mine areas to reduce their exposure to risk, may be related to the apparent disparity between actual risk and perceived risk (Table 4.12).

Table 4.12

Number of shafts seen in the area * Overall Risk Perception Crosstabulation

Count

		Overall Risk Perception			
		low perception of risk	medium perception of risk	high perception of risk	Total
Number of shafts seen in the area	0	68	27	17	112
	1	12	5	3	20
	2	13	5	2	20
	3	2	7	2	11
	4	9	4	6	19
	5	6	3	2	11
	6	2	1	1	4
	7			3	3
	8		1		1
	10	2	4	2	8
	12			1	1
	15	3	1	3	7
	20	2	1	1	4
	100	1			1
	200			1	1
Total		120	59	44	223

The indication is that even though a participant scored a relatively high perception of risk among participants in the survey, their "high perception of risk" is still extremely low in relation to the actual risk.

Another possible reason for the lack of correlation between perception of risk and the participant's willingness to support foregoing use of the areas, may be due to the individual's efforts to self protect (Table 4.13). By taking their own measures to reduce

their risk for both physical injury and health risk they may not see the need for external efforts to reduce their risk exposure.

Table 4.13 – Crosstabulation of Perception of Risk and Measures to Reduce Risk

taken measures to reduce chance of injury * Overall Risk Perception Crosstabulation

Count

		Overall Risk Perception			Total
		Low	Medium	High	
taken measures to reduce chance of injury	Yes	71	39	26	136
	No	51	19	19	89
Total		122	58	45	225

measures taken to reduce health risk * Overall Risk Perception Crosstabulation

Count

		Overall Risk Perception			Total
		Low	Medium	High	
measures taken to reduce health risk	Yes	29	15	16	60
	No	93	43	27	163
Total		122	58	43	223

Since some of the respondents are taking measures to reduce their own risk, their perception of risk may be lowered and therefore their willingness to support would not be as strong since they believed they have taken care of their own concerns. A substantially larger percentage, 60.5% take measures to reduce their risk of physical injury versus only 25.8% taking measures to reduce their risk of injury to health (Table 4.14). Due to the chemical hazards associated with abandoned mines, it is of concern that so small a percentage took measures to protect themselves, and that a similarly small percentage, 19.9%, rated an overall high risk perception for chemical hazards associated with abandoned mines.

Table 4.14 - Measures taken to reduce risk

taken any measures to reduce chance of injury

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	144	58.8	60.5	60.5
	No	94	38.4	39.5	100.0
	Total	238	97.1	100.0	
Missing	No Response	7	2.9		
	Total	7	2.9		
Total		245	100.0		

measures taken to reduce chance of health risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	61	24.9	25.8	25.8
	No	175	71.4	74.2	100.0
	Total	236	96.3	100.0	
Missing	No Response	9	3.7		
	Total	9	3.7		
Total		245	100.0		

Finally, many OHV users have witnessed an increase in the number of regulations and restrictions placed on the use of OHVs. In an effort to try to protect themselves from additional regulations or loss of opportunities, they may have underrepresented their perception of risk, or they may have understated their willingness to support efforts of risk reduction to "balance" any concerns that further restrictions were being planned.

Chapter 5

SUMMARY

Conclusions

This research examined two major questions. The first question dealt with whether an individual's perception of risk associated with abandoned mines affected their willingness to use abandoned mine lands for recreation. The second question was concerned with whether the level of perceived risk associated with abandoned mines affected an individual's willingness to support reclamation of these sites to reduce their exposure to risk. Data from the questionnaire was used in statistical analysis to determine if the questions could be answered and if so, how they were answered.

Five hypotheses followed from the above research questions. The first three hypotheses stated that there is a relationship between the various measures of perception of risk and familiarity, gender, and knowledge of the hazards. The result of the hypothesis tests show that there is not a relationship between familiarity and perception of risk; however there is a relationship between gender and knowledge of the hazards with perception of risk.

The fourth hypothesis states that as an individual's perceived risk associated with abandoned mine lands increased so did their willingness to support reclamation. As physical risk perception increased so did the individual's support for sloping the highwalls to reduce their exposure to risk.

The fifth hypothesis states that as an individual's perception of risk associated with abandoned mine lands increased, so would their willingness to forego using the areas, to reduce their risk exposure. When this hypothesis is tested with the overall

perception of risk measure, a relationship appears with closing areas with high numbers of open hazards but no direction of the relationship is identified. Similarly, physical risk perception shows a relationship with losing access to unsafe areas, but again, no direction in the relationship is apparent. The measure of physical risk perception also shows a relationship, although not significant at the .05 level with closing areas that have a high number of open shafts and pits. This last result did show a significant positive relationship between these two measures.

It was surprising that with regard to chance of injury to health there are no relationships detected and with physical injury perception or risk, there is only one significant correlation. This perception of risk correlated with losing access to unsafe areas. It appears that perception of physical risk does not impact a person's willingness to forego using an area as much as was anticipated, therefore we do not reject the null hypothesis that there is no relationship between perception of risk and willingness to support foregoing use.

In general, the results of this research were somewhat unexpected due to personal interviews conducted with OHV users at the Fivemile Pass area. Most visitors that were asked about their knowledge of the area indicated that they had a wide familiarity with the area, which was expected to reveal awareness of the hazards in the area associated with abandoned mines.

Limitations in the Data

Although every effort was made to develop and implement a useful survey, there were several questions that were not used in the analysis. The pilot test was quite helpful but could not ensure a perfect questionnaire.

The scale used to measure perception of risk was not an interval scale, which made correlation testing difficult. Although the different values that the participants ranked were real measures, they may have been a bit abstract for participants to accurately gauge their perception.

A map of the area was also incorporated into the instrument as an additional measure of familiarity and to provide information to the BLM on what areas received the most use. Many of the participants did not circle areas on the map. Some areas were circled in such a fashion that coding would have been more dependent on the interpretation of the participants response, instead of specific responses by the participants. Therefore this question was not incorporated into the data for this study.

Recommendations for Further Research

One of the most important results of this data was the documentation that visitors to Fivemile Pass, and likely other high use OHV areas, have a very limited understanding of the risks that they are exposed to when recreating on public lands in abandoned mining areas. The gross disparity between actual numbers of hazardous features and estimated numbers of hazardous features is alarming.

An area that has not been researched yet, but would create an interesting and useful addition to this data, would be to initiate an extensive education program on the hazards of recreating around abandoned mine lands. Following this education program, it would be interesting to then reassess participants' perception of risk and any behavior modification that might be spurred by this new knowledge.

Developing several different mediums to deliver this education would be another area to research. This research could focus on identifying the most effective method of

education of risks to increase participants' awareness of hazards and to see how they were motivated to reduce their risk. Some ideas might be the impact of informational signs in OHV areas, news releases, education sessions with different OHV groups, and individual contacts at a site.

Additionally, it would be useful to see what other methods of support that participants would be willing to engage in to reduce their risk, such as paying fees, lobbying legislators, or some other method suggested by OHV users.

Recommendations for Management

Manager of public lands that host OHV use in abandoned mine areas should be concerned about the risk that they are exposing the pubic to when these types of areas are promoted for recreation use. Additional liability may be incurred when an area is designated and the public is formally invited to use the area, making it an attractive nuisance.

It is recommended that managers develop a public awareness plan to inform users of the risks associated with abandoned mine hazards. They should also develop management plans that will protect the public from these hazards through abandoned mine inventories, mine reclamation, OHV designations, fencing, signing, and regulations.

Support for management plans can be gained from the public by involving users in plan development as well as developing partnerships in education and reclamation efforts. Public buy in in the management of public lands will increase the compliance with changes from the status quo, as well as decrease vandalism and ultimately reduce risk exposure from recreating around abandoned mines.

Due to the high cost associated with abandoned mine reclamation, management should pursue elevating the attention of the risks associated with the hazards to the offices that dispense budget dollars, including the U.S. Congress. Managers should also look at other funding opportunities such as grants, local recreation site fees, and licensing fees to support expediting particularly high risk areas. Additionally, managers should work with their state agencies that are responsible for abandoned mine reclamation to pool their financial, material, and labor resources to remediate the risks associated with abandoned mines.

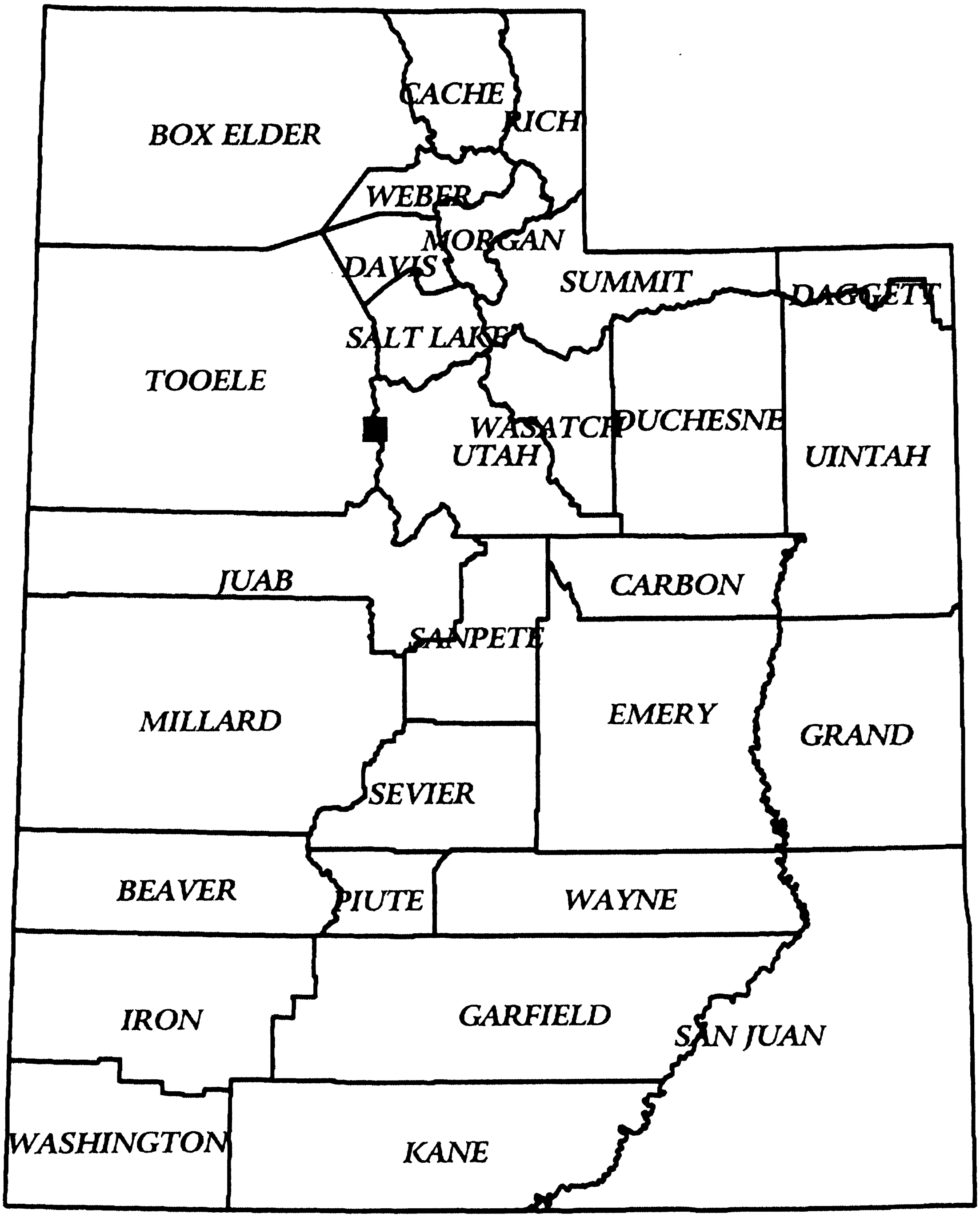
Recommendation for OHV users

Off Highway Vehicle users have been exposed to a high level of risk associated with pre-reclamation law mining. In recent years some focus has been placed by federal agencies to inventory and reclaim many of these abandoned mines. Mine closures are expensive and because of the high volume of open abandoned mines, the task may be overwhelming in scope.

The OHV community is recommended to lobby federal and state land managers to prioritize reclamation efforts within their jurisdiction, on high use OHV areas. Although OHV use has been under attack for various environmental concerns, the OHV community as a whole has a strong lobby due to volume of users in the west, and licensing dollars that are often available for distribution through grants in many states.

OHV users could lobby state legislators to funnel portions of the licensing fees to fund abandoned mine reclamation and education efforts to raise public awareness of the hazards and subsequent risk associated with recreating around these abandoned mine lands. OHV users are further encouraged to work with local land managers to partner in their efforts to protect the public from risks, and to maintain safe opportunities for recreating on public lands.

Appendix A
Map of the Research Area



Appendix B
Soil Sample Results

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ – DSHW
ATTN:
288 N 1460 W
SLC UT 84114-4880 801-538-6170

Description:	MC-SC-01			
Site ID:		Source: 00		Date of Review and QA Validation
Cost Code:	365			Inorganic Review:
Lab Number:	9707935	Type:	50	Organic Review:
Sample Date:	08/13/97	Time:	09:30	Radiochemistry Review:
				Microbiology Review:

TEST RESULTS:		MAX. CONCENTRATION LIMITS:
T-Arsenic *	6230.0 ppm	5.0 ppm
T-Cadmium	22.4 ppm	1.0 ppm
T-Lead	<11.6 ppm	5.0 ppm
T-Selenium	<23.2 ppm	1.0 ppm
T-Barium *	1240.0 ppm	100.0 ppm
T-Chromium	8.84 ppm	5.0 ppm
T-Mercury	14.5 ppm	.2 ppm
T-Silver	<1.16 ppm	5.0 ppm

T-AS Due to matrix interference this sample result is not reliable
T-BA Due to matrix interference this sample result is not reliable

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ – DSHW
ATTN:
288 N 1460 W
SLC UT 84114-4880 801-538-6170

Description:	MC-SC-02			
Site ID:		Source: 00		Date of Review and QA Validation
Cost Code:	365			Inorganic Review:
Lab Number:	9707936	Type:	50	Organic Review:
Sample Date:	08/13/97	Time:	09:45	Radiochemistry Review:
				Microbiology Review:

TEST RESULTS:		MAX. CONCENTRATION LIMITS:
T-Arsenic	6510.0 ppm	5.0 ppm
T-Cadmium	23.7 ppm	1.0 ppm
T-Lead	<14.1 ppm	5.0 ppm
T-Selenium	<28.2 ppm	1.0 ppm
T-Barium	3360.0 ppm	100.0 ppm
T-Chromium	11.4 ppm	5.0 ppm
T-Mercury	9.56 ppm	.2 ppm
T-Silver	<1.41 ppm	5.0 ppm

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ – DSHW
ATTN:
288 N 1460 W
SLC UT 84114-4880 801-538-6170

Description:	MC-SC-03			
Site ID:		Source: 00		Date of Review and QA Validation
Cost Code:	365			Inorganic Review:
Lab Number:	9707937	Type:	50	Organic Review:
Sample Date:	08/13/97	Time:	09:55	Radiochemistry Review:
				Microbiology Review:

TEST RESULTS:		MAX. CONCENTRATION LIMITS:
T-Arsenic	5350.0 ppm	5.0 ppm
T-Cadmium	19.7 ppm	1.0 ppm
T-Lead	16.8 ppm	5.0 ppm
T-Selenium	<28.2 ppm	1.0 ppm
T-Barium	2400.0 ppm	100.0 ppm
T-Chromium	13.7 ppm	5.0 ppm
T-Mercury	15.58 ppm	.2 ppm
T-Silver	<1.41 ppm	5.0 ppm

UTAH STATE HEALTH DEPARTMENT
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ – DSHW
ATTN:
288 N 1460 W
SLC UT 84114-4880 801-538-6170

Description:	MC-SC-04			
Site ID:		Source:	00	<u>Date of Review and QA Validation</u>
Cost Code:	365			Inorganic Review:
Lab Number:	9707938	Type:	50	Organic Review:
Sample Date:	08/13/97	Time:	10:20	Radiochemistry Review:
				Microbiology Review:

TEST RESULTS:			MAX. CONCENTRATION LIMITS:	
T-Arsenic	5580.0	ppm	5.0	ppm
T-Cadmium	20.0	ppm	1.0	ppm
T-Lead	<12.6	ppm	5.0	ppm
T-Selenium	<25.2	ppm	1.0	ppm
T-Barium	2290.0	ppm	100.0	ppm
T-Chromium	10.7	ppm	5.0	ppm
T-Mercury	16.7	ppm	.2	ppm
T-Silver	<1.26	ppm	5.0	ppm

Arsenic Concentrations, Manning Canyon Tailings, ppm

Sample Site	As	Sample Site	As
2B	723	10DA	4229
2C	26	10E	184
2D	295	10F	48
2E	0	11B	1345
3B	0	11C	257
3C	437	11D	665
3D	7768	11E	3998
3E	3137	11F	32
3F	5509	12B	796
3G	0	12C	3516
4B	903	12D	112
4C	33	12E	5110
4D	6555	12F	38
4E	2744	13B	885
4F	2674	13C	4690
4G	0	13D	82
5B	968	13E	4240
5C	569	13F	42
5D	2915	14B	509
5F	243	14C	1843
6B	1077	14D	695
6C	0	14E	1333
6D	5027	14F	12
6E	4571	15B	0
		15C	1256
6F	0	15C	1141
7B	775	15D	1291
7E	3118	15E	3481
7F	2	15F	0
8B	843	16A	89
8C	174	16B	2909
8D	239	16C	420
8E	0	16D	13
8F	0	16E	72
9B	692	16F	0
9C	1876	17A	8
9D	2305	17B	1452
9E	80	17C	0
9F	0	17D	1137
10B	833	17E	94
10C	28	17F	1102
18A	4095	20B	1543

18B	**123**		**20C**	**7**
18C	**0**		**20D**	**42**
18D	**0**		**20E**	**167**
18E	**0**		**20F**	**45**
18F	**1109**		**ST-0**	**5272**
19A	**102**		**ST-2**	**4126**
19B	**24**		**ST-4**	**4156**
19C	**77**		**ST-6**	**3097**
19D	**0**		**W-1**	**1890**
19E	**129**		**W-2**	**279**
19F	**279**		**W-3**	**129**

Appendix C - Survey Instrument

Survey Questions related to Abandoned Mine lands

Dear Fivemile OHV user,

The Michigan State University, Department of Resource Development is conducting this questionnaire related to OHV recreation in Abandoned Mine Lands.

Your participation in this survey is voluntary and your answers are strictly anonymous. The survey will take approximately 10 minutes to complete, and we ask that you return it to the person that gave you the survey, before continuing on your visit to Fivemile Pass.

In appreciation for your time to complete this survey, we would like to give you a map of the area and hope that it will aid in your safety and enjoyment while visiting the area.

Sincerely,

Connie Stump
Candidate for Master's of Science, Department of Resource Development

Familiarity And Type Of OHV Use In The Fivemile Pass Area

1. Indicate the number or OHVs in your household within each of the following categories.

motorcycle ______ 3 wheeler ______ 4X4 vehicle ______

4 wheeler ______ sand rail ______ Other ________________

2. How many years have you been visiting the Fivemile Pass area?

First visit ☐ First Season ☐ 1-2 years ☐ 3-5 years ☐ 6-10 years ☐
11 or more years ☐

3. How often have you visited the Fivemile Pass area over the last twelve months?

1-2 visits ☐ 3-4 visits ☐ 5-6 visits ☐ 7-8 visits ☐ 9 or more visits ☐

4. Check the number of times in the past year you have participated in the following activities at Fivemile Pass.

	Never	**1-2**	**3-4**	**5+**
Riding on dirt roads	☐	☐	☐	☐
Riding on ATV trails	☐	☐	☐	☐
Riding cross country	☐	☐	☐	☐
Hill climbs with OHVs	☐	☐	☐	☐
Exploring on OHVs	☐	☐	☐	☐
Camping	☐	☐	☐	☐
Target Shooting	☐	☐	☐	☐
Other ____________	☐	☐	☐	☐

5. Circle the areas on the map above that you frequently visit.

6. Please indicate the number of shafts, pits, and tailings piles in the Fivemile Pass Area based on your experience here. (Fill in the blank for each item below,including **NONE** in you have not seen any in the area.)

Shafts ________ **Pits** ________ **Tailings** ________

Perceptions Of Risk

7. Are you aware of accidents related to open shafts or pits in the Fivemile area?

Yes ☐ **No** ☐

a) If Yes, Please list the number and types of accidents you are aware of.

8. While recreating in the area, have you taken any measures to reduce your chance of injury associated with riding in an abandoned mine area?

Yes ☐ **No** ☐

a) If Yes, Please list the measures that you take.

9. While recreating in the area, have you taken any measures to reduce your chance of health risk associated with riding in an abandoned mine area?

Yes ☐ **No** ☐

a) If Yes, Please list the measures that you take.

10. Indicate below, your estimate of the chance of personal injury occurring while recreating at Fivemile Pass on a single outing.

	No Chance	**1 in 1000**	**1 in 500**	**1 in 250**	**1 in 100**	**in 10**
Falling into a shaft	☐	☐	☐	☐	☐	☐
Entering a horizontal opening	☐	☐	☐	☐	☐	☐
Driving off into a pit	☐	☐	☐	☐	☐	☐
Riding over tailings	☐	☐	☐	☐	☐	☐
Coming in contact with toxic chemicals	☐	☐	☐	☐	☐	☐
Physical injury from accident while riding	☐	☐	☐	☐	☐	☐
Developing cancer from riding on the tailings	☐	☐	☐	☐	☐	☐
Overall chance of any of the above resulting in injury	☐	☐	☐	☐	☐	☐

11. How would you grade the overall risk of recreating at Fivemile in relation to the abandoned mines?

	Safe Level Of Risk						**Need Risk Reduction**
Physical Safety with open mines	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Health safety due to elements in the tailings	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Reasons for Choosing Fivemile

12. To what degree are the following items a consideration in choosing to recreate in this area?

	Not Important						**Very Important**
Level of safety offerred	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Travel time	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Technical riding opportunities	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Opportunity to shoot	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Abandoned mine areas	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Tailings in Manning Canyon	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Lack of OHV restrictions	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Risk Responsibility

13. Do you consider OHV users recreating in the Fivemile Pass area to be recreating at their own risk?

Yes ☐ **No** ☐

a) If No, Who do you consider to be responsible for accidents occurring at Fivemile?

Miners ☐ State Parks ☐ BLM ☐ Land Owner ☐ Other ☐

Support for Abandoned Mine Reclamation

14. Indicate your support for the following programs if you knew that it would reduce your exposure to risk by 50%.

	Very Strongly Support						Strongly Not Support
Losing access to an unsafe area.	1	2	3	4	5	6	7
Changing OHV designation to no cross country travel.	1	2	3	4	5	6	7
Restricting use to existing roads and trails.	1	2	3	4	5	6	7
Closing areas that have a High number of open shafts or pits.	1	2	3	4	5	6	7
Slope the highwalls around the open pits.	1	2	3	4	5	6	7
Closing all the open shafts.	1	2	3	4	5	6	7

Risk Lifestyle

15. How often do you engage in the following practices?

	All the Time	Once a Week	Once a Month	Once a Year	Never	Not Appl
Ride an OHV without a helmet.	☐	☐	☐	☐	☐	☐
Use safety gear.	☐	☐	☐	☐	☐	☐
Ride an OHV alone.	☐	☐	☐	☐	☐	☐
Speed while driving around town.	☐	☐	☐	☐	☐	☐
Drive after drinking alcohol.	☐	☐	☐	☐	☐	☐
Use tobacco products.	☐	☐	☐	☐	☐	☐

Demographic Data

The following questions request some information about you and your household. This information will be used to better understand the types of users in the area.

16. What is your zip code? __________

17. What is your gender? ☐ Male ☐ Female

18. What is your age? __________

19. Education level completed: High School☐ Some College☐ Graduate School ☐ Trade School ☐ Bachelors Degree☐

20. Number of people living in house __________

21. What was your gross household income in 1996? $__________

Appendix D
Demographic Zip Codes

Zip Code	Frequency	Percent	Valid Percent	Cumulative Percent
18005	1	.4	.4	.4
80209	1	.4	.4	.8
84003	16	6.5	6.8	7.6
84004	1	.4	.4	8.1
84013	2	.8	.8	8.9
84020	2	.8	.8	9.7
84029	1	.4	.4	10.2
84032	3	1.2	1.3	11.4
84037	1	.4	.4	11.9
84041	3	1.2	1.3	13.1
84042	3	1.2	1.3	14.4
84043	7	2.9	3.0	17.4
84044	1	.4	.4	17.8
84047	1	.4	.4	18.2
84057	6	2.4	2.5	20.8
84058	6	2.4	2.5	23.3
84062	12	4.9	5.1	28.4
84065	11	4.5	4.7	33.1
84070	5	2.0	2.1	35.2
84074	3	1.2	1.3	36.4
84075	1	.4	.4	36.9
84084	10	4.1	4.2	41.1
84088	13	5.3	5.5	46.6
84092	10	4.1	4.2	50.8
84093	3	1.2	1.3	52.1
84094	7	2.9	3.0	55.1
84095	15	6.1	6.4	61.4
84097	6	2.4	2.5	64.0
84105	2	.8	.8	64.8
84107	1	.4	.4	65.3
84108	1	.4	.4	65.7
84111	1	.4	.4	66.1
84115	2	.8	.8	66.9
84117	3	1.2	1.3	68.2
84118	18	7.3	7.6	75.8
84119	10	4.1	4.2	80.1
84120	9	3.7	3.8	83.9
84121	1	.4	.4	84.3
84123	6	2.4	2.5	86.9
84124	1	.4	.4	87.3

84128	4	1.6	1.7	89.0
84401	1	.4	.4	89.4
84600	1	.4	.4	89.8
84601	12	4.9	5.1	94.9
84604	3	1.2	1.3	96.2
84633	1	.4	.4	96.6
84647	1	.4	.4	97.0
84651	1	.4	.4	97.5
84660	1	.4	.4	97.9
85401	1	.4	.4	98.3
91765	1	.4	.4	98.7
98857	2	.8	.8	99.6
840965	1	.4	.4	100.0
Total	236	96.3	100.0	
System	9	3.7		
Missing	9	3.7		
Total	245	100.0		

Appendix E
Demographic – Gender

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	174	71.0	72.8	72.8
	Female	65	26.5	27.2	100.0
	Total	239	97.6	100.0	
Missing	System Missing	6	2.4		
	Total	6	2.4		
Total		245	100.0		

Appendix F
Demographic – Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
18	15	6.1	6.3	6.3
19	7	2.9	3.0	9.3
20	7	2.9	3.0	12.2
21	7	2.9	3.0	15.2
22	5	2.0	2.1	17.3
23	12	4.9	5.1	22.4
24	2	.8	.8	23.2
25	3	1.2	1.3	24.5
26	6	2.4	2.5	27.0
27	8	3.3	3.4	30.4
28	7	2.9	3.0	33.3
29	3	1.2	1.3	34.6
30	10	4.1	4.2	38.8
31	7	2.9	3.0	41.8
32	13	5.3	5.5	47.3
33	6	2.4	2.5	49.8
34	8	3.3	3.4	53.2
35	2	.8	.8	54.0
36	8	3.3	3.4	57.4
37	4	1.6	1.7	59.1
38	12	4.9	5.1	64.1
39	9	3.7	3.8	67.9
40	8	3.3	3.4	71.3
41	8	3.3	3.4	74.7
42	5	2.0	2.1	76.8
43	4	1.6	1.7	78.5
44	2	.8	.8	79.3
45	8	3.3	3.4	82.7
46	1	.4	.4	83.1
47	1	.4	.4	83.5
48	3	1.2	1.3	84.8
49	4	1.6	1.7	86.5
50	3	1.2	1.3	87.8
52	3	1.2	1.3	89.0
54	6	2.4	2.5	91.6
55	2	.8	.8	92.4
56	1	.4	.4	92.8
58	2	.8	.8	93.7
60	1	.4	.4	94.1
62	3	1.2	1.3	95.4

63	3	1.2	1.3	96.6
64	1	.4	.4	97.0
65	3	1.2	1.3	98.3
66	1	.4	.4	98.7
67	1	.4	.4	99.2
68	1	.4	.4	99.6
72	1	.4	.4	100.0
Total	237	96.7	100.0	
99	1	.4		
System	7	2.9		
Missing	8	3.3		
Total	245	100.0		

Appendix G
Demographic – Education Level Completed

Education level completed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High School	85	34.7	36.0	36.0
	Trade School	30	12.2	12.7	48.7
	Some College	75	30.6	31.8	80.5
	Bachelors Degree	27	11.0	11.4	91.9
	Graduate School	19	7.8	8.1	100.0
	Total	236	96.3	100.0	
Missing	No Response	1	.4		
	System Missing	8	3.3		
	Total	9	3.7		
Total		245	100.0		

Appendix H
Demographic – Number of People in House

Number of people living in house

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	4.1	4.2	4.2
	2	33	13.5	13.9	18.1
	3	42	17.1	17.7	35.9
	4	59	24.1	24.9	60.8
	5	52	21.2	21.9	82.7
	6	23	9.4	9.7	92.4
	7	8	3.3	3.4	95.8
	8	3	1.2	1.3	97.0
	10	6	2.4	2.5	99.6
	13	1	.4	.4	100.0
	Total	237	96.7	100.0	
Missing	System Missing	8	3.3		
	Total	8	3.3		
Total		245	100.0		

Appendix I
Demographic – Income

Income	Frequency	Percent	Valid Percent	Cumulative Percent
$200	1	.4	.5	.5
$1,400	1	.4	.5	1.1
$3,000	1	.4	.5	1.6
$5,000	1	.4	.5	2.2
$6,000	1	.4	.5	2.7
$10,000	1	.4	.5	3.3
$18,000	1	.4	.5	3.8
$20,000	2	.8	1.1	4.9
$22,000	1	.4	.5	5.4
$25,000	1	.4	.5	6.0
$27,000	1	.4	.5	6.5
$30,000	10	4.1	5.4	12.0
$32,000	3	1.2	1.6	13.6
$33,000	1	.4	.5	14.1
$35,000	10	4.1	5.4	19.6
$36,000	2	.8	1.1	20.7
$38,000	1	.4	.5	21.2
$39,000	1	.4	.5	21.7
$40,000	12	4.9	6.5	28.3
$42,000	3	1.2	1.6	29.9
$45,000	10	4.1	5.4	35.3
$46,000	1	.4	.5	35.9
$47,000	2	.8	1.1	37.0
$48,000	1	.4	.5	37.5
$50,000	22	9.0	12.0	49.5
$52,000	2	.8	1.1	50.5
$55,000	2	.8	1.1	51.6
$56,000	2	.8	1.1	52.7
$60,000	24	9.8	13.0	65.8
$62,000	2	.8	1.1	66.8
$64,000	1	.4	.5	67.4
$65,000	2	.8	1.1	68.5
$66,000	1	.4	.5	69.0
$69,000	1	.4	.5	69.6
$70,000	8	3.3	4.3	73.9
$72,000	1	.4	.5	74.5
$75,000	6	2.4	3.3	77.7
$75,800	1	.4	.5	78.3
$76,000	1	.4	.5	78.8
$80,000	10	4.1	5.4	84.2

$82,000	**1**	**.4**	**.5**	**84.8**
$85,000	**4**	**1.6**	**2.2**	**87.0**
$87,000	**1**	**.4**	**.5**	**87.5**
$87,500	**1**	**.4**	**.5**	**88.0**
$90,000	**1**	**.4**	**.5**	**88.6**
$100,000	**10**	**4.1**	**5.4**	**94.0**
$110,000	**1**	**.4**	**.5**	**94.6**
$120,000	**1**	**.4**	**.5**	**95.1**
$130,000	**1**	**.4**	**.5**	**95.7**
$150,000	**2**	**.8**	**1.1**	**96.7**
$155,000	**1**	**.4**	**.5**	**97.3**
$190,000	**1**	**.4**	**.5**	**97.8**
$200,000	**1**	**.4**	**.5**	**98.4**
$1,000,000	**1**	**.4**	**.5**	**98.9**
$2,000,000	**1**	**.4**	**.5**	**99.5**
$14,000,000	**1**	**.4**	**.5**	**100.0**
Total	**184**	**75.1**	**100.0**	
System	**61**	**24.9**		
Missing	**61**	**24.9**		
Total	**245**	**100.0**		

Appendix J
Demographic – Number of OHVs in Household

# of Motorcycles in household

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	120	49.0	49.0	49.0
	1	59	24.1	24.1	73.1
	2	35	14.3	14.3	87.3
	3	15	6.1	6.1	93.5
	4	13	5.3	5.3	98.8
	5	2	.8	.8	99.6
	6	1	.4	.4	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

3 Wheeler

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	199	81.2	81.2	81.2
	1	34	13.9	13.9	95.1
	2	7	2.9	2.9	98.0
	3	1	.4	.4	98.4
	4	1	.4	.4	98.8
	5	1	.4	.4	99.2
	6	2	.8	.8	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

4 Wheeler

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	95	38.8	38.8	38.8
	1	75	30.6	30.6	69.4
	2	46	18.8	18.8	88.2
	3	16	6.5	6.5	94.7
	4	9	3.7	3.7	98.4
	5	4	1.6	1.6	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Sand Rail

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	238	97.1	97.1	97.1
	1	7	2.9	2.9	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Other

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	238	97.1	97.1	97.1
	1	6	2.4	2.4	99.6
	2	1	.4	.4	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Appendix K
Estimated Abandoned Mine Features

Number of shafts seen in the area

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	127	51.8	52.9	52.9
	1	20	8.2	8.3	61.3
	2	21	8.6	8.8	70.0
	3	11	4.5	4.6	74.6
	4	19	7.8	7.9	82.5
	5	11	4.5	4.6	87.1
	6	4	1.6	1.7	88.8
	7	3	1.2	1.3	90.0
	8	1	.4	.4	90.4
	10	8	3.3	3.3	93.8
	12	1	.4	.4	94.2
	15	7	2.9	2.9	97.1
	20	5	2.0	2.1	99.2
	100	1	.4	.4	99.6
	200	1	.4	.4	100.0
	Total	240	98.0	100.0	
Missing	99	5	2.0		
	Total	5	2.0		
Total		245	100.0		

PITS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	116	47.3	48.1	48.1
	1	15	6.1	6.2	54.4
	2	27	11.0	11.2	65.6
	3	16	6.5	6.6	72.2
	4	15	6.1	6.2	78.4
	5	6	2.4	2.5	80.9
	6	8	3.3	3.3	84.2
	7	2	.8	.8	85.1
	8	1	.4	.4	85.5
	10	15	6.1	6.2	91.7
	12	6	2.4	2.5	94.2
	15	2	.8	.8	95.0
	20	5	2.0	2.1	97.1
	25	1	.4	.4	97.5
	30	4	1.6	1.7	99.2
	50	1	.4	.4	99.6
	100	1	.4	.4	100.0
	Total	241	98.4	100.0	
Missing	99	4	1.6		
	Total	4	1.6		
Total		245	100.0		

TAILINGS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	118	48.2	49.0	49.0
	1	24	9.8	10.0	58.9
	2	15	6.1	6.2	65.1
	3	18	7.3	7.5	72.6
	4	11	4.5	4.6	77.2
	5	11	4.5	4.6	81.7
	6	7	2.9	2.9	84.6
	8	3	1.2	1.2	85.9
	10	13	5.3	5.4	91.3
	12	4	1.6	1.7	92.9
	15	1	.4	.4	93.4
	20	5	2.0	2.1	95.4
	23	1	.4	.4	95.9
	30	3	1.2	1.2	97.1
	35	1	.4	.4	97.5
	40	1	.4	.4	97.9
	50	3	1.2	1.2	99.2
	100	1	.4	.4	99.6
	1000	1	.4	.4	100.0
	Total	241	98.4	100.0	
Missing	99	4	1.6		
	Total	4	1.6		
Total		245	100.0		

Appendix L
Awareness of Accidents Related to Abandoned Mines

Aware of accidents related to AML

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	101	41.2	42.3	42.3
	No	138	56.3	57.7	100.0
	Total	239	97.6	100.0	
Missing	No Response	6	2.4		
	Total	6	2.4		
Total		245	100.0		

Number of accidents related to AML

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	4.9	42.9	42.9
	2	9	3.7	32.1	75.0
	3	4	1.6	14.3	89.3
	5	3	1.2	10.7	100.0
	Total	28	11.4	100.0	
Missing	No Response	217	88.6		
	Total	217	88.6		
Total		245	100.0		

Type of Accident

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	lost	2	.8	4.0	4.0
	falling down holes	38	15.5	76.0	80.0
	climbing in shafts	1	.4	2.0	82.0
	driving off cliffs	5	2.0	10.0	92.0
	alcohol related	2	.8	4.0	96.0
	Cave in	1	.4	2.0	98.0
	crashing	1	.4	2.0	100.0
	Total	50	20.4	100.0	
Missing	No response	195	79.6		
	Total	195	79.6		
Total		245	100.0		

Appendix M
Chance of Injury Related to Abandoned Mine Hazards

Chance of falling into a shaft

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	79	32.2	34.3	34.3
	1 to 1000	95	38.8	41.3	75.7
	1 in 500	31	12.7	13.5	89.1
	1 in 250	5	2.0	2.2	91.3
	1 in 100	12	4.9	5.2	96.5
	1 in 10	8	3.3	3.5	100.0
	Total	230	93.9	100.0	
Missing	No Response	15	6.1		
	Total	15	6.1		
Total		245	100.0		

Chance of entering a horizontal opening

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	88	35.9	38.9	38.9
	1 in 1000	65	26.5	28.8	67.7
	1 in 500	28	11.4	12.4	80.1
	1 in 250	14	5.7	6.2	86.3
	1 in 100	14	5.7	6.2	92.5
	1 in 10	17	6.9	7.5	100.0
	Total	226	92.2	100.0	
Missing	No Response	19	7.8		
	Total	19	7.8		
Total		245	100.0		

Chance of driving off into a pit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	54	22.0	23.5	23.5
	1 in 1000	88	35.9	38.3	61.7
	1 in 500	27	11.0	11.7	73.5
	1 in 250	19	7.8	8.3	81.7
	1 in 100	27	11.0	11.7	93.5
	1 in 10	15	6.1	6.5	100.0
	Total	230	93.9	100.0	
Missing	No Response	15	6.1		
	Total	15	6.1		
Total		245	100.0		

Chance of riding over tailings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	34	13.9	15.1	15.1
	1 in 1000	47	19.2	20.9	36.0
	1 in 500	31	12.7	13.8	49.8
	1 in 250	15	6.1	6.7	56.4
	1 in 100	34	13.9	15.1	71.6
	1 in 10	64	26.1	28.4	100.0
	Total	225	91.8	100.0	
Missing	No Response	20	8.2		
	Total	20	8.2		
Total		245	100.0		

Chance of contact with toxic chemical

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	88	35.9	38.8	38.8
	1 in 1000	60	24.5	26.4	65.2
	1 in 500	23	9.4	10.1	75.3
	1 in 250	17	6.9	7.5	82.8
	1 in 100	22	9.0	9.7	92.5
	1 in 10	17	6.9	7.5	100.0
	Total	227	92.7	100.0	
Missing	No Response	18	7.3		
	Total	18	7.3		
Total		245	100.0		

Chance of Physical Injury from accident while riding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	23	9.4	10.2	10.2
	1 in 1000	35	14.3	15.5	25.7
	1 in 500	46	18.8	20.4	46.0
	1 in 250	34	13.9	15.0	61.1
	1 in 100	40	16.3	17.7	78.8
	1 in 10	48	19.6	21.2	100.0
	Total	226	92.2	100.0	
Missing	No Response	19	7.8		
	Total	19	7.8		
Total		245	100.0		

Chance of developing cancer from riding in tailings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	105	42.9	48.4	48.4
	1 in 1000	77	31.4	35.5	83.9
	1 in 500	15	6.1	6.9	90.8
	1 in 250	6	2.4	2.8	93.5
	1 in 100	5	2.0	2.3	95.9
	1 in 10	9	3.7	4.1	100.0
	Total	217	88.6	100.0	
Missing	No Response	28	11.4		
	Total	28	11.4		
Total		245	100.0		

Overall Perception of Risk/Chance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Chance	37	15.1	16.4	16.4
	1 in 1000	85	34.7	37.6	54.0
	1 in 500	32	13.1	14.2	68.1
	1 in 250	27	11.0	11.9	80.1
	1 in 100	23	9.4	10.2	90.3
	1 in 10	22	9.0	9.7	100.0
	Total	226	92.2	100.0	
Missing	No Response	19	7.8		
	Total	19	7.8		
Total		245	100.0		

Appendix N
Years at Fivemile Pass

Years visiting Fivemile

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First Visit	39	15.9	15.9	15.9
	First Season	29	11.8	11.8	27.8
	1-2 Years	41	16.7	16.7	44.5
	3-5 Years	55	22.4	22.4	66.9
	6-10 Years	21	8.6	8.6	75.5
	11 or more Years	60	24.5	24.5	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Appendix O
Visits in the Last 12 Months

Visit 5mile in last 12 months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2 Visits	95	38.8	40.1	40.1
	3-4 Visits	62	25.3	26.2	66.2
	5-6 Visits	33	13.5	13.9	80.2
	7-8 Visits	14	5.7	5.9	86.1
	9 or more visits	33	13.5	13.9	100.0
	Total	237	96.7	100.0	
Missing	No Response	8	3.3		
	Total	8	3.3		
Total		245	100.0		

Appendix P
Activities at Fivemile Pass Over Last 12 Months

Riding on Dirt Roads in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	13	5.3	5.5	5.5
	1-2 times	96	39.2	40.9	46.4
	3-4 times	46	18.8	19.6	66.0
	5+ times	80	32.7	34.0	100.0
	Total	235	95.9	100.0	
Missing	No Response	10	4.1		
	Total	10	4.1		
Total		245	100.0		

Riding on ATV trails in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	23	9.4	9.7	9.7
	1-2 times	93	38.0	39.4	49.2
	3-4 times	43	17.6	18.2	67.4
	5+ times	77	31.4	32.6	100.0
	Total	236	96.3	100.0	
Missing	No Response	9	3.7		
	Total	9	3.7		
Total		245	100.0		

Riding cross country in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	83	33.9	43.5	43.5
	1-2 times	54	22.0	28.3	71.7
	3-4 times	16	6.5	8.4	80.1
	5+ times	38	15.5	19.9	100.0
	Total	191	78.0	100.0	
Missing	No Response	54	22.0		
	Total	54	22.0		
Total		245	100.0		

Hill Climbs with OHVs in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	33	13.5	15.6	15.6
	1-2 times	80	32.7	37.7	53.3
	3-4 times	45	18.4	21.2	74.5
	5+ times	54	22.0	25.5	100.0
	Total	212	86.5	100.0	
Missing	No Response	33	13.5		
	Total	33	13.5		
Total		245	100.0		

Exploring on OHVs in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	28	11.4	12.8	12.8
	1-2 times	87	35.5	39.7	52.5
	3-4 times	41	16.7	18.7	71.2
	5+ times	63	25.7	28.8	100.0
	Total	219	89.4	100.0	
Missing	No Response	26	10.6		
	Total	26	10.6		
Total		245	100.0		

Target shooting in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	99	40.4	52.9	52.9
	1-2 times	55	22.4	29.4	82.4
	3-4 times	11	4.5	5.9	88.2
	5+ times	22	9.0	11.8	100.0
	Total	187	76.3	100.0	
Missing	No Response	58	23.7		
	Total	58	23.7		
Total		245	100.0		

Other in past year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	20	8.2	74.1	74.1
	1-2	2	.8	7.4	81.5
	3-4 times	1	.4	3.7	85.2
	5+ times	4	1.6	14.8	100.0
	Total	27	11.0	100.0	
Missing	No Response	218	89.0		
	Total	218	89.0		
Total		245	100.0		

Appendix Q
Overall Physical Safety

Overal risk to Physical Safety with open mines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Safe level of Risk	69	28.2	30.4	30.4
	moderately safe level of risk	56	22.9	24.7	55.1
	minimally safe level of	38	15.5	16.7	71.8
	neutral	35	14.3	15.4	87.2
	minimally in need of risk reduction	12	4.9	5.3	92.5
	moderately in need of risk reduction	7	2.9	3.1	95.6
	Needs risk reduction	10	4.1	4.4	100.0
	Total	227	92.7	100.0	
Missing	No Response	18	7.3		
	Total	18	7.3		
Total		245	100.0		

Appendix R
Overall Health Safety

Overall risk to Health Safety due to elements in the tailings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Safe level of risk	81	33.1	36.2	36.2
	moderately safe level of risk	48	19.6	21.4	57.6
	minimally safe level of	39	15.9	17.4	75.0
	neutral	30	12.2	13.4	88.4
	minimally in need of risk reduction	14	5.7	6.3	94.6
	moderately in need of risk reduction	3	1.2	1.3	96.0
	need risk reduction	9	3.7	4.0	100.0
	Total	224	91.4	100.0	
Missing	No Response	21	8.6		
	Total	21	8.6		
Total		245	100.0		

Appendix S
Liability

OHV users recreating at their own risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	229	93.5	97.0	97.0
	No	7	2.9	3.0	100.0
	Total	236	96.3	100.0	
Missing	No Response	9	3.7		
	Total	9	3.7		
Total		245	100.0		

LIABLE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	miners	5	2.0	38.5	38.5
	State Parks	2	.8	15.4	53.8
	BLM	3	1.2	23.1	76.9
	land owner	1	.4	7.7	84.6
	Other	2	.8	15.4	100.0
	Total	13	5.3	100.0	
Missing	No Response	232	94.7		
	Total	232	94.7		
Total		245	100.0		

Appendix T
Risk Lifestyle

Ride an OHV without a helmet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	46	18.8	20.3	20.3
	Once a Week	10	4.1	4.4	24.7
	Once a Month	28	11.4	12.3	37.0
	Once a Year	41	16.7	18.1	55.1
	Never	102	41.6	44.9	100.0
	Total	227	92.7	100.0	
Missing	Not Appl.	10	4.1		
	No Response	8	3.3		
	Total	18	7.3		
Total		245	100.0		

Use Safety gear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	38	15.5	17.1	17.1
	Once a week	17	6.9	7.7	24.8
	Once a Month	16	6.5	7.2	32.0
	Once a Year	11	4.5	5.0	36.9
	Never	140	57.1	63.1	100.0
	Total	222	90.6	100.0	
Missing	Not Appl.	7	2.9		
	No Response	16	6.5		
	Total	23	9.4		
Total		245	100.0		

Ride an OHV alone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	71	29.0	32.0	32.0
	Once a Week	11	4.5	5.0	36.9
	Once a Month	23	9.4	10.4	47.3
	Once a Year	21	8.6	9.5	56.8
	Never	96	39.2	43.2	100.0
	Total	222	90.6	100.0	
Missing	Not Appl.	13	5.3		
	No Response	10	4.1		
	Total	23	9.4		
Total		245	100.0		

Speed while driving around town

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	26	10.6	12.3	12.3
	Once a week	24	9.8	11.4	23.7
	Once a Month	11	4.5	5.2	28.9
	Once a Year	23	9.4	10.9	39.8
	Never	127	51.8	60.2	100.0
	Total	211	86.1	100.0	
Missing	Not Appli.	27	11.0		
	No Response	7	2.9		
	Total	34	13.9		
Total		245	100.0		

Drive after drinking alcohol

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	7	2.9	3.3	3.3
	Once a Week	2	.8	1.0	4.3
	Once a Month	5	2.0	2.4	6.7
	Once a Year	7	2.9	3.3	10.0
	Never	189	77.1	90.0	100.0
	Total	210	85.7	100.0	
Missing	Not Appl.	27	11.0		
	No Response	8	3.3		
	Total	35	14.3		
Total		245	100.0		

Use Tobacco Products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All the Time	52	21.2	25.5	25.5
	Once a Week	2	.8	1.0	26.5
	Once a Month	1	.4	.5	27.0
	Once a Year	3	1.2	1.5	28.4
	Never	146	59.6	71.6	100.0
	Total	204	83.3	100.0	
Missing	Not Appl.	33	13.5		
	No Response	8	3.3		
	Total	41	16.7		
Total		245	100.0		

Risk Lifestyle by Group

Overall Risk Lifestyle

Risk Lifestyle by Groups

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low risk lifestyle	175	71.4	74.8	74.8
	medium risk lifestyle	55	22.4	23.5	98.3
	high risk lifestyle	4	1.6	1.7	100.0
	Total	234	95.5	100.0	
Missing	System Missing	11	4.5		
	Total	11	4.5		
Total		245	100.0		

Overall OHV Risk Lifestyle Group

OHV Risk Lifestyle by group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low risk lifestyle	134	54.7	57.0	57.0
	medium risk lifestyle	88	35.9	37.4	94.5
	high risk lifestyle	13	5.3	5.5	100.0
	Total	235	95.9	100.0	
Missing	System Missing	10	4.1		
	Total	10	4.1		
Total		245	100.0		

Appendix U
Physical Risk Reduction and Measures

taken any measures to reduce chance of injury

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	144	58.8	60.5	60.5
	No	94	38.4	39.5	100.0
	Total	238	97.1	100.0	
Missing	No Response	7	2.9		
	Total	7	2.9		
Total		245	100.0		

What measures have you taken

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	aware of places unfamiliar	18	7.3	15.7	15.7
	research area	8	3.3	7.0	22.6
	Stay away from features	48	19.6	41.7	64.3
	Stay on the trails	13	5.3	11.3	75.7
	Accompany someone who knows area	5	2.0	4.3	80.0
	Drive slowly	8	3.3	7.0	87.0
	communicate with others	4	1.6	3.5	90.4
	gear	11	4.5	9.6	100.0
	Total	115	46.9	100.0	
Missing	No Response	130	53.1		
	Total	130	53.1		
Total		245	100.0		

Appendix V
Chemical Risk Reduction and Measures

measures taken to reduce chance of health risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	61	24.9	25.8	25.8
	No	175	71.4	74.2	100.0
	Total	236	96.3	100.0	
Missing	No Response	9	3.7		
	Total	9	3.7		
Total		245	100.0		

measure taken for health risk reduction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	avoid riding in known areas	31	12.7	73.8	73.8
	only ride in familiar areas	1	.4	2.4	76.2
	gear	3	1.2	7.1	83.3
	don't touch soil	3	1.2	7.1	90.5
	Stay on Trail	4	1.6	9.5	100.0
	Total	42	17.1	100.0	
Missing	No Response	203	82.9		
	Total	203	82.9		
Total		245	100.0		

Appendix W
Willingness to Support

Losing access to an unsafe area

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	55	22.4	23.6	23.6
	Strongly Support	20	8.2	8.6	32.2
	Moderately Strongly Support	18	7.3	7.7	39.9
	Neutral	33	13.5	14.2	54.1
	Moderately Not Support	19	7.8	8.2	62.2
	Not Support	12	4.9	5.2	67.4
	Strongly Not Support	76	31.0	32.6	100.0
	Total	233	95.1	100.0	
Missing	No Response	12	4.9		
	Total	12	4.9		
Total		245	100.0		

Changing OHV designation to no cross country travel

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	19	7.8	8.3	8.3
	Strongly Support	14	5.7	6.1	14.3
	Moderately Strongly Support	18	7.3	7.8	22.2
	Neutral	24	9.8	10.4	32.6
	Moderately Not Support	18	7.3	7.8	40.4
	Not Support	25	10.2	10.9	51.3
	Strongly Not Support	112	45.7	48.7	100.0
	Total	230	93.9	100.0	
Missing	No Response	15	6.1		
	Total	15	6.1		
Total		245	100.0		

Restricting use to existing roads and trails

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	26	10.6	11.2	11.2
	Strongly Support	19	7.8	8.2	19.4
	Moderately Strongly Support	18	7.3	7.8	27.2
	Neutral	23	9.4	9.9	37.1
	Moderately Not Support	21	8.6	9.1	46.1
	Not Support	18	7.3	7.8	53.9
	Strongly Not Support	107	43.7	46.1	100.0
	Total	232	94.7	100.0	
Missing	No Response	13	5.3		
	Total	13	5.3		
Total		245	100.0		

Closing areas that have a high number of open shafts or piits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	67	27.3	28.5	28.5
	Strongly Support	17	6.9	7.2	35.7
	Moderately Strongly Support	27	11.0	11.5	47.2
	Neutral	30	12.2	12.8	60.0
	Moderately Strongly Not Support	13	5.3	5.5	65.5
	Not Support	20	8.2	8.5	74.0
	Strongly not Support	61	24.9	26.0	100.0
	Total	235	95.9	100.0	
Missing	No Response	10	4.1		
	Total	10	4.1		
Total		245	100.0		

Slope the highwalls around the open pits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	62	25.3	26.7	26.7
	Strongly Support	39	15.9	16.8	43.5
	Moderately Strongly Support	32	13.1	13.8	57.3
	Neutral	28	11.4	12.1	69.4
	Moderately Strongly Not Support	11	4.5	4.7	74.1
	Not Support	10	4.1	4.3	78.4
	Strongly Not Support	50	20.4	21.6	100.0
	Total	232	94.7	100.0	
Missing	No Response	13	5.3		
	Total	13	5.3		
Total		245	100.0		

Closing all the open shafts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Strongly Support	110	44.9	47.4	47.4
	Strongly Support	17	6.9	7.3	54.7
	Moderately Strongly Support	16	6.5	6.9	61.6
	Neutral	24	9.8	10.3	72.0
	Moderately Strongly Not Support	10	4.1	4.3	76.3
	Not Support	10	4.1	4.3	80.6
	Strongly Not Support	45	18.4	19.4	100.0
	Total	232	94.7	100.0	
Missing	No Response	13	5.3		
	Total	13	5.3		
Total		245	100.0		

Appendix X
Grouped Perception of Risk

Overall Risk Perception

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	122	49.8	54.0	54.0
	Medium	59	24.1	26.1	80.1
	High	45	18.4	19.9	100.0
	Total	226	92.2	100.0	
Missing	System Missing	19	7.8		
	Total	19	7.8		
Total		245	100.0		

Physical Perception of Risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Perception of Risk	77	31.4	33.3	33.3
	Medium Perception of Risk	120	49.0	51.9	85.3
	High Perception of Risk	34	13.9	14.7	100.0
	Total	231	94.3	100.0	
Missing	System Missing	14	5.7		
	Total	14	5.7		
Total		245	100.0		

Chemical Perception of Risk

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Perception of Risk	96	39.2	41.6	41.6
	Medium Perception of Risk	99	40.4	42.9	84.4
	High Perception of Risk	36	14.7	15.6	100.0
	Total	231	94.3	100.0	
Missing	System Missing	14	5.7		
	Total	14	5.7		
Total		245	100.0		

Appendix Y
Familiarity Groups

Familiarity by Years Visiting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low familiarity	68	27.8	27.8	27.8
	medium familiarity	96	39.2	39.2	66.9
	high familiarity	81	33.1	33.1	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

12 month visiting groups

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low visit familiarity	95	38.8	40.1	40.1
	medium visit familiarity	95	38.8	40.1	80.2
	high visit familiarity	47	19.2	19.8	100.0
	Total	237	96.7	100.0	
Missing	System Missing	8	3.3		
	Total	8	3.3		
Total		245	100.0		

COMPUTE activ@5m = MEAN(camp,explore,hillclmb,roads,target,trails) (COMPUTE)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low activity familiarity	110	44.9	45.1	45.1
	medium activity familiarity	79	32.2	32.4	77.5
	high activity familiarity	55	22.4	22.5	100.0
	Total	244	99.6	100.0	
Missing	System Missing	1	.4		
	Total	1	.4		
Total		245	100.0		

Overall Grouped Familiarity

Familiarity Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low familiarity	81	33.1	33.1	33.1
	medium familiarity	113	46.1	46.1	79.2
	high familiarity	51	20.8	20.8	100.0
	Total	245	100.0	100.0	
Total		245	100.0		

Appendix Z
Perception of Risk and Willingness to Support Reclamation

Overall Perception of Risk by Sloping the Highwalls

Crosstab

			Reslope Highwalls			
			1.00	2.00	3.00	Total
Overall Risk Perception	low perception of risk	Count	35	33	51	119
		% within Overall Risk Perception	29.4%	27.7%	42.9%	100.0%
		Std. Residual	.8	-.7	.0	
		Adjusted Residual	1.4	-1.2	-.1	
	medium perception of risk	Count	11	25	22	58
		% within Overall Risk Perception	19.0%	43.1%	37.9%	100.0%
		Std. Residual	-1.0	1.6	-.6	
		Adjusted Residual	-1.4	2.3	-.9	
	high perception of risk	Count	10	10	21	41
		% within Overall Risk Perception	24.4%	24.4%	51.2%	100.0%
		Std. Residual	-.2	-.8	.8	
		Adjusted Residual	-.2	-1.0	1.2	
Total		Count	56	68	94	218
		% within Overall Risk Perception	25.7%	31.2%	43.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.381[a]	4	.172
Likelihood Ratio	6.219	4	.183
Linear-by-Linear Association	.847	1	.357
N of Valid Cases	218		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.53.

Overall Perception of Risk by Closing the Open Shafts

Overall Risk Perception * Close All Open Shafts Crosstabulation

			Close All Open Shafts			Total
			1.00	2.00	3.00	
Overall Risk Perception	low perception of risk	Count	31	28	59	118
		% within Overall Risk Perception	26.3%	23.7%	50.0%	100.0%
		Std. Residual	.4	.4	-.5	
		Adjusted Residual	.7	.6	-1.1	
	medium perception of risk	Count	11	16	30	57
		% within Overall Risk Perception	19.3%	28.1%	52.6%	100.0%
		Std. Residual	-.8	1.0	-.1	
		Adjusted Residual	-1.0	1.3	-.1	
	high perception of risk	Count	11	4	27	42
		% within Overall Risk Perception	26.2%	9.5%	64.3%	100.0%
		Std. Residual	.2	-1.7	1.0	
		Adjusted Residual	.3	-2.2	1.6	
Total		Count	53	48	116	217
		% within Overall Risk Perception	24.4%	22.1%	53.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.087[a]	4	.193
Likelihood Ratio	6.830	4	.145
Linear-by-Linear Association	1.088	1	.297
N of Valid Cases	217		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.29.

Physical Risk Perception by Sloping the Highwalls

Crosstab

			Reslope Highwalls			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	26	21	27	74
		% within Physical Perception of Risk	35.1%	28.4%	36.5%	100.0%
		Std. Residual	1.6	-.4	-.9	
		Adjusted Residual	2.3	-.6	-1.5	
	Medium Perception of Risk	Count	23	43	53	119
		% within Physical Perception of Risk	19.3%	36.1%	44.5%	100.0%
		Std. Residual	-1.3	1.0	.2	
		Adjusted Residual	-2.3	1.8	.3	
	High Perception of Risk	Count	8	5	17	30
		% within Physical Perception of Risk	26.7%	16.7%	56.7%	100.0%
		Std. Residual	.1	-1.4	1.1	
		Adjusted Residual	.1	-1.8	1.6	
Total		Count	57	69	97	223
		% within Physical Perception of Risk	25.6%	30.9%	43.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.709[a]	4	.046
Likelihood Ratio	9.893	4	.042
Linear-by-Linear Association	4.006	1	.045
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.67.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T [b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.204	.101	1.997	.046
N of Valid Cases		223			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Physical Risk Perception by Closing Open Shafts

Physical Perception of Risk * Close All Open Shafts Crosstabulation

			Close All Open Shafts			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	21	20	33	74
		% within Physical Perception of Risk	28.4%	27.0%	44.6%	100.0%
		Std. Residual	.8	.9	-1.1	
		Adjusted Residual	1.1	1.3	-2.0	
	Medium Perception of Risk	Count	23	23	71	117
		% within Physical Perception of Risk	19.7%	19.7%	60.7%	100.0%
		Std. Residual	-.9	-.6	1.0	
		Adjusted Residual	-1.6	-.9	2.1	
	High Perception of Risk	Count	9	6	16	31
		% within Physical Perception of Risk	29.0%	19.4%	51.6%	100.0%
		Std. Residual	.6	-.3	-.2	
		Adjusted Residual	.7	-.4	-.3	
Total		Count	53	49	120	222
		% within Physical Perception of Risk	23.9%	22.1%	54.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.292[a]	4	.259
Likelihood Ratio	5.293	4	.259
Linear-by-Linear Association	.952	1	.329
N of Valid Cases	222		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.84.

Chemical Risk Perception by Sloping the Highwalls

Crosstab

			Reslope Highwalls			
			1.00	2.00	3.00	Total
Chemical Perception of Risk	Low Perception of Risk	Count	25	31	38	94
		% within Chemical Perception of Risk	26.6%	33.0%	40.4%	100.0%
		Std. Residual	.2	.4	-.5	
		Adjusted Residual	.3	.6	-.8	
	Medium Perception of Risk	Count	24	34	39	97
		% within Chemical Perception of Risk	24.7%	35.1%	40.2%	100.0%
		Std. Residual	-.2	.7	-.5	
		Adjusted Residual	-.2	1.2	-.9	
	High Perception of Risk	Count	8	4	20	32
		% within Chemical Perception of Risk	25.0%	12.5%	62.5%	100.0%
		Std. Residual	-.1	-1.9	1.6	
		Adjusted Residual	-.1	-2.4	2.3	
Total		Count	57	69	97	223
		% within Chemical Perception of Risk	25.6%	30.9%	43.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.344[a]	4	.119
Likelihood Ratio	8.045	4	.090
Linear-by-Linear Association	1.424	1	.233
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.18.

Chemical Risk Perception by Closing Open Shafts

Chemical Perception of Risk * Close All Open Shafts Crosstabulation

			Close All Open Shafts			
			1.00	2.00	3.00	Total
Chemical Perception of Risk	Low Perception of Risk	Count	24	19	51	94
		% within Chemical Perception of Risk	25.5%	20.2%	54.3%	100.0%
		Std. Residual	.3	-.4	.0	
		Adjusted Residual	.5	-.6	.1	
	Medium Perception of Risk	Count	20	25	50	95
		% within Chemical Perception of Risk	21.1%	26.3%	52.6%	100.0%
		Std. Residual	-.6	.9	-.2	
		Adjusted Residual	-.9	1.3	-.4	
	High Perception of Risk	Count	9	5	19	33
		% within Chemical Perception of Risk	27.3%	15.2%	57.6%	100.0%
		Std. Residual	.4	-.8	.3	
		Adjusted Residual	.5	-1.0	.4	
Total		Count	53	49	120	222
		% within Chemical Perception of Risk	23.9%	22.1%	54.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.335[a]	4	.674
Likelihood Ratio	2.386	4	.665
Linear-by-Linear Association	.026	1	.872
N of Valid Cases	222		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.28.

Appendix AA
Perception of Risk and Willingness to Forego Use

Overall Perception of Risk by Losing Access to Unsafe Areas

Crosstab

			Losing Access to an Unsafe Area			Total
			1.00	2.00	3.00	
Overall Risk Perception	low perception of risk	Count	49	30	41	120
		% within Overall Risk Perception	40.8%	25.0%	34.2%	100.0%
		Std. Residual	.7	-1.1	.4	
		Adjusted Residual	1.2	-2.0	.7	
	medium perception of risk	Count	16	20	20	56
		% within Overall Risk Perception	28.6%	35.7%	35.7%	100.0%
		Std. Residual	-1.1	.7	.5	
		Adjusted Residual	-1.5	.9	.7	
	high perception of risk	Count	16	17	9	42
		% within Overall Risk Perception	38.1%	40.5%	21.4%	100.0%
		Std. Residual	.1	1.1	-1.2	
		Adjusted Residual	.1	1.5	-1.7	
Total		Count	81	67	70	218
		% within Overall Risk Perception	37.2%	30.7%	32.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.467[a]	4	.167
Likelihood Ratio	6.686	4	.153
Linear-by-Linear Association	.093	1	.761
N of Valid Cases	218		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.91.

Overall Perception of Risk by Changing OHV Designation

Crosstab

			Change Designation to No XCountry			
			1.00	2.00	3.00	Total
Overall Risk Perception	low perception of risk	Count	71	27	20	118
		% within Overall Risk Perception	60.2%	22.9%	16.9%	100.0%
		Std. Residual	.1	-.6	.6	
		Adjusted Residual	.3	-1.1	1.0	
	medium perception of risk	Count	29	21	6	56
		% within Overall Risk Perception	51.8%	37.5%	10.7%	100.0%
		Std. Residual	-.7	1.7	-.8	
		Adjusted Residual	-1.3	2.3	-1.0	
	high perception of risk	Count	28	8	6	42
		% within Overall Risk Perception	66.7%	19.0%	14.3%	100.0%
		Std. Residual	.6	-.9	-.1	
		Adjusted Residual	1.1	-1.1	-.1	
Total		Count	128	56	32	216
		% within Overall Risk Perception	59.3%	25.9%	14.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.021[a]	4	.198
Likelihood Ratio	5.824	4	.213
Linear-by-Linear Association	.314	1	.575
N of Valid Cases	216		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.22.

Overall Perception of Risk by Restrict Use to Existing Roads and Trails

Crosstab

			Restrict to Existing Roads and Trails			
			1.00	2.00	3.00	Total
Overall Risk Perception	low perception of risk	Count	65	31	23	119
		% within Overall Risk Perception	54.6%	26.1%	19.3%	100.0%
		Std. Residual	.2	-.2	-.1	
		Adjusted Residual	.5	-.4	-.2	
	medium perception of risk	Count	29	17	11	57
		% within Overall Risk Perception	50.9%	29.8%	19.3%	100.0%
		Std. Residual	-.2	.4	-.1	
		Adjusted Residual	-.4	.5	-.1	
	high perception of risk	Count	21	11	9	41
		% within Overall Risk Perception	51.2%	26.8%	22.0%	100.0%
		Std. Residual	-.2	.0	.3	
		Adjusted Residual	-.3	-.1	.4	
Total		Count	115	59	43	217
		% within Overall Risk Perception	53.0%	27.2%	19.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.453[a]	4	.978
Likelihood Ratio	.446	4	.979
Linear-by-Linear Association	.207	1	.649
N of Valid Cases	217		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.12.

Overall Perception of Risk by Closing Areas with High Numbers of Hazards

Crosstab

			Closing Areas with high numbers of hazards			
			1.00	2.00	3.00	Total
Overall Risk Perception	low perception of risk	Count	45	29	46	120
		% within Overall Risk Perception	37.5%	24.2%	38.3%	100.0%
		Std. Residual	.7	-1.5	.7	
		Adjusted Residual	1.3	-2.7	1.3	
	medium perception of risk	Count	15	28	15	58
		% within Overall Risk Perception	25.9%	48.3%	25.9%	100.0%
		Std. Residual	-1.0	2.2	-1.1	
		Adjusted Residual	-1.5	3.1	-1.6	
	high perception of risk	Count	14	13	15	42
		% within Overall Risk Perception	33.3%	31.0%	35.7%	100.0%
		Std. Residual	.0	-.1	.1	
		Adjusted Residual	.0	-.1	.2	
Total		Count	74	70	76	220
		% within Overall Risk Perception	33.6%	31.8%	34.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.512[a]	4	.033
Likelihood Ratio	10.208	4	.037
Linear-by-Linear Association	.005	1	.941
N of Valid Cases	220		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.36.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.005	.098	.049	.961
N of Valid Cases		220			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Physical Risk Perception by Losing Access to Unsafe Areas

Crosstab

			Losing Access to an Unsafe Area			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	34	20	21	75
		% within Physical Perception of Risk	45.3%	26.7%	28.0%	100.0%
		Std. Residual	1.2	-.6	-.7	
		Adjusted Residual	1.8	-.9	-1.0	
	Medium Perception of Risk	Count	36	34	47	117
		% within Physical Perception of Risk	30.8%	29.1%	40.2%	100.0%
		Std. Residual	-1.1	-.3	1.5	
		Adjusted Residual	-2.1	-.5	2.6	
	High Perception of Risk	Count	13	14	4	31
		% within Physical Perception of Risk	41.9%	45.2%	12.9%	100.0%
		Std. Residual	.4	1.5	-1.9	
		Adjusted Residual	.6	1.9	-2.5	
Total		Count	83	68	72	223
		% within Physical Perception of Risk	37.2%	30.5%	32.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.733[a]	4	.019
Likelihood Ratio	12.383	4	.015
Linear-by-Linear Association	.049	1	.824
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.45.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.045	.092	.483	.629
N of Valid Cases		223			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Physical Risk Perception by Changing the OHV Designation

Crosstab

			Change Designation to No XCountry			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	49	16	10	75
		% within Physical Perception of Risk	65.3%	21.3%	13.3%	100.0%
		Std. Residual	.7	-.8	-.4	
		Adjusted Residual	1.4	-1.2	-.5	
	Medium Perception of Risk	Count	63	36	16	115
		% within Physical Perception of Risk	54.8%	31.3%	13.9%	100.0%
		Std. Residual	-.6	1.1	-.3	
		Adjusted Residual	-1.3	1.8	-.4	
	High Perception of Risk	Count	18	6	7	31
		% within Physical Perception of Risk	58.1%	19.4%	22.6%	100.0%
		Std. Residual	-.1	-.7	1.1	
		Adjusted Residual	-.1	-.9	1.3	
Total		Count	130	58	33	221
		% within Physical Perception of Risk	58.8%	26.2%	14.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.657[a]	4	.324
Likelihood Ratio	4.525	4	.340
Linear-by-Linear Association	1.418	1	.234
N of Valid Cases	221		

a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 4.63.

Physical Risk Perception by Restrict to Existing Roads and Trails

Crosstab

			Restrict to Existing Roads and Trails			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	46	17	11	74
		% within Physical Perception of Risk	62.2%	23.0%	14.9%	100.0%
		Std. Residual	1.1	-.7	-1.0	
		Adjusted Residual	2.0	-1.0	-1.4	
	Medium Perception of Risk	Count	53	37	27	117
		% within Physical Perception of Risk	45.3%	31.6%	23.1%	100.0%
		Std. Residual	-1.1	1.0	.7	
		Adjusted Residual	-2.3	1.6	1.1	
	High Perception of Risk	Count	18	6	7	31
		% within Physical Perception of Risk	58.1%	19.4%	22.6%	100.0%
		Std. Residual	.4	-.8	.3	
		Adjusted Residual	.6	-1.0	.3	
Total		Count	117	60	45	222
		% within Physical Perception of Risk	52.7%	27.0%	20.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.285[a]	4	.179
Likelihood Ratio	6.411	4	.170
Linear-by-Linear Association	1.667	1	.197
N of Valid Cases	222		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.28.

Physical Risk Perception by Closing Areas with High Numbers of Hazards

Crosstab

			Closing Areas with high numbers of hazards			
			1.00	2.00	3.00	Total
Physical Perception of Risk	Low Perception of Risk	Count	35	19	21	75
		% within Physical Perception of Risk	46.7%	25.3%	28.0%	100.0%
		Std. Residual	1.9	-.9	-1.0	
		Adjusted Residual	2.9	-1.3	-1.6	
	Medium Perception of Risk	Count	33	40	46	119
		% within Physical Perception of Risk	27.7%	33.6%	38.7%	100.0%
		Std. Residual	-1.1	.5	.7	
		Adjusted Residual	-2.0	.9	1.2	
	High Perception of Risk	Count	8	11	12	31
		% within Physical Perception of Risk	25.8%	35.5%	38.7%	100.0%
		Std. Residual	-.8	.4	.3	
		Adjusted Residual	-1.0	.6	.5	
Total		Count	76	70	79	225
		% within Physical Perception of Risk	33.8%	31.1%	35.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.415[a]	4	.078
Likelihood Ratio	8.260	4	.082
Linear-by-Linear Association	5.127	1	.024
N of Valid Cases	225		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.64.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.224	.093	2.362	.018
N of Valid Cases		225			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Chemical Risk Perception by Losing Access to Unsafe Areas

Crosstab

			Losing Access to an Unsafe Area			
			1.00	2.00	3.00	Total
Chemical Perception of Risk	Low Perception of Risk	Count	36	24	34	94
		% within Chemical Perception of Risk	38.3%	25.5%	36.2%	100.0%
		Std. Residual	.2	-.9	.7	
		Adjusted Residual	.3	-1.4	1.1	
	Medium Perception of Risk	Count	38	32	26	96
		% within Chemical Perception of Risk	39.6%	33.3%	27.1%	100.0%
		Std. Residual	.4	.5	-.9	
		Adjusted Residual	.6	.8	-1.4	
	High Perception of Risk	Count	9	12	12	33
		% within Chemical Perception of Risk	27.3%	36.4%	36.4%	100.0%
		Std. Residual	-.9	.6	.4	
		Adjusted Residual	-1.3	.8	.5	
Total		Count	83	68	72	223
		% within Chemical Perception of Risk	37.2%	30.5%	32.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.850[a]	4	.427
Likelihood Ratio	3.977	4	.409
Linear-by-Linear Association	.052	1	.820
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.06.

Chemical Risk Perception by Changing OHV Designation

Crosstab

			Change Designation to No XCountry			Total
			1.00	2.00	3.00	
Chemical Perception of Risk	Low Perception of Risk	Count	58	18	16	92
		% within Chemical Perception of Risk	63.0%	19.6%	17.4%	100.0%
		Std. Residual	.5	-1.3	.6	
		Adjusted Residual	1.1	-1.9	.9	
	Medium Perception of Risk	Count	57	27	12	96
		% within Chemical Perception of Risk	59.4%	28.1%	12.5%	100.0%
		Std. Residual	.1	.4	-.6	
		Adjusted Residual	.1	.6	-.9	
	High Perception of Risk	Count	15	13	5	33
		% within Chemical Perception of Risk	45.5%	39.4%	15.2%	100.0%
		Std. Residual	-1.0	1.5	.0	
		Adjusted Residual	-1.7	1.9	.0	
Total		Count	130	58	33	221
		% within Chemical Perception of Risk	58.8%	26.2%	14.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.908[a]	4	.206
Likelihood Ratio	5.848	4	.211
Linear-by-Linear Association	.623	1	.430
N of Valid Cases	221		

a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 4.93.

Chemical Risk Perception by Restrict to Existing Roads and Trails

Crosstab

			Restrict to Existing Roads and Trails			Total
			1.00	2.00	3.00	
Chemical Perception of Risk	Low Perception of Risk	Count	52	21	20	93
		% within Chemical Perception of Risk	55.9%	22.6%	21.5%	100.0%
		Std. Residual	.4	-.8	.3	
		Adjusted Residual	.8	-1.3	.4	
	Medium Perception of Risk	Count	51	32	14	97
		% within Chemical Perception of Risk	52.6%	33.0%	14.4%	100.0%
		Std. Residual	.0	1.1	-1.3	
		Adjusted Residual	.0	1.8	-1.9	
	High Perception of Risk	Count	14	7	11	32
		% within Chemical Perception of Risk	43.8%	21.9%	34.4%	100.0%
		Std. Residual	-.7	-.6	1.8	
		Adjusted Residual	-1.1	-.7	2.1	
Total		Count	117	60	45	222
		% within Chemical Perception of Risk	52.7%	27.0%	20.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.781[a]	4	.100
Likelihood Ratio	7.420	4	.115
Linear-by-Linear Association	1.251	1	.263
N of Valid Cases	222		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.49.

Chemical Risk Perception by Closing Areas with High Numbers of Hazards

Crosstab

			Closing Areas with high numbers of hazards			
			1.00	2.00	3.00	Total
Chemical Perception of Risk	Low Perception of Risk	Count	33	25	36	94
		% within Chemical Perception of Risk	35.1%	26.6%	38.3%	100.0%
		Std. Residual	.2	-.8	.5	
		Adjusted Residual	.4	-1.2	.8	
	Medium Perception of Risk	Count	35	35	28	98
		% within Chemical Perception of Risk	35.7%	35.7%	28.6%	100.0%
		Std. Residual	.3	.8	-1.1	
		Adjusted Residual	.5	1.3	-1.8	
	High Perception of Risk	Count	8	10	15	33
		% within Chemical Perception of Risk	24.2%	30.3%	45.5%	100.0%
		Std. Residual	-.9	-.1	1.0	
		Adjusted Residual	-1.3	-.1	1.3	
Total		Count	76	70	79	225
		% within Chemical Perception of Risk	33.8%	31.1%	35.1%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.808[a]	4	.308
Likelihood Ratio	4.892	4	.299
Linear-by-Linear Association	.303	1	.582
N of Valid Cases	225		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.27.

Appendix BB
Bibliography

"Abandoned Mine Hazards at Proposed Fivemile Pass Off-Highway-Vehicle Area" BLM, Utah State Office, Terry McParland, (February, 1997)

"Abandoned Mine Land Inventory Report for the Southern Oquirrh Mountains: Mercur, West Mercur, and Fivemile Pass Mining Districts, Utah Eric D. Hetherington, and John L. Mayers - December 1996

"Abandoned Mine Land Inventory and Remediation: A Status Report to the Director" (November, 1996). United States Department of the Interior, Bureau of Land Management, Abandoned Mine Land Task Force - BLM/NV/GI-97/004

Bord, R. J., Fisher, A., and O'Connor, R.E. (1997). Is Accurate Understanding of Global Warming Necessary to Promote Willingness to Sacrifice? Franklin Pierce Law Center, Risk: Health Safety and the Environment. 8.339

Cummings, R.G. Valuing Environmental Goods: An assessment of the Contingent Valuation Method (1986

"Deaths and Incidents at Abandoned Mines in Utah Summary: From 1982 to June 1997" Utah Abandoned Mine Reclamation Program (1997)

Dolzani, R, Gobla, M, and Valerie, A. (1994). Analysis of the Wyoming Abandoned mine land reclamation program/prepared for the BLM, Division of Mineral Policy and Economic Evaluation. [Washington, DC] 1994

"Fivemile Pass OHV Area Abandoned Mine Study – Final Report and Recommendations" Utah Abandoned Mine Reclamation Program (December 31, 1996)

Gregory, R., Lichtenstein, S., Slovic, P., (1993). Valuing Environmental Resources: A Constructive Approach. Journal of Risk and Uncertainty, 7:177-197 Kluwer Academic Publishers

Johnson, F.R., Fisher, A., Smith, V.K., Desvousges, W.H. (1988). Informed Choice or Regulated Risk? Lessons from a Study in Radon Risk Communication. Environment, Vol. 30, No.4: pp. 12 - 35

Kunreuther, H., Desvousges, W.H., Slovic, P. (1988). Nevada's Predicament. Public Perceptions of Risk from the Proposed Nuclear Waste Repository. Environment, Vol. 30, No. 8

O'Doherty, R.K., Planning, People and Preferences: a Role for Contingent Valuation (1996). Avebury Ashgate Publishing Limited pp. 31-34, 46-63, 99-101

Renn, Ortwinn, Concepts of Risk: A Classification. Social Theories of Risk (1992) pp. 53-79

Slovic, P., Fischhoff, B., and Lichenstein, S. (1982). Why study risk perception? Risk Analysis, 2, 83-94.

Slovic, P. (1987). Perception of risk. Science, 236:280-85..,eds..

Smith, VK, WH Desvousges. (1988). Risk perception, learning, and individual behavior. American journal of agricultural economics, December 1988..,pp. 1113 - 1117

Smith, VK, WH Desvousges, FR Johnson, and A Fisher. (1990). Can public information programs affect risk perceptions?. Journal of policy analysis and management, 9(1):41-59..,eds..

U.S. Office of Surface Mining Reclamation and Enforcement. (1986). Warning! : Old Mines Can be Dangerous. [Washington DC] - Shipping List no.: 86-740-p

U.S. Congress. House. Committee on Interior and Insular Affairs. (1989). Abandoned Mine Reclamation Act of 1989 : report together with dissenting views (to accompany H.R. 2095) (including cost estimates of the Congressional budget Office). [Washington, DC: U.S. GPO] 1989. Shipping List no.: 89-739-p

U.S. Environmental Protection Agency. Region 8. (1995). Historic hardrock mining: the West's toxic legacy ; the critical link between water quality and abandoned mine sites. [Washington, DC] U.S. Environmental Protection Agency, Region 8 Shipping List no. 96-0093-p

Vernet, J.-P. (1992) Impact of heavy metals on the environment. Amsterdam; New York : Elsevier, 1992