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Robert Berrett, Gerald Argyle v. Denver and Rio Grande Western Railroad Company, Inc. : Brief of Appellant

Utah Supreme Court

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BEFORE THE SUPREME COURT OF THE STATE OF UTAH

ROBERT BERRETT, GERALD ARGYLE, et al.,

Plaintiffs-Appellants,

vs.

DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY, INC.,

Defendant-Respondent.

Case No. ~~900098~~

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BRIEF FOR APPELLANTS

APPEAL FROM THE FOURTH JUDICIAL DISTRICT COURT OF UTAH COU
STATE OF UTAH, CULLEN Y. CHRISTENSEN, JUDGE

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PARTIES

Plaintiffs: Gerald Argyle, Robert Berrett, Madge Black, Lloyd Jackson, Maurice Jackson, William Jackson, Edward Jones, Vaughn Gardner, Shirley Roberta Tace Gousley, Robert Hatch, Evelyn Colleen Pace Keller, Alan Leifson, James Moore, Evan Nelson, Helen Stay, David J. Tate, Calvin Woodcock.

Defendant: Denver and Rio Grande Western Railroad.

STATEMENT OF JURISDICTION

This is an appeal from final judgment and order denying plaintiffs' motion for new trial entered by the Honorable Cullen Y. Christensen, Judge, Fourth Judicial District Court of Utah County, State of Utah. Said Judgment and Order was entered on the 9th day of February, 1990. Appeal is taken pursuant to Utah Code Annotated § 78-2-2 (1953, as amended).

STATEMENT OF THE ISSUES

I. Whether the trial court erred in failing to allow the testimony of expert witness Dr. John F. Shroder, either as a witness in the plaintiffs' case in chief or as a rebuttal witness, and if the plaintiffs were prejudiced thereby. The standard of review on this issue is abuse of discretion. Christenson v. Jewkes, 761 P.2d 1375, 1377 (Utah 1988).

II. Whether the trial court erred in failing to allow the evidence regarding the insurance policies and proceeds paid to the defendant as a result of those policies to evidence the factors of control and foreknowledge. The standard of review is abuse of discretion. Terry v. Zions Cooperative Mercantile Institution, 605 P.2d 314, 323 (Utah 1979).

III. Whether the trial court erred in failing to grant the plaintiffs a new trial when counsel for the defendant read into the record, in the presence of the jury, evidence of insurance by one of the plaintiffs and receipt of benefits from said insurance, especially in light of the court's ruling precluding the plaintiffs from introducing evidence of insurance on behalf of the defendant. The standard of review is abuse of discretion. Ibid. at 323.

IV. Whether the trial court erred in not granting plaintiffs a new trial based on the irregularity in the proceedings caused by Mr. Heber's presence as the jury foreman in the jury trial pursuant to Utah Rules of Civil Procedure 59(a)(1),(2). The appropriate standard of review is abuse of discretion. Maltby v. Cox Const. Co., Inc., 598 P.2d 336, 341 (Utah 1979).

STATEMENT OF THE FACTS

In the late 1800's, the Denver and Rio Grande Western Railroad Company, defendant, built a railroad track across the "toe" of an ancient landslide formation, now known as the Thistle landslide.[1] For decades, up to and including the spring of 1983, the defendant performed construction and maintenance on the area of track traversing the toe. Prior to the Thistle disaster, there was a 500-foot scar across the 1000-foot toe of this formation as a result of removal of soil by the defendant (Testimony of James E. Slosson 24,25).

The potential danger of the ancient Thistle landslide was a known, documented fact. In 1967, Dr. John Shroder discussed the potential problems of altering the toe of the

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[1] A toe of a slide is the lowest part of the slide. WEBSTER'S NEW COLLEGIATE DICTIONARY (1979).

Thistle slide in his Doctoral thesis as well as an article published in 1971, *Landslides of Utah* (See Appendix A).

In late March and early April of 1983, following 2 years of above-normal precipitation, the ancient Thistle landslide began to move toward the floor of the canyon (Testimony of Blaine Leonard 64, 65). Several entities were involved in making decisions concerning the slide: the railroads, State Department of Transportation, State Engineers Office, Bureau of Reclamation and Corps of Engineers (Testimony of Bruce Kaliser 36,37). Initially, heavy equipment was brought in and used to excavate on and near the toe in an attempt to keep the river channel open. However, as the slide progressed, a decision was made to create a dam and the heavy equipment began pushing the sliding land into the canyon, blocking the Spanish Fork and Diamond Fork rivers, causing upstream flooding and destroying the community of Thistle (Testimony of Maurice Jackson 13). The homes and property of the plaintiffs, Thistle residents, were submerged in water 80 to 100 feet deep for a period in excess of six months (Testimony of Maurice W. Jackson 16).

When the water receded, there was near-total destruction of the homes and outbuildings, up to six feet of sand and gravel in places that were once crop and grazing lands, cracks six inches wide and six feet deep in the land, and some drainage systems had been completely washed away (Testimony of Maurice W. Jackson 18). The town was thereafter designated a flood plain, and no one has been allowed to construct or rebuild in the town. There was no longer sandy farmable loam soil, only hard un-farmable clay and silt. Years after the flood, the quality of the grazing lands was still greatly diminished (Testimony of Maurice W. Jackson 19). The flood not only destroyed the plaintiffs' homes and land, but their way of life.

Following the slide and flood, there was considerable study of the area. Dr. James E. Slosson and colleagues conducted one such study: The Thistle: Was Mitigation Possible? This report suggested that a system of drains could have been implemented and the excess water drained off, at an expense of $1.00 for every $1,000.00 in damage resulting from the slide. Had these drainage systems been utilized, there may not have been any slide, much less the degree of damage suffered by the residents of Thistle (Testimony of James E. Slosson 41, 43, 115).

STATEMENT OF THE CASE

This case was originally set for trial in April of 1989. However, the trial was continued when the defendant answered interrogatories concerning previous litigation related to the slide in a misleading manner. Plaintiffs discovered through their own investigation that the defendant had in fact previously been sued by the Utah Railway for their negligence in the Thistle disaster.[2] In January of 1989, Judge Christensen compelled defendant to produce the related information concerning the previous litigation. However, plaintiffs did not receive the requested documents until June of 1989 (Hearing 1).

As a result of documents discovered from the compelled information, the importance of calling Dr. Shroder became obvious. In the summer of 1989, Dr. Shroder was in Yellowstone National Park, out of reach of the plaintiffs, researching the impact of the fires of 1988 on landslide potential. On returning from Yellowstone, Dr. Shroder contacted plaintiffs' counsel and stated that he would be willing to testify as an expert in support of the position that defendant's activities at the toe of the slide were negligent and a

[2] The Utah Railway/Denver Rio Grande Western action was settled out of court.

cause in fact of the Thistle slide (Hearing for New Trial 7). On August 1, 14 days before trial, defendant was notified of plaintiffs' intent to call Dr. Shroder as a witness (Hearing 2).

On August 2, 1989, the trial court held a hearing on motions concerning several issues, those relevant to this appeal being expert witness Dr. Shroder and evidence of defendant's property insurance. At this hearing, plaintiffs' counsel submitted to the trial court a letter dated July 12, 1989 from defense counsel which stated in part,

> We agreed to to exchange exhibit lists no later than August 1, 1989. At that time, you will also supply us with your final witness list, including the identity of any depositions that you propose to read. As we have previously discussed, within two days of receiving your list, we will provide you with our final witness list. You advised me that, as of July 12, 1989, you had not identified with certainty those witnesses that you plan to call whose names do not appear in the latest draft of the pretrial order.

See July 12, 1989 letter, Appendix B. Defendant's counsel stated that he had suggested as the final day to notify the other party as August 1; plaintiffs' counsel stated this was acceptable (Hearing 5). No pretrial agreement had been entered with the court and no order stating when witness lists were to be exchanged (Hearing on Motions 3, 4, 23). The defendant's proposed pretrial order suggested:

> In the event that other witnesses are to be called at trial, a statement of their names and addresses and the general subject matter of their testimony will be served upon opposing counsel and filed with the Court at least 10 days prior to trial. This restriction shall not apply to rebuttal witnesses, ...

(emphasis added) See Defendant's Proposed Pretrial Order, Appendix B. The trial court held that, regardless of the July 12 letter or the proposed pretrial order of the defendant, that because of dilatory action on the part of both sides, no witnesses listed after July 9, 1989 (particularly Dr. Shroder) would be allowed to testify (Hearing on Motions 32,33).

The hearing on motions also addressed plaintiffs' evidence that over the course of the years, the defendant railroad had heavily insured the rail line that crossed the toe of the landslide, and had in fact received insurance benefits of over $29 million as a result of the slide (Hearing on the Motions 4-9). The trial court held that any evidence of insurance would be inadmissable at trial.

Trial commenced on or about August 14, 1989. On the first day of trial, all potential jurors were asked if they had any acquaintance with any of the parties, attorneys or other members of their firms (Voir Dire of Potential Jurors 13). Mr. Keith Heber did not respond to this question, and was subsequently elected jury foreman. The day after the trial, it came to plaintiffs' counsel's attention that Mr. Heber had been an adverse witness and representative in at least five adversarial hearings against plaintiffs' law firm of Young & Kester during the years 1988 and 1989 dealing with state unemployment compensation. The administrator's findings were overturned by the Appellate Court of Utah as "unreasonable and irrational." The Appellate Court's ruling was in direct opposition to the position advocated by Mr. Heber in the prior proceedings (Memorandum in Support of Motion for New Trial 11,12).

Following a 12-day trial, the jury found that the activities of the railroad were not a cause in fact of the Thistle disaster. Plaintiffs then filed a Motion for New Trial which was heard on January 3, 1990 and denied (Hearing of Motion for New Trial 1).

SUMMARY OF THE ARGUMENT

Failure of the trial court to grant plaintiffs' Motion for a New Trial was an abuse of judicial discretion in light of the errors at trial. Specifically, failure to allow Dr. John Shroder, a well-known geologist and geomorphologist, to testify as an expert witness prejudiced the plaintiffs and deprived the jury of the opportunity to receive relevant evidence that would have aided in their deliberations. Exclusion is a drastic measure that should be used only with extreme caution. Even if Dr. Shroder's testimony was excluded from the plaintiffs' case-in-chief he should have been allowed to testify as a rebuttal witness. Because of the minimal evidence available relative to the soil stability, water states and slope failures just prior to the slide movement, emphasis was placed on the aerial photos taken of the early stages of the slide. These were used by all experts to support their theories of cause and when the slide started. Defendant emphasized geomorphology and geotechnology and advocated the position that plaintiffs' geotechnical engineers were not trained to decipher the significance of the many photos of the slide. Plaintiffs should have been allowed to call Dr. Shroder to rebut these issues, particularly in light of the defendant's position that plaintiffs' experts were not qualified as geomorphologists, and therefore their testimony not credible. It was a new issue not previously raised or even hinted at until defendant's case-in-chief. It was a significant issue which plaintiffs were entitled to rebut with Dr. Shroder's testimony. Dr. Shroder's background in these fields was necessary to rebut defendant's contention that only a geotechnologist or geomorphologist could perform the necessary analysis. Dr. Shroder's testimony was critical, as well, to counter the testimony of defendant's witnesses Slosson and Morgenstern.

In addition, the exclusion of defendant's property insurance from evidence prejudiced the plaintiff and deprived the jury of pertinent information. Analogy to Utah Rules of Evidence 411 prohibition of evidence of liability insurance was inappropriate as property insurance is at issue in the present case. Rule 411 should not be extended to other types of insurance as it has been criticized as superficial and unrealistic even in application to liability insurance.

In fairness to the plaintiff, defendant's reading into evidence of Maurice Jackson's deposition concerning property insurance and proceeds on his property was prejudicial and should not have been allowed. The ruling prohibiting evidence of insurance should have been applied consistently to the defendant and plaintiffs.

Finally, Mr. Heber's failure to respond to voir dire concerning recent adverse association with the plaintiffs' law firm, Young & Kester, infringes on the integrity of the judicial proceedings. The fact that a position he vigorously advocated was overturned as "unreasonable and irrational" when Young & Kester represented the opposing party on appeal is grounds to suspect bias towards plaintiffs' attorney. His role as foreman taints the jury deliberation.

These errors constitute grave prejudice towards the plaintiffs, and the trial court's failure to grant a new trial was abuse of discretion which we request that the court remedy by reversing the trial court and allowing a new and fair trial.

ARGUMENT

I. THE TRIAL COURT ERRED IN FAILING TO ALLOW THE TESTIMONY OF EXPERT WITNESS DR. JOHN F. SHRODER AS A WITNESS EITHER IN THE PLAINTIFFS' CASE IN CHIEF OR AS A REBUTTAL WITNESS, THUS PREJUDICING THE PLAINTIFFS.

A. Effect of the Lack of a Pretrial Order Regarding the Exchange of Witness Lists.

Exclusion of Dr. John F. Shroder as an expert witness for plaintiffs' case in chief or on rebuttal critically flawed the plaintiffs' case and was an abuse of discretion by the trial court. No pretrial order was entered in this case and no definite agreement was ever reached between the parties. There was, however, a written and verbal agreement that the witnesses lists were to be exchanged on August 1, 1989 (See July 12, 1989 letter, Appendix B). Although Utah Rules of Civil Procedure 26 states that discovery should be completed 30 days prior to trial, there is Utah case law allowing unlimited expert witnesses to testify. Dugan v. Jones, 615 P.2d 1239 (Utah 1980).

The clear intent of the parties to set a date later than July 9 as the last opportunity to notify the opposing party of witnesses to be called is evidenced by the proposed pretrial order sent to counsel for the plaintiffs by counsel for the defendant on or about the 21st day of June 1989. Paragraph seven of that proposal stated all other witnesses to be used at trial would be listed not later than the second day of August 1989 (See Appendix B).

Further evidence of the parties' intent to set the first week in August as the time to exchange lists is a letter dated July 12, 1989 from defendant's counsel, stating that he knew additional witnesses would be listed in the future and his verbal suggestion at the hearing that all names be submitted by August 1, 1989. It was the understanding that the witness lists were to be exchanged the first of August rather than any dilatory action that caused the late notice of witnesses to be called at trial.

The Utah Supreme Court, in Dugan at 1244, a case where no pretrial order was entered, supported the position that a trial court's order denying defendant's calling of an expert witnesses at trial because they had failed to provide an expert witness list was an abuse of discretion. See also McHenry v. Hanover Insurance Company, 246 So. 2d 374 (La. App. 1970).

In compliance with Utah Rules of Evidence 103 (a)(2) the substance of the evidence was proffered to the court. Plaintiffs' counsel entered into the record the nature of Shroder's potential testimony at the hearing on the motions (Hearing on Motions 18,19).

Ashton v. Ashton, 733 P.2d 147 (Utah 1987). Shroder made plans to come to Utah and was available to be deposed at a reasonable time prior to trial.

B. Preclusion of a Witness is a Drastic Remedy That Should be Used With Extreme Caution.

The objective in a lawsuit is resolution of a dispute. Thus, exclusion of witness testimony is extreme in nature and must be applied with caution, especially where there is risk of unjustly depriving a party of a meritorious cause of action. Ellis v. Gilbert, 429 P.2d 39, 19 Utah 2d 189 (Utah 1967), Plonkey v. Superior Court In and For Co. of Conoconino, 475 P.2d 492 (Ariz. 1970).

Preclusion orders should be exercised only to the extent necessary to achieve a just disposition of the case in a speedy and efficient manner. In Cooper v. Industrial Commission, 387 P.2d 689, 690, 15 Utah 2d 91,93 (Utah 1963), the Supreme Court of Utah held, "It is an elemental principle of justice that a party seeking adjudication of his rights should be neither prevented nor dissuaded from presenting any evidence he desires which is competent and material to the issues."

The Pennsylvania Superior Court set out the following persuasive list of considerations to be made prior to preclusion of witness testimony: bad faith on the part of the party seeking to call an unlisted witness, ability of the party to have discovered the witnesses earlier, validity of the excuse offered, willfulness of failure to comply with the court's order, intent to mislead or confuse one's adversary, importance of the excluded testimony, surprise in fact of the party against whom the excluded witnesses would have testified, ability to cure the prejudice, extent calling the unlisted witnesses would disrupt the orderly and efficient trial of the case or other cases in the court. Feingold v. Southeastern

Pa. Transp. Auth., 488 A.2d 284, 287-88 (Pa. Super. 1985). See also, Binger v. King Pest Control, 401 So. 1315, 1314 (Fla. 1981).

In the present case, just resolution of the dispute would have been better served by allowing the jury to hear all relevant information, including Dr. Shroder's testimony. Notice of intent to call Dr. Shroder as an expert witness on August 1, 1989 was not in bad faith; late notice was due in part to plaintiffs' inability to reach Dr. Shroder, as he was working in Yellowstone National Park. Dr. Shroder contacted plaintiffs' counsel on approximately July 15th. Prior to that time, plaintiffs' had no means to determine if Dr. Shroder would be able to testify. Once he stated that he believed the railroad cut at the toe of the slide was a cause of the Thistle slide, and that he would be willing to testify, the defendant was notified of plaintiffs' intent to call Dr. Shroder as an expert witness.

Plaintiffs had no intent to mislead or confuse, nor was defendant surprised by the intent to call Dr. Shroder. Defendant was aware of Dr. Shroder and his writings on the Thistle landslide. This is evidenced by their production in response to Judge Christensen's order compelling discovery of Dr. Shroder's article in the Utah Mineralogical Survey, *Landslides of Utah.*

Dr. Shroder's testimony was crucial to plaintiffs' case, as he possesses the credentials that the defendant emphasized as indispensable to one's ability to analyze the slide or interpret the photos. Dr. Shroder has an extensive history with the Thistle slide area, had assessed the potential danger of construction on the toe of the Thistle slide many years prior to the slide, and has a background in geomorphology and geotechnology.

Notice to defendant was timely and would not have disrupted the efficiency of this trial or other trials in the court. There is precedent that 5 days is sufficient time to notify the opposing party of an expert witness, especially when the witness is made available to the opposing party, as was done in this case. Christenson v. Jewkes, 761 P.2d 1375, (Utah 1988), Nickey v. Brown, 454 N.E.2d 177, 181 (Ohio App. 1982).

Plaintiffs' offer to have Dr. Shroder available for deposition cured any prejudice to defendant. Availability of the witness was a reasonable cure, as defendant found time to depose 3 other witnesses on plaintiffs' August 1 list (Docketing Statement at 12, 13).

C. Dr. Shroder Should Have Been Allowed to Testify as a Rebuttal Witness

At trial, several expert witnesses testified concerning movement of land masses and soil. Impeachment of plaintiffs' expert witnesses (whose expertise was in geotechnical engineering) relied heavily on the fact that Dr. Leonard and Dr. Olsen were not experts in geomorphology, geotechnology and investigative photography (Testimony of James E. Slosson 16, Closing Arguments by Mr. Richman).

In light of this emphasis Dr. Shroder should, at a minimum, have been allowed to testify as a rebuttal witness. Dr. Shroder is a geologist and geomorphologist who is intimately familiar with the Thistle landslide. His doctoral thesis was written on the subject, and his studies were made the official publication of the State of Utah with regard to landslides in Utah; particularly the Thistle landslide (Testimony by James E. Slosson 16).

When witnesses in the adversary's case-in-chief testified with regard to the matters upon which the other party's expert witness was called to rebut, the trial court properly allowed the testimony. Preclusion from introducing an expert's testimony in a case-in-chief does not mean preclusion from presenting it on rebuttal. McDonald v. Safeway Stores, Inc., 707 P.2d 416 (Idaho 1985). The Georgia Appellate court emphasized the importance of allowing a witness to testify on rebuttal in the case of Canada West, Ltd. et. al. v. City of Atlanta et. al., 315 S.E. 442 (Ga. App. 1984). The court stated,

> The purpose of all trials is to arrive at the truth of the issues in controversy. Thus, the courts of this state have held that it is not error to call an unlisted witness in rebuttal, for the obvious reason that the rebuttal witness may not be necessary except to respond to an issue raised by the opposing party.

In light of the above considerations, Dr. Shroder should have been allowed to testify in rebuttal, even if there had been a court-ordered pretrial agreement as to the witness lists. However, since there was not a court order, it is all the more prejudicial to the plaintiffs that Dr. Shroder's testimony was excluded.

II. THE TRIAL COURT ERRED IN FAILING TO ALLOW THE EVIDENCE REGARDING THE INSURANCE POLICIES AND PROCEEDS PAID TO THE DEFENDANT AS A RESULT OF THOSE POLICIES, TO EVIDENCE THE FACTORS OF CONTROL AND FOREKNOWLEDGE.

A. All Relevant Evidence Should be Admitted at Trial

Failure to admit relevant evidence of defendant's property insurance at trial was a prejudicial abuse of discretion by the trial court. Utah Rules of Evidence 402 and 403 are controlling in relevancy of evidence and assert the premise that relevant evidence should be allowed at trial.[3] Utah case law emphasizes evidence that helps attain a just resolution of a dispute is "relevant" to the lawsuit. Ellis at 40, Cooper at 690. The Utah Supreme Court in State of Utah v. Danker, 599 P.2d 518 (Utah 1979) stated,

> The general rule is that if evidence is relevant and competent, the mere fact that it may be inflammatory does not render it inadmissible. The reason for this is that the jury is entitled to know the truth of the situation in order to arrive at a just verdict. Judge should exclude only if he thinks it will cause the processes of justice to go awry.

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[3] "All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States or the Constitution of the state of Utah, statute, or by these rules, or by other rules applicable in courts of this state. Evidence which is not relevant is not admissible." Utah Rules of Evidence 402

"'Relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence." Utah Rules of Evidence 401

Danker at 519, 520. See also Meyers v. Salt Lake City Corp., 747 P.2d 1058 (Utah App. 1987).

Evidence that defendant heavily insured the property in the Thistle area is relevant to the issue of control and foreknowledge that their actions were causing potential danger of a landslide or exacerbating existing danger. Defendant argued that such evidence would be prejudicial and should be excluded by analogy to Utah Rules of Evidence 411. However, merely because the evidence is inflammatory does not require that it be excluded. The evidence of property insurance would not "cause the processes of justice to go awry" but merely demonstrate to the jury the defendant's knowledge and control of the situation.

In compliance with Utah Rules of Evidence 103, proffer was made concerning the evidence concerning property insurance at the hearing on Motions (Hearing on Motions 2-14). Ashton at 153.

B. Utah Rules of Evidence 411 is Inapplicable to Property Insurance and Should Not be Extended by Analogy.

Defendant argued that by analogy to Utah Rules of Evidence 411, plaintiffs were prohibited from introducing evidence of liability insurance (Hearing on Motions 6).[4] It is improper to extend Rule 411 to evidence of property insurance. The Utah Legislature could have exercised their discretion in writing the Rules of Evidence and expanded the scope of Rule 411 to include other types of insurance. They did not do so, and the rule should be strictly construed and applied only to liability insurance. The language of the statute is clear and unambiguous.

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[4] "Evidence that a person was or was not insured against liability is not admissible upon the issue whether the person acted negligently or otherwise wrongfully. This rule does not require the exclusion of evidence of insurance against liability when offered for another purpose, such as proof of agency, ownership, or control, or bias or prejudice of a witness." Utah Rules of Evidence 411

Criticisms of Rule 411 provide further support to the argument that Rule 411 application should not be expanded to other types of insurance. McCormick, McCORMICK'S HANDBOOK OF THE LAW OF EVIDENCE, §201 (2d ed. 1972) and Wigmore, EVIDENCE §282a (3d ed. 1979) state that Rule 411 is a controversial rule. Specifically, McCormick states,

> This area is one of the controversial corners of evidence law. The practice bears the marks of the pressures and counter pressures of opposing special interests, and the present evidential rule may eventually disappear....

It is common knowledge that most persons and entities insure their property; jurors are aware that there is insurance. Thus, exclusion of evidence of insurance at trial on the basis of juror misuse is a rouse and prevents jurors from considering all evidence that will aid the fact finder.

Assuming that by analogy to Rule 411, evidence of the property insurance was properly excluded, the court should consider the case of Reid v. Owens, 93 P.2d 680, 98 Ut 50 (Utah 1939). This case was decided prior to the adoption of Rule 411, but has not been overturned and is cited in the Utah Code annotation to Rule 411. In this personal injury case, the Supreme Court of Utah held that evidence of insurance was admissible to show foreknowledge of the potential for harm.

The defendant in the instant case, over a period of years, increased its insurance significantly on that particular section of the track of its railway. This conduct is evidence, on the issue of the defendant's foreknowledge of the existence of the slide, the possibility of their actions causing a slide or other damage, and it is evidence that the jury should have been allowed to consider.

III. THE TRIAL COURT ERRED IN FAILING TO GRANT THE PLAINTIFFS' A NEW TRIAL WHEN COUNSEL FOR THE DEFENDANT READ INTO THE RECORD, IN THE PRESENCE OF THE JURY, EVIDENCE OF INSURANCE BY ONE OF THE PLAINTIFFS AND RECEIPT OF BENEFITS FROM SAID INSURANCE, ESPECIALLY IN LIGHT OF THE TRIAL COURT'S RULING PRECLUDING THE PLAINTIFFS FROM INTRODUCING EVIDENCE OF INSURANCE ON BEHALF OF THE DEFENDANT.

In light of the court's decision to exclude evidence of the defendant's property insurance, it heightens the graveness of the prejudice to the plaintiffs that resulted when defendant's counsel made the following statement, reading into the record from plaintiff Maurice Jackson's deposition:

> Q Mr. Jackson, I just wanted to go back to a point we talked about briefly on the cross examination. If you'll recall, in your deposition when I asked you the value you put on your home you fix a value, I believe, $80,000. And then I asked the basis for that, and your response was referring to someone had, had valued your home after the flood, because they had "listed the replacement values of the home, I think, as $95,000, and they depreciated us $19,000, and then they paid us along about $75,000 for that." Now do you recall that testimony?

(Testimony of Maurice Jackson 31)

Defendant objected to the plaintiffs admitting into the record evidence of insurance because it would create prejudicial error. However, they intentionally read into the record the deposition testimony of Maurice Jackson with regard to his having received insurance proceeds on his home. Evidence of their prejudiced intent is the fact that to plaintiffs' knowledge, his was the only deposition which contained references to actual reimbursement by insurance. This information had to be specifically ferreted out by defendant's counsel. The purpose of counsel's remarks is clearly to indicate to the jury that the residents of Thistle had not been damaged because their property had been insured.

In fairness to plaintiffs, the trial court's ruling to exclude evidence of insurance should be applied reciprocally and fairly. While plaintiffs are barred from any reference to insurance, counsel for the defendant should not be allowed to willfully and intentionally read into the record the only pages in all of the depositions referring to insurance coverage and the receipt of insurance. This was clearly an attempt by counsel to inflame the jury against the plaintiffs in a way which was improper and against the former rulings of the Court.

The likelihood of prejudice to the plaintiffs from the inference that plaintiffs had already recovered their losses resulting from the Thistle landslide is sufficient to meet the standard of review, if there was a reasonable likelihood, absent the error, of a result more favorable to the complaining party. Cerritos Trucking Co. v. Utah Venture No. 1, 645 P.2d 608, 613 (Utah 1982).

There was no purpose of reading into the record the fact of insurance. All other damage testimony was effected without this reference. Counsel for the defense could have presented the information to the jury without any reference to insurance proceeds. Therefore, a new trial should have been granted by the trial court to rectify this deliberate and prejudicial action.

IV.THE TRIAL COURT ERRED IN NOT GRANTING PLAINTIFFS NEW TRIAL BASED ON THE IRREGULARITY IN THE PROCEEDINGS CAUSED BY MR. HEBER'S PRESENCE AS THE JURY FOREMAN IN THE JURY TRIAL.

Mr. Keith Heber's presence on the jury and role as jury foreman casts doubt on the judicial proceedings. His representation of the Department of Utah State Employment Security Division for Unemployment Compensation in hearings before the Industrial Commission against clients which Young & Kester represented on appeal, and failure to notify the court of this adverse relationship with the firm of Young & Kester casts a serious interference and creates an intolerable doubt as to his objectivity as a juror.

Mr. Heber was an adverse representative in at least five advesarial hearings during the years of 1988 and 1989 concerning clients of Young & Kester. Before the Industrial Commission, Mr. Heber made vigorous arguments against the USX employees' unemployment compensation claims and prevailed when the administrative law judge denied the claims. In a successful appeal to the Appellate Court of Utah, Young & Kester represented the USX employees. The court stated that the department's position, which Mr. Heber advocated, was "unreasonable and irrational". Carl Boyd, et al., vs. Department of Employment Security, 773 P.2d 398 (Utah App. 1989). Such a finding by the Appellate Court surely did not endear Mr. Heber to the plaintiffs' law firm. The fact that Mr. Heber attempted to get off the jury at the outset, but did not bring to the court's attention these matters, creates additional concern on the part of the plaintiffs.

At the outset of the trial both parties and the court agreed that any clients or family members of counsel should be stricken for cause. Counsel for defendant was concerned that counsel for the plaintiffs represent approximately 1,700 former USX steel workers. In light of this concern, it is all the more relevant the Mr. Heber was acquainted with the firm of Young & Kester in an adversarial role and did not advise the court that he had been in an adversarial position to the plaintiffs' law firm in the recent past.

In Anderton v. Montgomery, 607 P.2d 828, (Utah 1988) the Utah Supreme Court held, "...a trial court may order a new trial should it appear that juror bias crept into the proceedings notwithstanding voir dire questioning. Utah Rules of Civil Procedure 59(a)(2)." In the instant case, every attempt was made to avoid juror bias through voir dire questioning. However, Mr. Heber's failure to respond appropriately circumvented the process and created a situation of juror bias.

In order to preserve the integrity of the judicial proceedings, a new trial should have been granted and failure to do so was an abuse of judicial discretion.

CONCLUSION

For the foregoing reasons, the judgment of the Fourth Judicial District Court of Utah County, State of Utah should be reversed and a new trial ordered.

RESPECTFULLY SUBMITTED this 5 day of July, 1990.

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APPENDICES

APPENDIX A

Dr. John F. Shroder's writings:

Landslides of Utah, published in the Utah Geological and Mineralogical Survey Bulletin, September 1971

Landslides of Utah, a thesis submitted to the faculty of the University of Utah in partial fulfillment of the requirements for the degree of Doctor of Philosophy, August 9, 1967

LANDSLIDES OF UTAH

by

John F. Schroder

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University of Utah, Salt Lake City, Utah

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LANDSLIDES IN UTAH

by

John F. Shroder, Jr.[1]

ABSTRACT

Approximately 600 landslides have been identified in Utah. These geologic hazards have been studied to provide information about their causes and distribution and their relation to slope exposure, climate, rock type and age. Descriptive and landform nomenclature, a simplified classification and criteria for assessing geomorphic age have been developed to facilitate work with them. Twenty-eight individual landslides and four landslide zones in which individual landslides cannot be distinguished are described in the appendix.

The primary cause of landsliding is the lithology, argillaceous sedimentary rocks which either commonly contain bentonite or which underlie massive sandstones, conglomerates or basalts. Most of the landslips have occurred in the Canyonlands section of the Colorado Plateau province because of the common occurrence there of these rock types. Cretaceous and Tertiary formations have produced the majority of movements. The largest number of landslips occurs between 6,000 and 8,000 feet. This elevation range is widespread and has steep slopes, high relief and moderate precipitation.

Approximately 83 landslips occur on each slope exposure except on the drier south- and southwest-facing slopes which have an average of 50. One-fourth of the landslides occur in areas with 12 to 16 inches of annual precipitation. The majority occur in midlatitude semiarid and humid microthermal climate zones. During the colder and wetter parts of the Pleistocene, when many of the landslips occurred, the dry climates were much reduced and landslides occurred primarily in the more humid climates.

INTRODUCTION

A landslide is a dramatic event precipitated by extremes—freeze-and-thaw, a cloudburst, an earthquake—and then the law of gravity takes over.

The stage is set, quietly, however, for this event by a series of circumstances—a combination of lithologies, accumulation of groundwater, angle and compass direction of a slope, mechanical disturbance—the raw material, so to speak for the drama to come.

The drama may ensue as a result of a series of natural events or of intervention by man. A highway-cut which removes the toe of a slide may cause the mass to move again. If a highway undercut destroys the equilibrium of an earth mass, a landslide will follow. Dam construction rearranges land and water and may start movement. Disturbing a hillside for subdivision development may create an economically disastrous situation.

Those concerned with the physical and economic development of Utah are interested in the role of landslides, past and future, in this development. Classification, description and nomenclature of slides, their sculpting of landforms, the influence of slope exposure, elevation, formation, lithology and geomorphic province, precipitation amounts and distribution, and past and present climates, are the subject of this study.

A large concentration of landslides occurs along the Wasatch Line. This zone is seismically active, and the great relief and relatively high precipitation facilitate sliding.

Landslides in Utah fall into two groups: individual landslides and landslide zones in which individual landslides cannot be distinguished. Twenty-eight individual landslides and four landslide zones throughout Utah were studied in the field. Individual landslides provided information on the processes of mass movement; the landslide zones gave an overall view of the role of mass movement in the production and modification of landforms.

The most common type of landslide studied in the field is the complex blockslide and debris-flow. Landslides known as Boars Tusk, Goslin Mountain, Thistle, York, Elbow, Green Hollow, Square Mountain, North Roundy, Dry Hollow, South Roundy and Dry Canyon, and the four landslide zones, Fish Lake Plateau, Thousand Lake Mountain, Boulder Mountain and Mount Peale, are largely of this type. The widest individual slides, South Roundy, Elbow and Goslin Mountain, average 10,000 feet in width. Montezuma Canyon landslide zone has the greatest width of all the reported landslide zones in the state (about 82 miles). Thompson Creek is at least four miles long, the longest in the state. The thickest known slide is Graveyard Flat, about 300 feet. This slide piled up in a steep-sided narrow valley. The largest volume of an individual landslide in the state

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is Thompson Creek, at least 1 billion cubic yards. The largest volume of a landslide zone is probably the Boulder Mountain landslide zone, about 18 billion cubic yards.

The main scarp of Thompson Creek is about 2,000 feet high, the largest main scarp of the individual landslides.

The formations most commonly involved in landsliding are the Chinle, Morrison, Tropic and North Horn formations, and an unnamed limestone and tuffaceous sandstone which may be equivalent to the Flagstaff Formation. Contractors would be advised to use utmost caution in construction in areas where these formations crop out.

Most of the landslides described in the appendix have been stable for a long time. Exceptions are Currant Creek, unstable and creeping slowly; Little Creek Peak, which slid within historic time because of a combination of faulting, tuffaceous sedimentary rock and heavy rains; Mount Terrel, which probably moved within historic time; Thistle, which moved at various times in the Pleistocene and Holocene; Washington Terrace, active until recently, with some minor slump and flow now in the spring. Fish Lake Plateau zone, Thousand Lake Mountain zone, and Boulder Mountain zone all have had some minor recent landsliding. These three areas are all high and remote from population concentrations.

Many old landslides could become active again if precipitation increased or if man altered ground-water or shear-strength characteristics. In general, however, the sites of old slides are stable and likely to remain so.

CLASSIFICATION OF LANDSLIDING

The terms *landslide* (American usage) and *landslip* (British usage) are usually considered synonymous and are generally applied only to the larger perceptible downslope movements of rock and earth materials. The term *landslide* should be restricted and used as little as possible because it implies a sliding movement to the exclusion of falling and flowing. Nevertheless, although *landslip* is preferable, *landslide* is so firmly entrenched in the literature and in common usage as to be virtually immutable. Both terms will therefore be used throughout this paper.

The terms *mass wasting* and *mass movement* are often used interchangeably for downslope movement of rock materials due to gravity. Savage (1968, p. 696), however, restricts the term *mass movement* to the movement of large masses as a unit (landslips) and thereby excludes mass-wasting phenomena such as creep, solifluction, talus accumulation and other imperceptible or small-scale movements of colluvial material.

Many classifications of mass wasting and mass movement have been proposed over the years (Sharpe, 1938; Varnes, 1958; Hutchinson, 1968; Savage, 1968). In general, the classifications have tended to use type of movement and type of material as their basis. The classification used herein (figure 1) is a modification of that of Varnes (1958), and all terms used herein are as defined by him with the exception of the following changes. The primary alteration is the substitution of the geological terms *debris* and *earth* for the engineering term *soil*. *Earth*, as used herein, connotes material with about 80 percent or more of fragments smaller than 2 mm in size, *debris*, about 20-80 percent of the fragments greater than 2 mm in size and the remainder less than 2 mm, and *rock* connotes 80 percent or more of the fragments more than 2 mm in size. In addition, *blockslide*, a new term, means slides involving rotational slump-block and tilt-block movements as well as planar glide-block and ridge-block movements (figure 1).

TYPE OF MOVEMENT		TYPE OF MATERIAL		
KIND	RATE	ROCK	DEBRIS	EARTH
Falls	Very rapid	Rockfall	Debris-fall	Earthfall
Slides — Few units	Slow to very rapid	Blockslide		
Slides — Many units		Rockslide	Debris-slide	Failure by lateral spreading
Flows — Dry	Slow to very rapid	Rock fragment-flow or avalanche		Sand-run; Loess-flow
Flows			Debris-avalanche	Slow and rapid earth-flow
Flows — Wet			Debris-flow	Sand- or silt-flow; Mud-flow
COMPLEX		Combinations of materials or types of movement		
UNKNOWN		Rockslip	Debris-slip	Earthslip

Figure 1. Classification of mass movement (adapted from Varnes, 1958, figure 5). The term *blockslide* means slides involving rotational movement of slump and tilt blocks and nonrotational planar movement of ridge and glide blocks. Subsidence and subaqueous movements are not included in this classification.

Application of the classification is easy as long as the type of material and type of movement are known. Difficulties arise, however, in classifying old landslips in which surficial erosion and interior weathering and cementation have subsequently obscured the original characteristics of the mass. It is commonly difficult to classify a landslip in which the original bedrock has been extensively pulverized during transport. Thus an initial rockslide could ultimately be classified as a debris-slide if much of the rock material were finely ground. In all such cases the mass is classified according to its existing characteristics regardless of possible pre-slip characteristics.

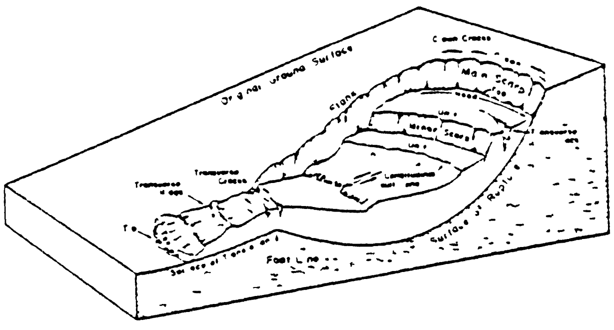

Figure 2. Anatomy of a landslide (adapted in part from Varnes 1958, plate 1-t)

DESCRIPTIVE NOMENCLATURE FOR LANDSLIDES

The nomenclature of landslides has long been informal and vague. Varnes (1958, plate 1-t) was the first to formally name and describe the parts of a landslide. His definitions follow:

Main scarp—a steep surface on the undisturbed ground around the periphery of the slide, caused by movement of slide material away from the undisturbed ground. The projection of the scarp surface under the disturbed material becomes the surface of rupture (slip surface).

Minor scarp—a steep surface on the disturbed material produced by differential movements within the sliding mass.

Head—the upper parts of the slide material along the contact between the disturbed material and the main scarp.

Top—the highest point of contact between the disturbed material and the main scarp.

Toe—the margin of disturbed material most distant from the main scarp.

Tip—the point on the toe most distant from the top of the slide.

Flank—the side of the landslide.

Crown—the material that is still in place, practically undisturbed, and adjacent to the highest parts of the main scarp.

Original ground surface—the slope that existed before the movement which is being considered took place. If this is the surface of an older landslide, that fact should be stated.

Left and right—compass directions are preferable in describing a slide, but if right and left are used they refer to the slide as viewed from the crown.

Varnes (1958, plate 1-t) originally defined the foot as the "line of intersection (sometimes buried) between the lower part of the surface of rupture and the original ground surface." H. D. Goode (personal communication) pointed out that the definition of the foot as a line is poor because the common connotation of the term would require it to apply to a definite part of the slide and not to a boundary between two parts. Consequently, I have herein changed Varnes's term *foot* to *foot line* in order to fit his definition, thus:

Foot line—The line of intersection (generally buried) between the lower part of the surface of rupture and the original ground surface.

The term *foot* should be used as an alternate for the *area of translation*.

Davis and Karzulovic (1963, p. 1404) assigned the term *crown cracks* to the fractures often found in the relatively undisturbed crown area of the slide. They also applied the term *unit* to a given portion of a landslide having a similar structure. A *block* is an individual mass which may have fractured but not separated during movement.

In addition to these terms, I herein apply the term *surface of translation* to the original ground surface

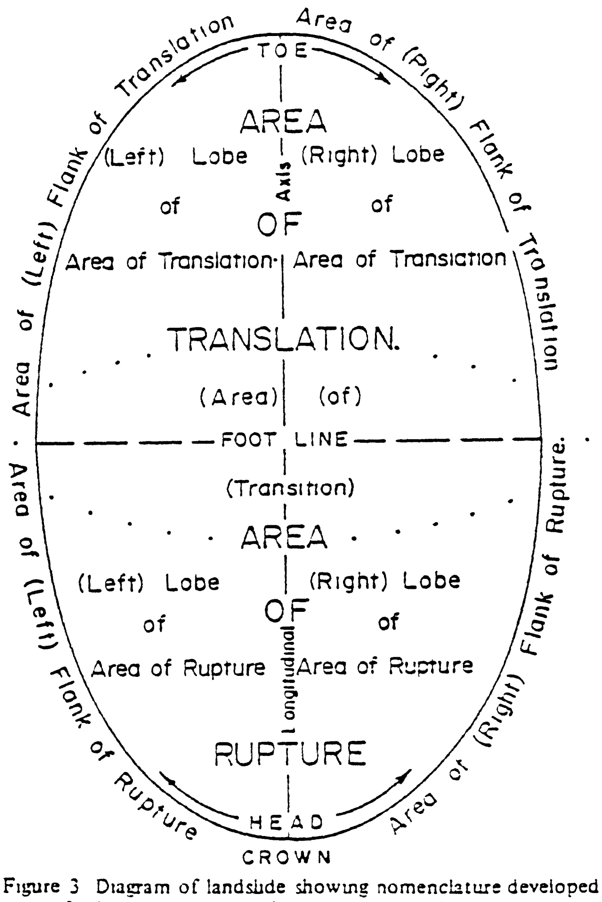

Figure 3. Diagram of landslide showing nomenclature developed to facilitate discussion of areal portions of a slide. See text for definition of terms.

Table 1. Lithologies involved in landslides in Utah.

Lithology	Individual Landslides[1]		Landslide Zones[2]		Total	Percent
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field		
Sandstone and/or conglomerate over mudstone[3] (bentonitic in part)	11		214	56	281	47
Mudstone[3] (may be bentonitic)	78	8		12	98	17
Basalt over limestone and tuffaceous sandstone	5	1		87	93	16
Carbonates	22	6		3	31	5
Conglomerate	9	1		12	22	4
Undivided volcanics (largely flow rocks)	21	2			23	4
Quartzite	18	1			19	3
Sandstone	14	6			20	2
Granite	1				1	
Tuffs, agglomerates, quartz latite, latite, quartz diorite porphyry, quartz monzonite, tillite, volcanic ash	5	2			7	2
Unknown	4				4	
Total	188	27	214	170	599	

[1] Number of landslides which involve given lithology.
[2] Miles of landslide (width of head) involving given lithology.
[3] Refers also to siltstone, claystone and shale.

below the foot line over which the slide has moved. The surface of translation and the surface of rupture together make up the slip surface. Most of the above terms are applied to the idealized landslide in figure 2.

Some designation is needed for the areas on the surface and environs of a landslide. Accordingly the following terms are herein introduced and illustrated in figure 3:

Area of rupture—The surface area of a slide which lies vertically above the surface of rupture and is bounded by the flanks, crown and projection of the foot line to the surface. If no landslide material remains above the foot line there is no area of rupture.

Area of transition—The surface of a slide which may lie partially above the surface of rupture or partially above the surface of translation or both. This term designates the vertical surface above the foot line where the nature of movement from rupture to slide, flow, fall or glide.

Area of translation (foot)—The surface area of a slide which is above the surface of translation and which is bounded by the flanks, toe and projection of the foot line upon the surface.

Areas (right and left) of flanks of rupture—The areas of original ground surface which border the slide between the foot line and the crown. Compass directions should be substituted for right and left.

Areas (right and left) of flanks of translation—The areas of original ground surface which border the slide between the foot line and the toe.

Longitudinal axis—The imaginary surficial line extending from the middle of the crown, through the center of the projection of the foot line upon the surface, to the middle of the toe.

Right and left lobes of the area of rupture—The areas bounded by the flanks of the area of rupture, the projection of the foot line upon the surface, and the crown.

Right and left lobes of the area of translation—The areas bounded by the flanks of the area of translation, the projection of the foot line upon the surface, and the toe.

In an occasional landslide it might be necessary to divide the area of transition into right and left lobes of transition above the foot and right and left lobes of transition below the foot.

NOMENCLATURE FOR LANDFORMS PRODUCED BY LANDSLIDES

Numerous landforms produced by landslips have been given formal names in the literature and will not be described further. New and useful terms, however, are listed herein (Shroder, 1968).

Landslide (landslip) block—any large mass which moves as a unit without breaking up. Landslip blocks include the *slump block* (Toreva-block of Reiche, 1937), with backward rotation in the direction of movement, the *tilt block*, with forward rotation, the *ridge block* (Watson and Wright, 1963, p. 532), with nonrotational downward and possible outward movement due to removal of underlying material, and the *glide block*, with nonrotational movement along a bedding plane or other planar surface.

Landslide (landslip) outlier—a disconnected erosional remnant of a formerly larger landslip mass.

Landslide (landslip) erratic—a boulder located apart from a landslip because of erosion of the mass from around it.

Landslide (landslip) levee—the linear ridge piled up along the flanks of a rapidly moving, commonly wet and fluid flow of debris or earth.

Landslide (landslip) col—a low pass through a ridge produced by the near junction of two back-to-back landslips.

Landslide (landslip) plateau—a plateau surrounded by and owing much of its topography to landslips which are commonly of the complex blockslide and debris-flow type. This landform commonly has a cuspate scarp and a lower *landslide (landslip) bench* (Yeend, 1966B, p. 60) surrounding it.

Landslide (landslip) blade or ridge—a residual linear ridge produced by back-to-back landsliding.

Table 2. Cenozoic formations involved in landslides in Utah.

Formation Q–Quaternary T–Tertiary TK–Cretaceous-Tertiary	Individual Landslides[1]		Landslide Zones[2]		Total
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field	
Q Gravel deposits				12.0	12.0
Q Provo Fm.	2.0				2.0
Q Bonneville Fm.	0.3				0.3
Q Alpine Fm.	0.3	1.0			1.3
T Salt Lake Group	1.3				1.3
T Sevier River Fm.	2.0				2.0
T Brian Head Fm.		1.0			1.0
T Bishop Conglomerate	4.1				4.1
T Duchesne River Fm.	1.0				1.0
T Uinta Fm.	1.0	0.5			1.5
T Green River Fm.	3.0	0.3		2.3	5.6
T Colton Fm.		0.7			0.7
T Flagstaff Fm.	5.3	1.2		3.2	9.7
TK North Horn Fm.	20.3	0.8		9.0	30.1
T Knight Fm.	1.5				1.5
T Currant Creek Fm.		0.5			0.5
T Bald Knoll Fm.	1.0				1.0
T Bullion Canyon volcanics	12.5	0.8			13.3
T Dry Hollow Fm.	4.5	0.8			5.3
T Laguna Springs latite		1.0			1.0
T Packard Quartz latite	1.0				1.0
T Quartz monzonite of Little Cottonwood stock	0.5				0.5
T Undivided volcanics	3.8	0.3			4.1
T Basalt over limestone and/or tuffaceous sandstone	5.0	1.0		87.5	93.5
Total	72.9	9.9	00.	114.0	194.3

[1]Number of landslides which involve given formation; decimals refer to division of one landslide when it involves several formations.
[2]Miles of landslide (width of head) involving given formation.

Landslide (landslip) peak—an isolated residual peak produced by landsliding all around it.

GEOMORPHIC AGE AND LANDSLIDES

In general, youthful landslips are characterized by freshness of appearance and lack of weathering, mature landslips by the blunting of features due to erosion and vegetative encroachment, and old landslips by a general removal of typical landslip landforms.

Features indicative of age are modified by variables—amount and type of precipitation, temperature changes, presence of groundwater, compass direction of slopes, degree of slope and lithology of the moving mass and of its substrate.

LITHOLOGIES INVOLVED IN LANDSLIDING IN UTAH

A compilation of the rock types involved in large-scale mass movements in Utah shows that argillaceous sedimentary rocks overlain by compact, well-indurated rocks are the chief lithologies associated with landslips (Shroder, 1970).

The greatest frequency of movement is related to a compound lithology of sandstone or conglomerate or both which overlie mudstone that is commonly bentonitic. This lithologic grouping occurs in 281 landslips: the Kayenta and Wingate over the Chinle Formation and the Dakota Sandstone and Burro Canyon Formation over the Brushy Basin Member of the Morrison Formation (table 1) are frequent combinations.

Mudstone, which may be bentonitic in places, and basalt, which overlies limestone and tuffaceous sandstone, are associated with the next two greatest frequencies, 98 and 93 landslips, respectively.

Carbonates, conglomerates, volcanic flow rocks, quartzite and sandstone follow in frequency with an average of 23 landslips apiece.

All other lithologies are associated with fewer than three landslips apiece.

FORMATIONS INVOLVED IN LANDSLIDING IN UTAH

Compilation of the formations involved in landsliding in Utah (tables 2–5) demonstrates a correlation between specific formations and landsliding.

Landslides occurring in Tertiary formations are approximately equal in number to those of the Cretaceous. The exact number depends on how the 30 landslides in the Cretaceous-Tertiary North Horn Formation are counted. If these 30 are divided equally between Cretaceous and Tertiary, then Tertiary landslides total 169 and Cretaceous 163.

The large outcrop area of Cenozoic rock in Utah (61 percent of total area) compared to the outcrop areas of all the other eras combined, greater lithologic unconsolidation than in older formations and the high stratigraphic and topographic positions in regions with greater precipitation and relief, all help to account for the high incidence of landslides in the Tertiary

The large number of landslides in the Cretaceous may be explained by the high proportion of argillaceous

Table 3. Mesozoic formations involved in landslides in Utah.

Formation K–Cretaceous J–Jurassic TR–Triassic	Individual Landslides[1] Reported in Literature	Individual Landslides[1] Investigated in Field	Landslide Zones[2] Reported in Literature	Landslide Zones[2] Investigated in Field	Total
TK Quartz diorite porphyry	2.5				2.5
K Echo Canyon Cgl.	0.5				0.5
K Henefer Fm.	1.0				1.0
K Frontier Fm.	5.2	0.2			5.4
K Aspen Fm.	0.2				0.2
K Kelvin Fm.	0.2				0.2
K Blackhawk Fm.	1.0				1.0
K Wahweap Ss. and volcanic ash	1.0				1.0
K Straight Cliff Ss.	0.5	2.0			2.5
K Tropic Fm.	18.5	4.0			22.5
K Mancos Sh.	4.5				4.5
K Mowry Sh.		0.2			0.2
K Undivided Dakota-Tropic	0.5				0.5
K Dakota Ss.	2.0	0.2	31.2	18.7	52.1
K Burro Canyon Fm.	4.5		31.2	18.7	54.4
J Brushy Basin Mbr. of Morrison Fm.	4.5		31.2	18.7	54.4
J Morrison Fm.	1.7	0.2			1.9
J Carmel Fm.	0.5				0.5
J Twin Creek Ls.	2.2				2.2
J Navajo Ss.	2.0	0.5			2.5
TR Kayenta Fm.		0.5	40.0		40.5
TR Wingate Ss.			40.0		40.0
TR Moenave Fm.		0.5			0.5
TR Chinle Fm.	6.1	0.5	40.0		46.6
TR Shinarump Cgl.	0.3				0.3
TR Ankareh Fm.	1.3	1.0			2.3
TR Thaynes Fm.	1.0				1.0
TR Moenkopi Fm.	0.2				0.2
Total	61.9	9.8	213.6	56.1	341.4

[1]Number of landslides which involve given formation; decimals refer to division of one landslide when it involves several formations.
[2]Miles of landslide (width of head) involving given formation.

sediments contained within its sections. The Mowry, Mancos and Aspen shales and the Tropic Formation all contribute to sliding within the Cretaceous, as also does the Jurassic Morrison Formation which immediately underlies the Cretaceous.

The Triassic has a large number of landslips (132), largely because of the unstable bentonitic shales and mudstones of the Chinle Formation.

The Mississippian has the highest proportion of landslips (22) among the Paleozoic rocks, largely due to the massive carbonate beds that overlie such incompetent units as the Manning Canyon Shale, undivided shale units and interbedded shales.

The Precambrian has the smallest number of landslips (28) of any era, due in part to the denseness and greater strength of the commonly metamorphosed rocks and in part to their limited outcrop area. The Red Pine Shale accounts for the largest number of landslips; the remainder of the slips are associated with faults and river undercutting.

ELEVATIONS OF LANDSLIDES IN UTAH

The relief of Utah may be divided into four zones according to altitude: 2,000-6,000 feet, 6,000-8,000 feet, 8,000-10,000 feet and 10,000 to 14,000 feet. Figure 4 and table 6 show distribution of landslides in Utah.

EXPLANATION

Figures 4, 6, 7, 8 and 9

Individual landslides

- Size not reported[1]
- Less than 1 million cubic yards[2]
- 8 — 1 million to 1 billion cubic yards[2] *Numbers correspond to landslides below*

Landslide zones

- More than 1 billion cubic yards[2]
- More than 1 billion cubic yards[2] *Long axis of ellipse indicates general orientation of zone*

Arrows indicate generalized direction of movement

[1]Reported in literature

[2]Investigated in field

Individual landslides

1. Ingham Peak landslide
2. Washington Terrace landslide complex
3. Boars Tusk landslide
4. Goslin Mountain landslide
5. South Fork landslide
6. Iron Canyon landslide
7. Albion Basin
8. Graveyard Flat landslide
9. Silver Creek landslide
10. Currant Creek landslide
11. ~~Thistle landslide~~
12. York landslide
13. Pole Canyon landslide
14. Couch Creek landslide
15. Silver Pass landslide
16. Rattlesnake Hill landslide
17. Mount Terrel landslide
18. Thompson Creek landslide
19. Elbow landslide
20. Little Creek Peak landslide
21. Green Hollow landslide
22. Square Mountain landslide
23. Johnson Mountain landslide
24. Eagle Crags landslide
25. North Roundy landslide
26. Dry Hollow landslide
27. South Roundy landslide
28. Dry Canyon landslide

Landslide zones

Fish Lake Plateau landslide zone
Thousand Lake Mountain landslide zone
Boulder Mountain landslide zone
Mount Peale landslide zone

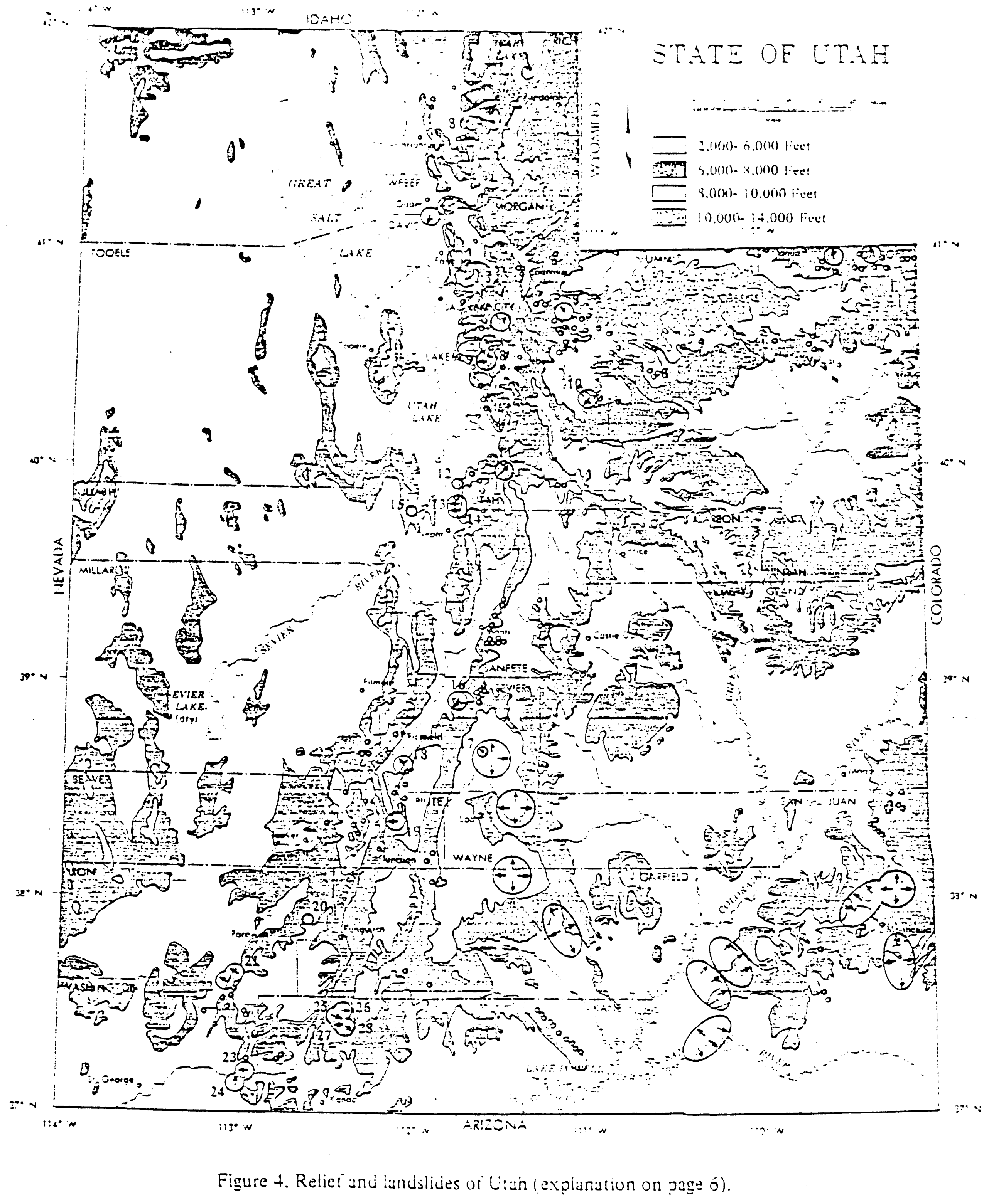

Figure 4. Relief and landslides of Utah (explanation on page 6).

Table 4. Paleozoic formations involved in landslides in Utah.

Formation ⅡP–Permian P–Pennsylvanian M–Mississippian C–Cambrian	Individual Landslides[1]		Landslide Zones		Total
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field	
ⅡP Park City Fm.	0.7				0.7
ⅡP P Oquirrh Fm.	2.3	.03			2.6
P Weber Fm	0.3				0.3
P Morgan Fm.					
P Round Valley Ls.	0.3				0.3
M Brazer Ls.	2.3	0.5			2.8
PM Manning Canyon Sh.	2.3	0.3			2.6
M Doughnut Fm.	0.8	1.0			1.8
M Great Blue Ls.	1.8	0.3			2.1
M Humbug Fm.	2.2				2.2
M Deseret Ls.		0.5			0.5
M Madison Ls.	1.5	0.5			2.0
M Gardison Ls.	1.5	1.5			3.0
M Undivided black shale	5.2				5.2
C Maxfield Ls.		1.0			1.0
C Ophir Fm.	3.0				3.0
C Tintic Quartzite	1.5				1.5
Total	25.7	5.9	00.0	00.0	31.6

[1]Number of landslides which involve given formation; decimals refer to division of one landslide when it involves several formations.

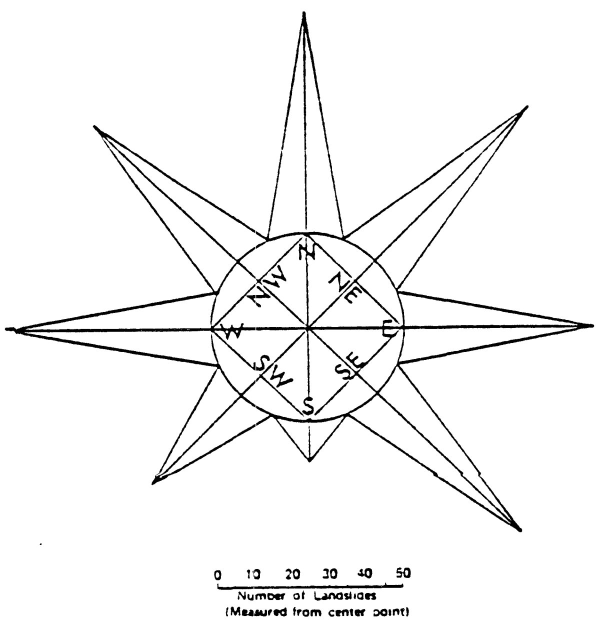

Figure 5. Rose diagram illustrating relative numbers of slope exposures of landslides in Utah. This shows graphically the paucity of landslides with a slope exposure facing to the south or southwest.

The zone at 6,000-8,000 feet contains the largest number of landslips. This is largely because the zones between 4,000 and 8,000 feet represent the largest area in the state, and because the area below 6,000 feet is largely a zone of gentle slopes and moderate relief. The zone at 6,000-8,000 feet not only covers a large area but it is mountainous, with the steep slopes of landslide-prone terrain.

SLOPE EXPOSURE OF LANDSLIDES IN UTAH

Maps and field measurements of both reported and investigated landslips and landslip zones reveal a distinct pattern in slope exposures of known large-scale mass movements in Utah (Shroder, 1969, 1970). Compass bearings of the landslips were grouped in eight zones, each one 45° wide and distributed symmetrically on either side (22° 30' per side) of the four cardinal points and four lesser points of the compass.

The slopes facing west, northwest, north, northeast, east and southeast share a similar frequency of landslips, approximately 83 each (figure 5, table 7). The slopes facing to the south and southwest have 38 and 61 landslips respectively.

Frequency of landsliding is partly controlled by slope wetness. The paucity of slips on the south and southwest is therefore probably the result of partial drying of those slopes which face the sun.

PRECIPITATION AND LANDSLIDE AREAS IN UTAH

One-fourth of the landslips in Utah occur in areas with annual precipitation between 12 and 16 inches (figure 6, table 8). This widespread occurrence of landslips in relatively dry situations contradicts the high correlation to be expected between sliding and precipitation. This contradiction can be explained by the fact that many of the landslides must have occurred in intervals in the late Pleistocene when temperatures averaged 10° to 15° F lower and the annual precipitation averaged 10 inches higher than those which now prevail (Schumm, 1965, p. 786).

Large amounts of precipitation favor landsliding for the following reasons (in part after Terzaghi, 1950, p. 91, and Varnes, 1958, p. 43-45):

(1) Water which enters voids in earth increases the unit weight of the material. The component of this weight in the slope direction may exceed the shear strength of the material, producing failure.

(2) Water may dissolve a soluble cement and reduce cohesion, reducing shear strength.

(3) Water entering ground may cause an increase of pore water pressure with a resulting decrease in shear resistance

(4) Water may freeze and thaw repeatedly, fracturing and weathering material to reduce shear strength.

(5) Water may cause hydration of clay minerals in which swelling and loss of cohesion results from absorption of water by the minerals.

(6) Water may cause saturation which will destroy intergranular pressure which results from capillary tension.

(7) Percolating groundwater may cause seepage pressures resulting from viscous drag between water and solid grains.

CLIMATE AND LANDSLIDES IN UTAH

Most landslips in Utah are of Late Pleistocene and Holocene age. This age distribution implies wide temporal climatic variability, ranging from cold and wet to warm and dry. Figure 7 is a climatic map on which landslips are plotted to show relationships between Pleistocene climate and mass movements.

Figure 8 and table 9 show landslips relative to the present climates of Utah. The climate base map was made by Burnham (1950), who used the Koeppen scheme of climate classification as modified by Trewartha (1954).

Schumm (1965, p. 786) estimated that during times of glaciation the nonglaciated regions of the southwest were 10° to 15° F cooler and the annual precipitation was about 10 inches more than at present. I took the temperature and precipitation figures for the 27 Utah stations that Burnham (1950) used and applied a 10° F temperature reduction and a 10-inch precipitation increase to them to obtain hypothetical figures for the glacial part of the Pleistocene (figure 7). I then applied these figures to formulae or to nomographs to obtain the new desert-steppe and steppe-humid boundaries. The maximum distribution of glaciers and of Lake Bonneville was also plotted. This map is, of course, based on many unprovable assumptions and is only a generalization because the maximum extent of glaciers, pluvial lakes and cool, wet climate zones may not have occurred simultaneously.

Landslips in Utah occur today primarily in humid cool summer and cool short summer and middle latitude steppe climate zones (figure 8). The cool summer climate zone has the highest proportion (224). During the glacial portions of the Pleistocene, the dry climates were greatly reduced in areal extent and landsliding occurred primarily within the humid climates (352 landslips) (table 10).

Occurrence of a large proportion of landslides in past or present D climate zones is probably a reflection of the influence of moderate to high precipitation and freeze and thaw in this zone. D climates here are largely a function of altitude and are therefore mountain climates.

Table 5. Precambrian and unknown formations involved in landslides in Utah

Formation	Individual Landslides[1]		Landslide Zones		Total
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field	
Red Pine shale	8.0				8.0
Mutual quartzite	2.5				2.5
"Buff" quartzite	2.5				2.5
Mineral Fork tillite	0.5				0.5
Red Creek quartzite	3.0				3.0
Uinta Mountain grp.	7.0	1.0			8.0
Harrison Fm.		1.0			1.0
Undivided Precambrian	2.0				2.0
Unknown	1.0				1.0
Total	26.5	2.0	00.0	00.0	28.5

[1] Number of landslides which involve given formation; decimals refer to division of a landslide when it involves several formations.

Table 6. Generalized elevations of landslides in Utah.

Elevation in feet	Individual Landslides[1]		Landslide Zones[2]		Total	Percent
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field		
12,000-14,000						
10,000-12,000	10			61	71	10
8,000-10,000	60	9		53	122	21
6,000-8,000	95	15	63	56	229	39
4,000-6,000	22	4	150		176	30
2,000-4,000						
Total	187	28	213	170	598	

[1] Number of landslides given elevation.
[2] Miles of landslide (width of head) within given elevation.

PRIMARY CAUSES OF LANDSLIDING IN UTAH

Sharpe (1938, p. 84) proposed two primary groups of causes of landslides. *Basic* or *passive* conditions favor-

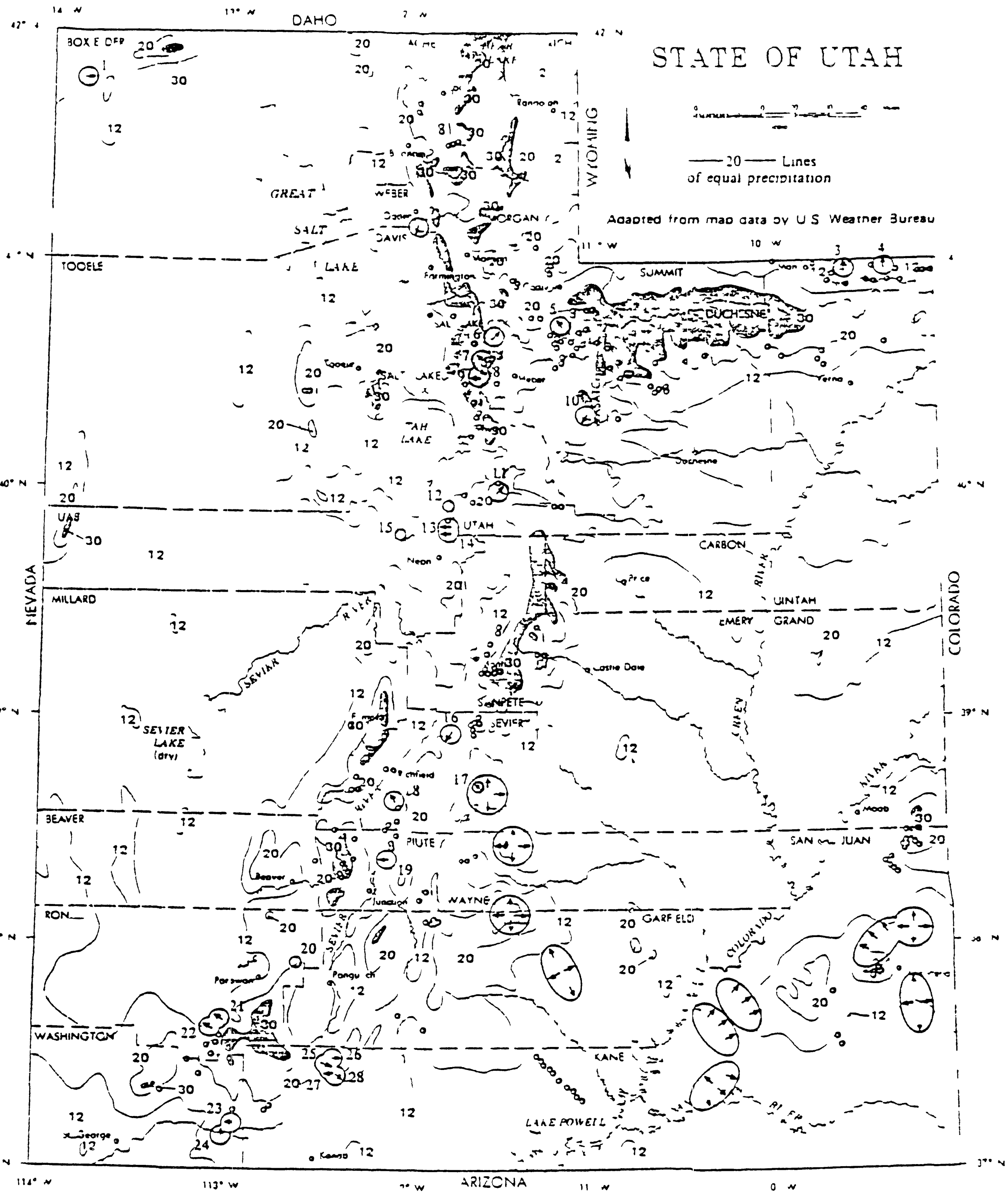

Figure 6 Average annual precipitation (1931-1960) and landslides of Utah (explanation on page 6)

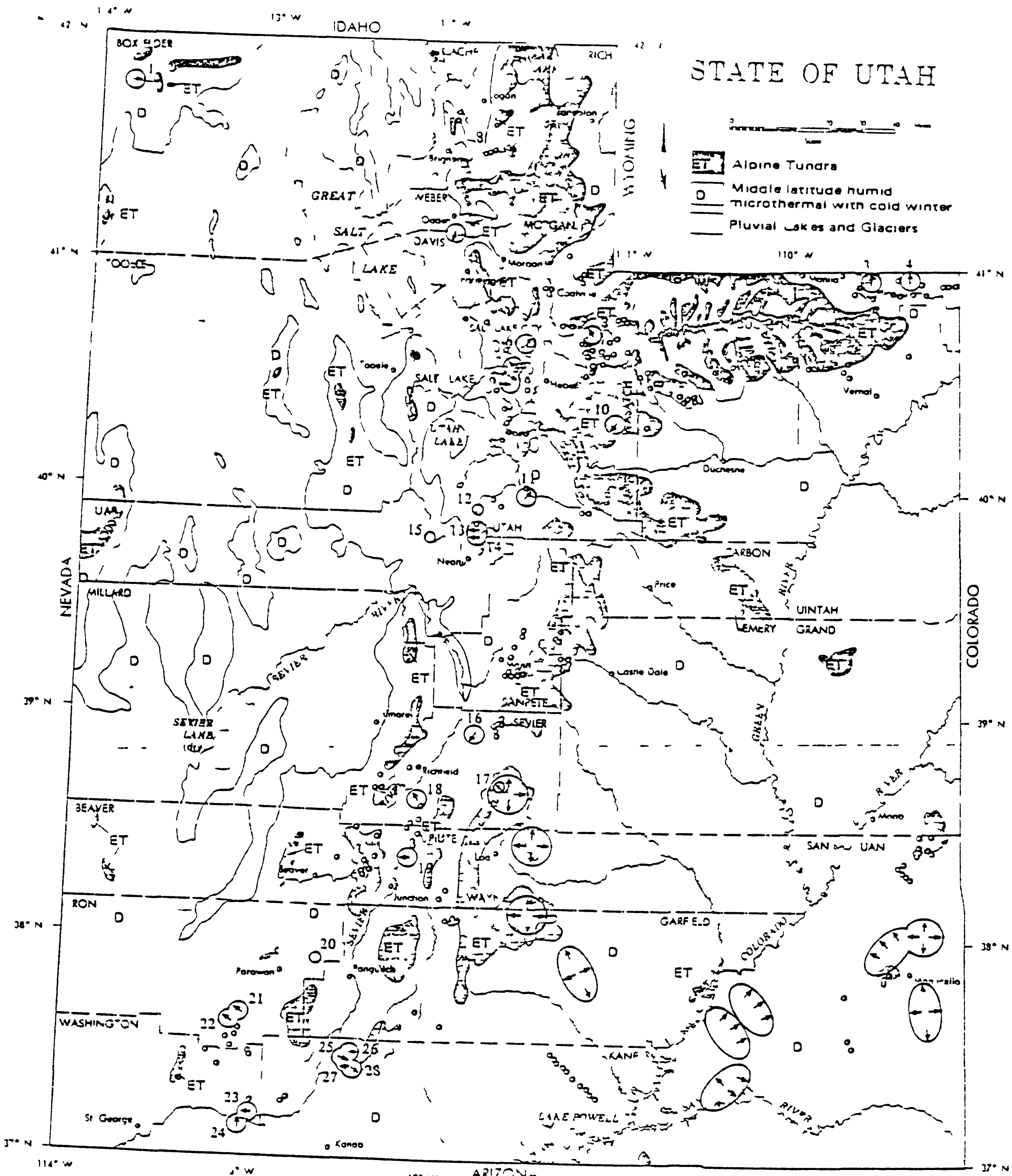

Figure 7. Pleistocene glacial climates and landslides of Utah (explanation on page 6)

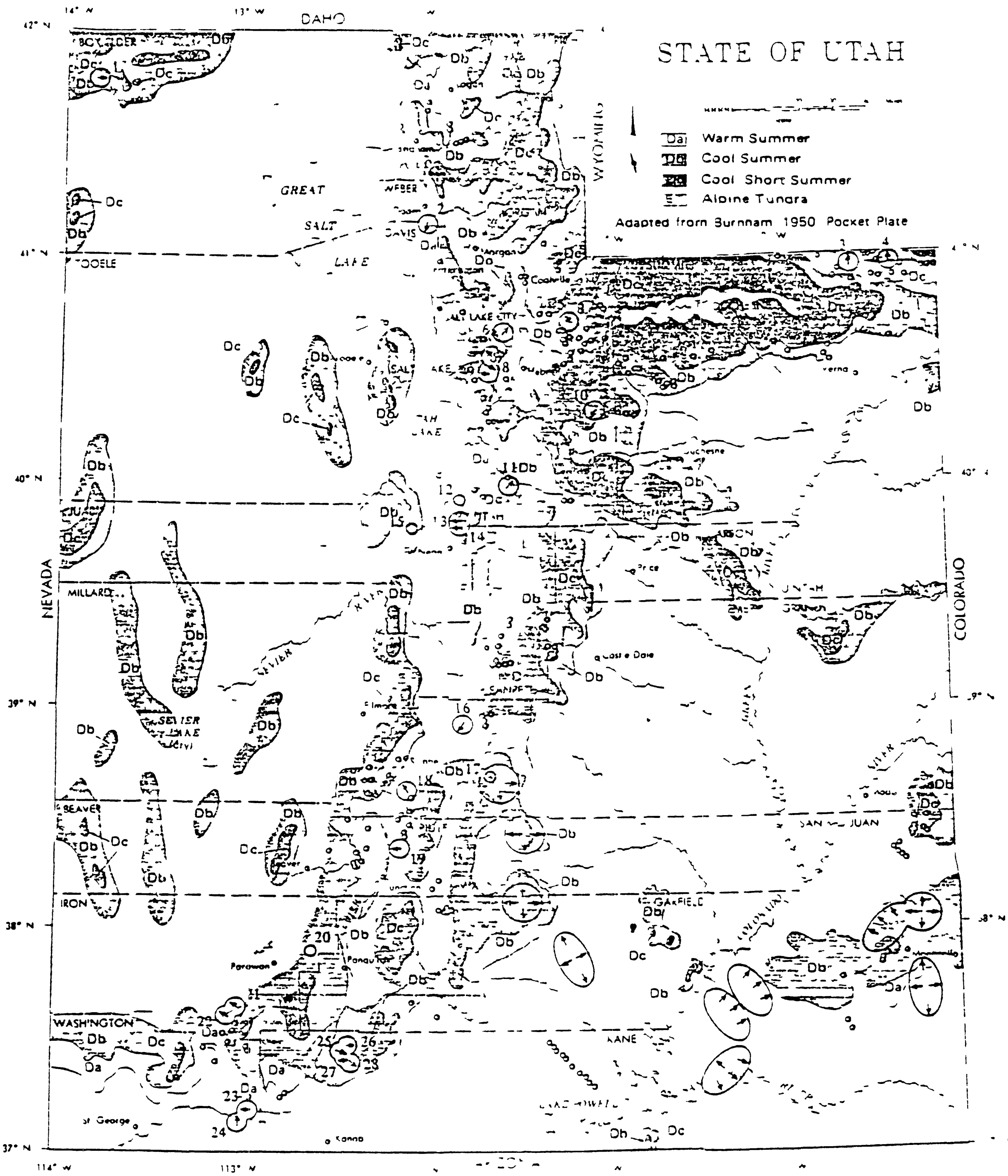

Figure 8. Present climate regions and landslides of Utah (explanation on page 6).

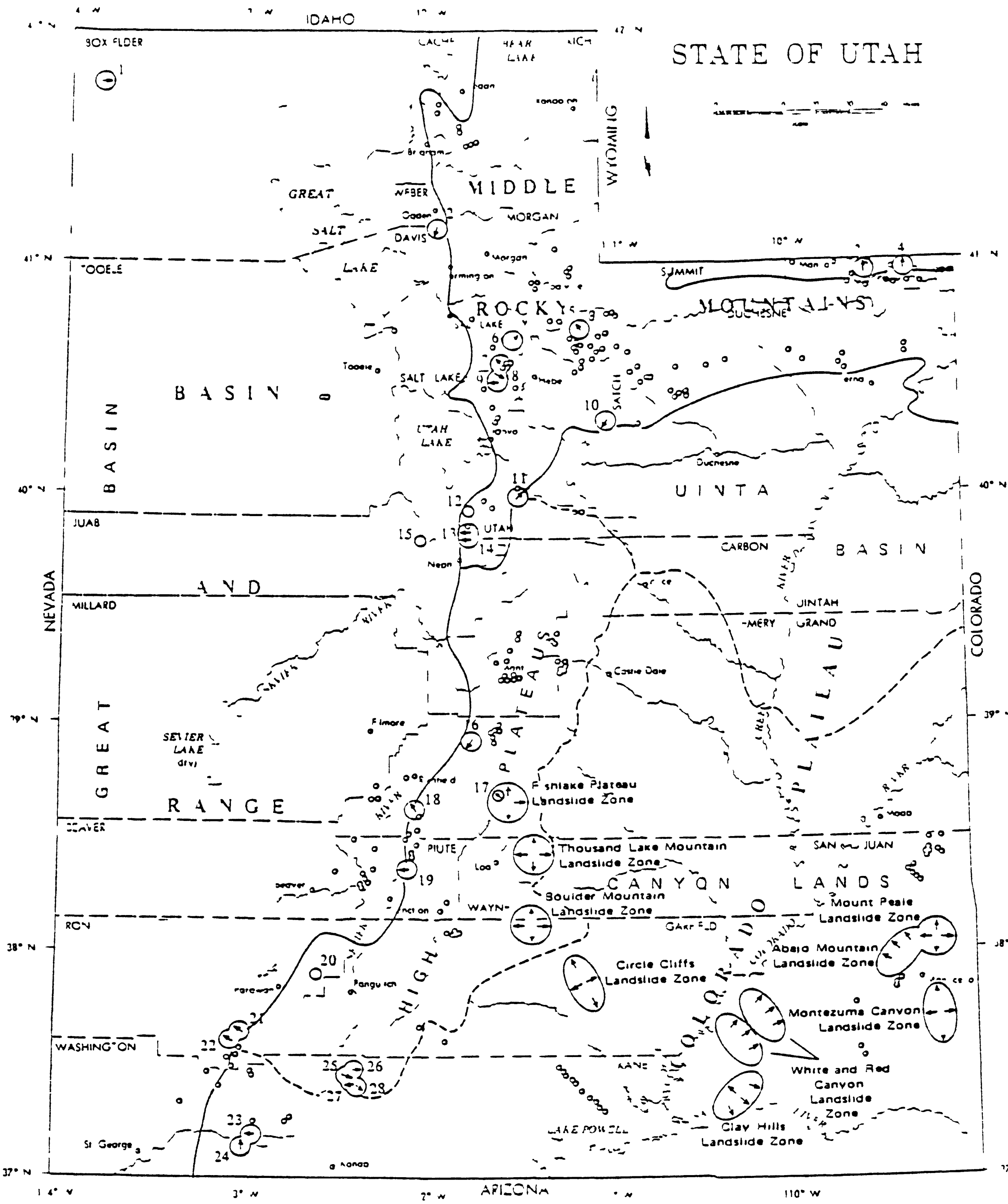

Figure 9 Geomorphic provinces and landslides of Utah (explanation on page 6)

Table 7. Slope exposure of landslides in Utah.

Slope Exposure	Individual Landslides[1]		Landslide Zones[2]		Total	Percent
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field		
North	41	4	15	28	88	14.6
Northeast	22	2	35	27	86	14.4
East	18	2	20	38	78	13.0
Southeast	15	4	58	5	82	13.7
South	19	1	9	8	37	6.4
Southwest	21	3	19	17	60	10.1
West	30	10	18	25	83	14.1
Northwest	20	1	40	21	82	13.7
Total	186	27	214	169	596	

[1] Number of landslides with given slope exposure; decimals refer to division of one landslide when it involves more than one slope exposure.
[2] Miles of slope exposure measured at head of landslide zone.

ing landslips are lithologic (presence of weak formations), stratigraphic, structural, topographic (steep slopes), and organic (lack of vegetation). *Active* or *initiating* causes are removal of support, overloading, reduction of friction, reduction of cohesion, earth tremors, prying or wedging action, production of oversteep constructional slopes, and earth strains produced by natural agencies such as tidal pull.

The most common passive cause is stratigraphic. Two hundred and eighty-one landslips resulted from sandstone or conglomerate or both overlying mudstone which may be bentonitic, and 93 landslips result from basalt which overlies limestone or tuffaceous sandstone or both.

The next most common basic cause is lithologic, with 109 landslips in an argillaceous lithology and 14 in bentonitic mudstone or sandstone.

Structural causes are fault zones (22 landslips) and dip in slope direction (10 landslips).

Active or initiating causes known or assumed to have had influence are river undercutting or spring sapping (11 landslips), glacially oversteepened cliff (1 landslip) and known heavy rain (1 landslip).

On a regional basis, if the distribution of landslides is compared to precipitation, climate, elevation and lithology, some generalizations emerge. It is obvious that landslips are more common in areas of high precipitation (figure 6), but it is impossible to determine whether high precipitation initiated any individual landslip.

GEOMORPHIC PROVINCES OF LANDSLIDES IN UTAH

The greatest proportion of landslides in Utah occurs in the Canyonlands section of the Colorado Plateau province (figure 9, table 12). This is largely a result of the occurrence of massive cliff-forming sandstones which overlie incompetent mudstones in this area. The most common form of landslip here is rockfall from the numerous cliffs.

The second highest proportion of landslides occurs in the High Plateaus section of the Colorado Plateau province. Landsliding here is largely in massive basalt, limestone and sandstone overlying incompetent units, commonly the North Horn or Flagstaff (?) Formation. Landslips in this zone are largely complex landslide blocks and debris-flows.

The Middle Rocky Mountains province contains the third highest proportion of landslips which, in this region, are largely rockslides, rockfalls, and some complex blockslides and debris-flows.

The Great Basin, with its low precipitation and generally competent rocks, has had few landslides. Mudflows and debris-flows are the most common types of mass movement here.

No landslides have been reported from the Uinta Basin. Several have been reported, however, in the Green River Formation there, and many have occurred in the Book Cliffs just across the Utah-Colorado border, suggesting that there may be some in Utah.

Table 8. Present annual precipitation rates on landslides of Utah.

Precipitation	Individual Landslides[1]		Landslide Zones[2]		Total	Percent
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field		
50–60		1			1	.2
40–50	6	2			8	1.3
35–40	7				7	1.2
30–35	18	2			20	3.2
25–30	28	1		57	86	14.2
20–25	40	2		57	99	16.5
16–20	42	15			57	9.5
12–16	30	5	53	56	144	24.5
10–12	6		61		67	11.2
8–10	10		81		91	15.2
6–8			18		18	3.0
0–6						
Total	187	28	213	170	598	

[1] Number of landslides within given precipitation zone.
[2] Miles of landslide (width of head) in given precipitation zone.

Table 9 Location of landslides of Utah relative to present climatic zones

Climatic Zone	Individual Landslides[1]		Landslide Zones[2]		Total	Percent
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field		
Dry						
Middle Latitude Steppe	29	2	105		136	22 7
Low Latitude Steppe		2			2	3
Middle Latitude Desert	1		44		45	7.5
Low Latitude Desert			12		12	2
Humid Micro-thermal						
Warm Summer	6	2	41		49	8.2
Cool Summer	83	16	12	113	224	37 4
Cool, Short Summer	68	6		57	131	21 9
Alpine Tundra						
Total	187	28	214	170	599	

[1] Number of landslides with given climate
[2] Miles of landslide (width of head) involving given climate.

Table 10 Location of landslides of Utah relative to proposed climatic zones of Pleistocene glacial time.

Climatic Zone	Individual Landslides[1]		Landslide Zones[2]		Total
	Reported in Literature	Investigated in Field	Reported in Literature	Investigated in Field	
Dry	1		45		46
Humid Micro-thermal	110	21	165	56	352
Alpine Tundra (ET)	56	3		115	174
Unknown (landslides within glacial or pluvial lake zones)	21	5			26
Total	188	29	210	171	598

[1] Number of landslides within given climate
[2] Miles of landslide (width of head) involving given climate

Figure 10. View of the Ingham Peak landslide from the summit of Ingham Peak. The rather vague lateral extent of the slide is indicated by white dots. Several small slumps (small arrows) are located in the foreground of the picture. The large arrow points to a landslide levee which occurs along the north flank of the slide.

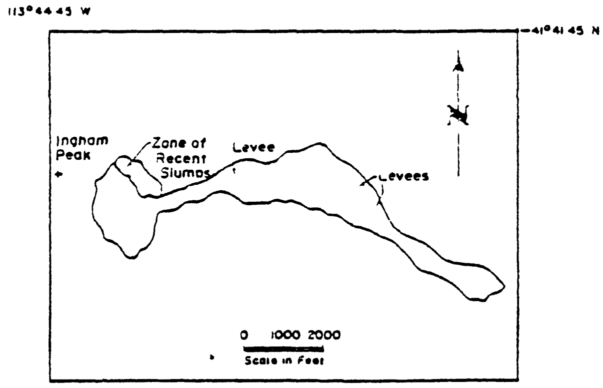

Figure 11 Outline map of Ingham Peak landslide. Scale and direction indicated by north arrow were derived from measurements of aerial photographs and are therefore approximate

Figure 12. View of typical landslide topography of Washington Terrace landslide complex. Photograph courtesy H. D Goode

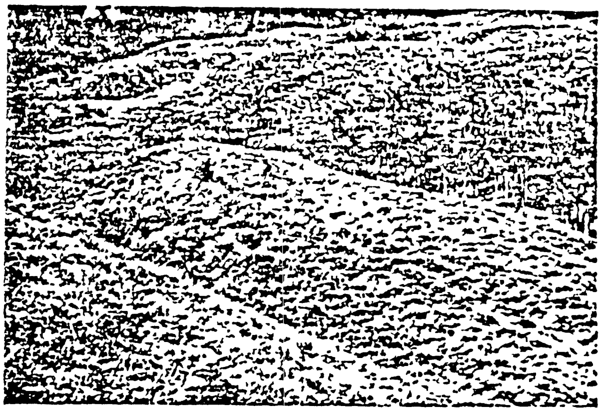

Figure 33. Large landslide levee on the south flank of the Currant Creek landslide. The view is northwest from the slopes west of Red Ledge towards the toe of the landslide.

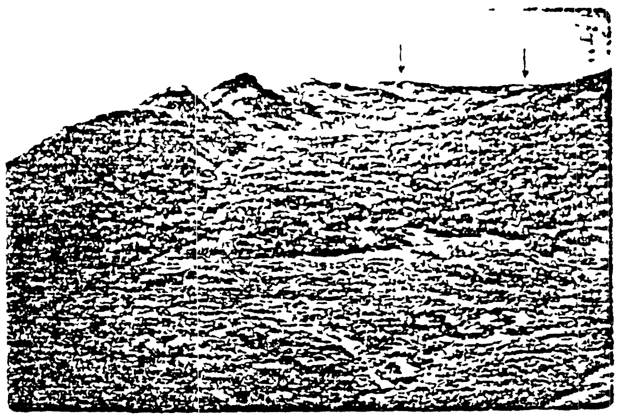

Figure 35. Middle and upper portions of the Thistle landslide. The largest and oldest of the several slides (1 on figure 36) here passes out of the picture to the left. The toe of the next larger and older slide (2) is marked by the prominent vegetation change from sagebrush to scrub oak in the middle distance. Slump block related to the first or second debris-flow, or both, is seen in the right foreground (3). The arrow points to historic slumps and flows in the head region (4).

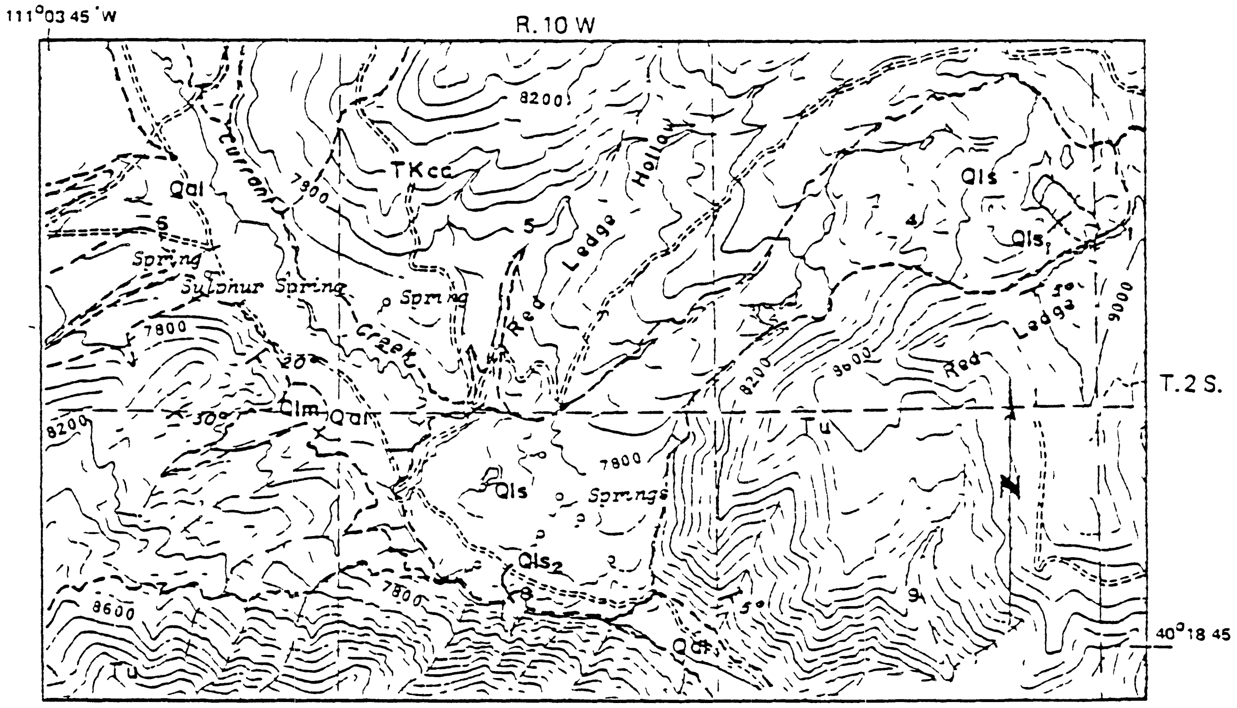

Figure 34. Geologic map of Currant Creek landslide (geology mostly from Garvin, 1967).

Qal	–	Quaternary alluvium
Qls_1	–	Quaternary debris-slide No. 1
Qls_2	–	Quaternary debris-slide No. 2
Qls	–	Quaternary landslide (slump and debris-flow)
Qlm	–	Quaternary mudflow
Tu	–	Tertiary Uinta (?) Formation
TKcc	–	Tertiary and/or Cretaceous Currant Creek Formation

Vegetation: sagebrush and aspen on lower flowed portion, scrub oak, willows and conifers on upper slumped portion.

Geologic setting: conglomerate and bentonitic sandstone of the Currant Creek Formation of Cretaceous and Paleocene age, and conglomerate, sandstone and shale of the Uinta (?) Formation of Eocene age, all of which dip gently to the south.

Causes: bentonitic sandstone in the Currant Creek Formation became saturated and very unstable.

Correlation: fresh uneroded aspect indicates a definite post-Wisconsin age; tree rings indicate the slide is more than 311 years old.

Geomorphic age: late youth, based on hummocky topography, partially filled surface ponds, fairly recent draining of landslide-dammed lake and development of meanders in subsequent lacustrine plain, rejuvenation in some areas is indicated by creep phenomena such as fresh cracks and recently tilted trees.

This landslide has a number of distinctive features which set it apart from many other landslides in Utah. Its relative recency and large size have allowed preservation of many landforms which usually are swiftly eroded away. For example, striking landslide levees occur all along the flanks of the slide; their presence attests to the fluidity of the moving mass and their large size to its high speed. Two subsidiary debris-slides occurred, one from the crown caused by oversteepening by the original slide, and one at the toe caused by undercutting of the opposite side of the valley by Currant Creek.

THISTLE LANDSLIDE
(figures 35-37)

Previous work: map, Metter, 1955; description, Rigby, 1962; map, Hintze, 1962.

Type: complex slump and debris-flow.

Dimensions: width, 4,000 ft at head, 1,000 ft in middle, 900 ft at toe; length, 8,000 ft; thickness, 50 ft; volume, 25 million cubic yards.

Elevation: crown, 6,800 ft; head, 6,500 ft; toe, 5,100 ft.

Rate of movement: very rapid to slow.

Slope exposure: northeast.

Vegetation: sagebrush and scrub oak.

Geologic setting: conglomerate, sandstone and red shale of the North Horn Formation of Cretaceous-Tertiary age, which is overlain by Tertiary limestone, shale and sandstone of the Flagstaff Formation and conglomerate and red beds of the Colton Formation, also of Tertiary age.

Causes: poorly consolidated, argillaceous nature of the North Horn Formation.

Correlation: numerous slides have occurred, dating from late Pleistocene until very recently.

Geomorphic age: early youth to maturity, as shown by successively younger slides headward.

This slide well illustrates repetitive or retrogressive movement. Continued instability in the head region is maintained by the formation of the main scarp after each episode of movement. Subsequent triggering effects produce successive landslides, each shorter and smaller than the preceding because of the reduction in slope and available unstable material.

YORK LANDSLIDE
(figures 38, 39)

Previous work: map, Eardley, 1934; map and description, Foutz, 1960.

Type: debris-flow.

Dimensions: width, 1,980 ft at head, 300 ft at narrowest point below foot line, 2,600 ft at toe; length, 6,280 ft from toe to head; thickness, 60 ft; volume, 200,000 cubic yards.

Elevation: crown, 6,200 ft; head, 5,900 ft; toe, 5,000 ft.

Rate of movement: rapid.

Slope exposure: west.

Vegetation: sagebrush, juniper and scrub oak.

Geologic setting: conglomerate and sandstone of Price River-North Horn Formation of Cretaceous-Tertiary age and Flagstaff Limestone of Tertiary age, which unconformably overlie Paleozoic carbonate and detrital rocks.

Causes: poorly consolidated and argillaceous nature of Price River-North Horn Formation and presence of possible earthquake-prone fault along mountain front.

Correlation: late Pleistocene or Holocene.

Geomorphic age: middle maturity, based on eroded remnant of landslide levees, dissection, lack of undrained depressions, and integrated drainage.

POLE CANYON LANDSLIDE
(figures 40, 41)

Previous work: map, Hintze, 1962.

Type: probably complex rockslide and debris-slide but best called debris-slip because type of original material and movement are obscure.

Dimensions: width, 3,700 ft; length, 3,000 ft; thickness, 100 ft; volume, 43 million cubic yards.

Elevation: crown, 7,400 ft; head, 6,600 ft; toe, 5,800 ft.

Rate of movement: probably rapid.

Slope exposure: west.

Vegetation: sagebrush, scrub oak and juniper.

Geologic setting: Gardison Limestone of Mississippian age outcrop in the prominent Wasatch fault scarp.

Causes: steep slopes and possible earthquakes, both produced by the Wasatch fault.

Correlation: middle or late Pleistocene, based on thick caliche horizon.

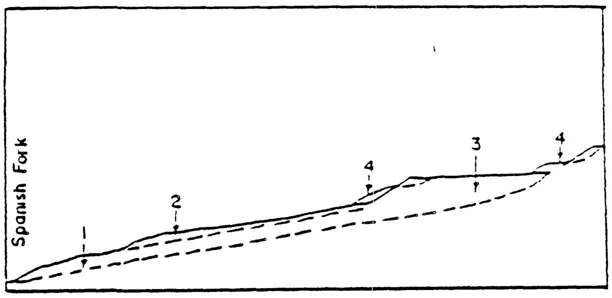

Figure 36. Schematic cross section of ~~Thistle~~ landslide drawn nearly to scale. 1—first debris-flow, 2—second debris-flow, 3—slump block related to either first or second debris-flow, or both, 4—mudflows and debris-flows of historic age. Refer to figure 35 for locations of these features.

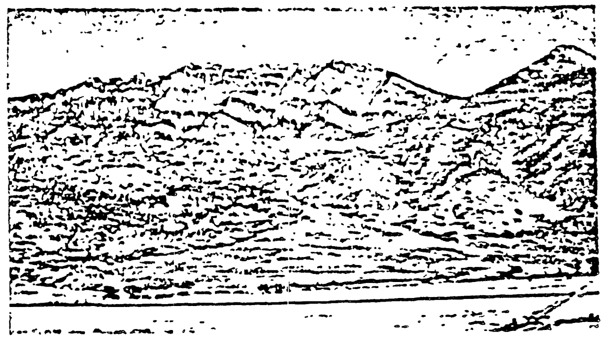

Figure 38. York landslide from the opposite side of Juab Valley. White dots indicate lower limits of slide.

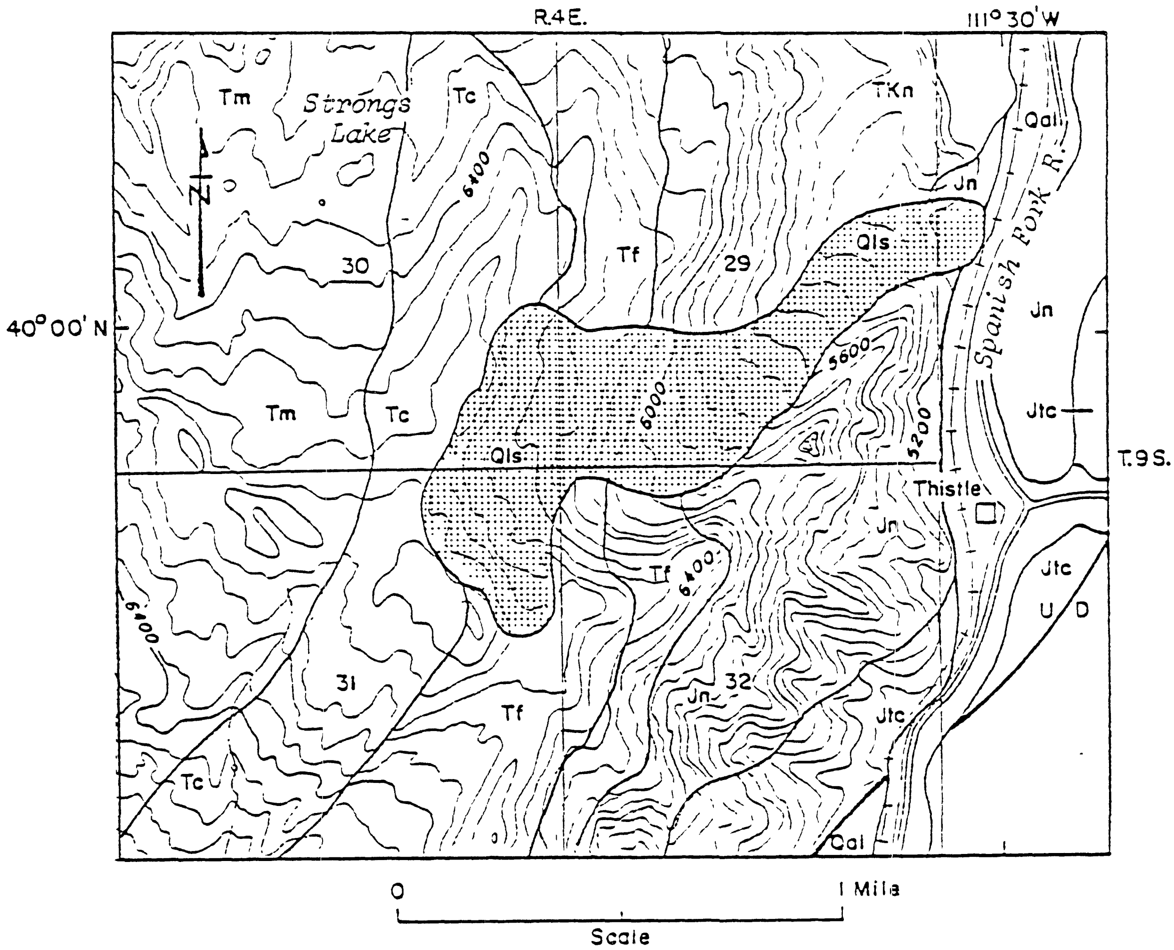

Figure 37. Geologic map of ~~Thistle~~ landslide (adapted from Hintze, 1962).

Qal	– Quaternary alluvium	Tf	– Tertiary Flagstaff Formation
Qls	– Quaternary landslide	Tkn	– Cretaceous and Tertiary North Horn Formation
Tm	– Tertiary Moroni Formation	Jn	– Jurassic Nugget Sandstone
Tc	– Tertiary Colton Formation	Jtc	– Jurassic Twin Creek Limestone

LANDSLIDES OF UTAH

by

~~John Ford Shroder, Jr.~~

A thesis submitted to the faculty
of the University of Utah in partial
fulfillment of the requirements for
the degree of

Doctor of Philosophy

Department of Geology

August 9, 1967

University of Utah

This Thesis for the

Doctor of Philosophy Degree

by

John Ford Shroder, Jr.

has been approved

June 9, 1967

Chairman, Supervisory Committee

Reader, Supervisory Committee

Reader, Supervisory Committee

Reader, Supervisory Committee

Reader, Supervisory Committee

Head, Major Department

Dean, Graduate School

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ABSTRACT

Landslides in Utah are of two types; individual landslides and landslide zones. Two hundred and fifteen individual landslides and 384 miles of landslide zone have been mapped in Utah. One mile of landslide zone is about equivalent to the average width of one individual landslide, and therefore we can say that about 600 landslides have been mapped in Utah. Field study involved 28 individual landslides and 170 miles of landslide zone. A literature search provided an additional 187 individual landslides and 214 miles of landslide zone. The data concerning those landslides which were investigated in the field are in Appendix I, and the literature sources of the reported landslides are in Appendix II. Each of the landslides studied in the field has a name, and also a number which is keyed to plates 1-5 for ease of location.

Landslides produce a variety of distinctive landforms which are herein given names. The landslide alcove is the cirque-like feature produced by landsliding. The landslide mesa is the landform produced by slumping and flowing all around a highland of flat-lying rocks. The landslide blade is the knife-edge ridge produced by landslides.

working headward in linear patterns. The landslide peak is the residual hill produced by landsliding all around it. A landslide col is the narrow neck of land connecting two larger and higher landmasses on either side of two back-to-back landslides. A landslide outlier is an isolated remnant of a formerly more widespread landslide mass. A landslide erratic is a single boulder located apart from the main landslide mass due to erosion of the main mass from around it. A tilt block is a landslide block which has tilted forward in its direction of motion. A landslide levee is the linear ridge thrown up along the edges of a rapidly moving, wet landslide mass.

Landslides pass through a cycle of geomorphic aging from youth, through maturity, to old age. These terms are formally applied to landslides and criteria for the recognition of each stage and substage are given. In general, youth is characterized by its freshness of appearance or lack of weathering, maturity by the muting of features due to erosive or vegetative encroachment, and old age by a general obscuration or removal of any typical landslide landforms.

Landslides in Utah are evenly distributed with regards to slope exposure with the exception of the south and southwest octants, which are deficient in number of slides. This is a direct result of the drying effect of the sun's rays.

The Tertiary and Cretaceous rocks have the most landslides. The North Horn Formation of Cretaceous-Tertiary age, the Tropic Formation of Cretaceous age, the Brushy Basin Member of the Morrison Formation of Jurassic age, and the Chinle Formation of Triassic age are the chief units involved in landsliding.

The highest number of slides is related to a compound lithology of sandstone or conglomerate or both, which overlie mudstone which is often bentonitic. Argillaceous sediments, and basalt overlying argillaceous sediments are the next two most frequent lithologies involved in sliding. The argillaceous sedimentary rocks are also the primary causes of sliding.

Landslides in Utah are found primarily in the Db, Dc, and BSk climate zones of today. New climate interpretations by other workers have allowed the application of an average estimated 10-inch increase in precipitation and a 10°-F reduction in temperature for the Pleistocene glacial stages. These figures have been applied to the present climate-zone boundaries in order to produce a generalized climate-zone map for the glacial part of the Pleistocene. During the Pleistocene glacials landsliding occurred primarily within the D climate zones.

The maximum number of landslides is found in the zones of 12-20 inches of annual precipitation, and from

6,000-8,000 feet in elevation. This is a zone where the combination of relief, steep slopes, extensive area, and moderate precipitation brings about the high frequency of slides.

The Colorado Plateau province has the highest number of landslides due to relatively high precipitation in places and incompetent rocks. The Basin and Range province has the lowest number of landslides due to relatively low precipitation and generally competent rocks. The Middle Rocky Mountains province has an intermediate amount of landslides.

The most common type of landslide investigated in the field is the complex slump and debrisflow. Eleven of the 28 individual slides and all four of the landslide zones are largely of this type. Three individual slides have an extreme width of 10,000 feet. One landslide zone studied in the field has an extreme width of about 64 miles but one of the reported landslide zones has an extreme width of 82 miles. One individual slide is about four miles long, making it the longest in the state. The thickest known slide is 300 feet thick. The largest volume of individual landslide studied is 1 billion cubic yards. The largest volume of landslide zone studied is about 18 billion cubic yards. The total volume of individual slides and landslide zones investigated in the field is about 33 billion cubic yards. The estimated total volume of individual slides and landslide zones reported in the literature is about 58 billion cubic yards. The highest main scarp of the individual landslides studied in the field is about 2,000 feet in height.

From an engineering point of view, the Chinle, Morrison, Tropic, and North Horn Formations, and an unnamed limestone and tuffaceous sandstone which may be equivalent to the Flagstaff Formation, are the ~~units most to avoid in construction:~~ Currant Creek landslide #10, Little Creek Peak slide #20, Mount Terrel slide #17, ~~Thistle slide #11~~, Washington Terrace slide #2, Fish Lake Plateau landslide zone #29, Thousand Lake Mountain zone #30, and Boulder Mountain zone #31 have all had some recent movement. ~~Cau-tion is~~ advised in construction in or near these areas.

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INTRODUCTION

General Statement

Landslides in Utah are of two types; individual landslides and landslide zones. Most of the naturally occurring landslides of Utah have been investigated for this report, in part by field research and in part by compilation of facts from the literature. The data concerning those landslides which were investigated in the field are in Appendix I, and the literature sources of the reported landslides are in Appendix II. Each of the landslides studied in the field has a name, and also a number which is keyed to plates 1-5 for ease of location.

I began a study of the landslides in Utah primarily because I wished to learn about the role of landsliding in the sculpting of landforms. Secondary, but equally important reasons for the study included a desire to know more about: (1) classification of landslides; (2) the relation of landsliding to slope exposure; (3) the frequency of landsliding relative to the formation involved; (4) the frequency of landsliding relative to the lithology involved; (5) the major causes of landsliding; (6) the relation of landslides to past and present climates in the state; (7) the relation of landsliding to precipitation amounts and distribution; (8) the relation of landsliding to elevation; and (9) the relation of landsliding to geomorphic province.

I did not attempt to relate landslide frequency to faults or to areas of active seismicity. There is probably a relation but it is difficult to assess. I can only say that there is a high concentration of landslides along the Wasatch Line. This zone has many faults and is seismically active but it also has great relief and high precipitation which facilitate sliding.

Research Methods

Landslides suitable for field research were found in large part by searching the literature and by communication with other workers, but several were found by driving through and walking over likely areas. During the first field summer I studied only the most recent landslides in order to gain a clear understanding of typical landslide features. Older landslides were investigated during the second and third summers. Twenty eight individual landslides and four landslide zones were chosen for the field-research part of this study. Individual landslides were studied in detail to obtain information on the processes of mass-wasting whereas the landslide zones were studied in general to obtain an overall point of view of the role of landsliding in the production and modification of landforms.

Field investigation of each slide usually involved a reconnaissance trip to see if the slide had interesting features. If the slide was found to be suitable, ~~aerial photographs and topographic maps~~ were obtained and a return visit or visits were made. The detailed study of each slide began with a climb to the crown or other high place in order to gain an overall view. I then moved down and over the slide in a series of diagonal traverses. Sometimes I traveled up or down arroyos or along the smoother flanks of the rougher slides. On some of the large landslide mesas I walked only along the crown and the toes of individual flows. Where possible I drove all over the large landslide zones. In all cases I looked in particular for springs, exposed stratigraphic sections, landslide levees, cracks, tilted trees, undrained depressions, and any distinguishing features which might set the slide apart from others.

Distances on slides were measured by scaling from maps or by measuring between points on the ground and comparing these points with aerial photographs. Width was measured perpendicular to the longitudinal axis of the slide (perpendicular to the direction of movement) and length was measured parallel to the longitudinal axis (parallel to the direction of movement). Thickness was obtained sometimes by visual estimate in the field and sometimes by solution of a right triangle whose hypotenuse was the horizontal distance between a contour in the center of the slide and the projection of this contour under the slide along the original ground surface. The angle of slope of the original ground surface is one of the acute angles of the right triangle. The volume of any slide was obtained by fitting the irregular outline of the slide into geometric figures and multiplying these areas by the average thickness figures. In all cases my volume estimates are inclined to be conservative. Elevations and longitude and latitude of some slides are approximate due to lack of large-scale maps.

Mapping of landslides was done in the following manners; (1) on aerial photographs in the field, (2) on aerial photographs in the office, but with field checks, (3) on topographic maps with aerial photographs in the field and office, always with field checks, (4) adaption of another worker's map, (5) use of another worker's map without change. Mapping of contacts, landforms, and other features was carried out by use of the usual methods of comparison of aerial photographs and topographic maps to the ground surface, and by Brunton-compass resection to obtain locations. Distinguishing features were recorded by field notes and sketches and by profuse photographs.

When I finished my field work I began an extensive literature search for data on all the remaining landslides of Utah. Records of 187 individual landslides and five landslide zones were compiled from various sources. These records must be interpreted with care because of the wide diversity of opinion in what constitutes a landslide. For example, in areas I have field checked I have found several areas of talus, colluvium, and alluvial-fan material that had been mapped as landslides. Presumably, then, in the records that I have not field checked there remain areas of talus and similar features that have been mapped erroneously as landslides. Despite these inherent errors, the compiled data add to the information gained from the field studies.

In order to equate the data of the individual landslide with the data of the landslide zone, I found it necessary to consider one mile of landslide zone (measured at the head) equivalent to one individual landslide. I think that this is valid as the average width of individual landslides (measured at the head) that I have studied in the field is about 4,200 feet, which is close to a mile.

Any landslide has one or more slope exposures, formations involved, lithologies involved, and the like. In the compilation of these factors I have found it necessary to divide them into decimal fractions in order to achieve a proper numerical weight for each. Thus if one individual landslide (or one mile of landslide zone) had one cause I assigned that cause a weight of 1.00; if two causes, a weight of 0.50 for each; if three, 0.33 for each; if four, 0.25 for each; if five, 0.20 for each; and if six, 0.17 for each. These decimal fractions were retained in the tables in order to maintain consistent totals but they were dropped from the text in order not to give the reader the erroneous notion that the two decimal places involve great accuracy.

Summary of the Outstanding Features of Landslides in Utah

Those landslides which were picked for field study are generally the most spectacular in the state. Consequently, the following summary of superlatives can be considered to include all the landslides in Utah, even though I have not measured all the landslides in the state to be sure.

The most common type of landslide investigated in the field is the complex slump and debrisflow. Boars Tusk landslide #2, Goslin Mountain slide #3, Thistle #11, York #12, Elbow #19, Green Hollow #21, Square Mountain #22, North Roundy #25, Dry Hollow #26, South Roundy #27, Dry Canyon #28, and the four landslide zones, Fish Lake Plateau #29, Thousand Lake Mountain #30, Boulder Mountain #31, and Mount Peale #32 are largely of this type. The widest individual slides are South Roundy #27, Elbow #19, and Goslin Mountain #4, which average 10,000 feet in width. The Fish Lake Plateau landslide zone #29 has the greatest width of landslide zones which I have investigated in the field (about 64 miles) but the Montezuma Canyon landslide zone has the greatest width of all the reported landslide zones in the state (about 82 miles). Thompson Creek slide #18 is at least four miles long, which makes it the longest in the state. The thickest known slide is the Graveyard Flat slide #8, which is about 300 feet in thickness. This slide is extremely thick because it fell into, and piled up deeply, in a steep-sided narrow valley. The largest volume of individual landslide in the state is Thompson Creek landslide #18, which has at least 1 billion cubic yards. The largest volume of landslide zone is probably the Boulder Mountain landslide zone #31, which has about 18 billion cubic yards of material.

The 28 individual slides investigated in the field total about 3 billion cubic yards of material and the 170 miles of landslide zone investigated in the field total about 30 billion cubic yards of material. If we assume that these figures are probably of the correct order of magnitude, we may use them to hypothesize the possible volume of the reported landslides. Thus the 187 reported individual landslides may total about 20 billion cubic yards of material and the 214 miles of reported landslide zone may total about 38 billion cubic yards of material. This is a total of about 90 billion cubic yards of landslide debris in the state. This landslide debris would cover the state of Utah to a depth of slightly over a foot if spread evenly over the surface.

The main scarp of Thompson Creek landslide #18 is about 2,000 feet high and thus is the largest main scarp of the individual landslides.

New nomenclature developed for landforms produced by landslides is introduced in following pages (p. 24-33). Among these newly named landforms, the best example of a landslide mesa is Thousand Lake Mountain landslide zone #30, but the Fish Lake Plateau slide zone #29, Boulder Mountain zone #31, and Mount Peale zone #32 also have the feature. The best and only good example of a landslide blade in Utah is Mount Marvine in the Fish Lake Plateau landslide zone #29. The best example of a landslide peak is Hens Hole Peak in the Thousand Lake Mountain landslide zone #30. Landslide cols are found between North Roundy landslide #25 and Dry Hollow landslide #26, South Roundy slide #27 and Dry Canyon slide #28, and in the Mount Peale slide zone #32. Landslide outliers and erratics are best developed in the Mount Peale zone #32. The best landslide tilt block is near Mount Marvine in the Fish Lake Plateau zone #29 but they also occur in the Mount Peale landslide zone #32, and probably in other areas as well. Landslide levees are found on Ingham Peak slide #1, Currant Creek slide #10, York slide #12, and Mount Terrel slide #17. They are largest and best developed on Currant Creek landslide #10.

Engineering Aspects of Landslides in Utah

I have purposely avoided engineering problems in relation to landsliding because I am not an engineer and this is primarily a geomorphic study of landslides. I should point out, however, a few of the formations and areas which have been unstable in the past and which could be unstable again if disturbed by man. The formations which were most commonly the cause of landsliding are the Chinle, Morrison, Tropic, and North Horn Formations, and an unnamed limestone and tuffaceous sandstone which may be equivalent to the

Flagstaff Formation. Contractors would be advised to utilize utmost caution in construction in areas where these formations crop out.

Most of the landslides described in the appendix have been stable for a long while. There are eight notable exceptions to this, however. Currant Creek landslide #10 is unstable and is creeping very slowly. Plans are pending for a dam somewhere in the valley of Currant Creek. If any significant amounts of water are added to this slide or to the bentonite-rich parts of the Currant Creek Formation from which the slide is largely derived, I would confidently predict an acceleration of movement. Road building across the toe of the slide could also produce further movement. Little Creek Peak #20 slid within historic times due to a combination of faulting, tuffaceous sedimentary rock, and heavy rains. The area is probably presently stable but the main scarp is a cliff and could slide again. The Mount Terrel landslide #17 probably moved within historic times. It is in an area of very unstable, bentonite-rich sedimentary and volcanic rocks. Further landsliding can be expected throughout this area. The Thistle landslide #11 has moved at various times in the Pleistocene and Recent. Flow has occurred in the headward portion of the slide twice within the last twenty years. Creep occurred for many years where the old highway cut into the toe, resulting in the moving of the highway to the other side of the canyon. Any further expansion of the railroad near the toe could result in renewed movement. The Washington Terrace landslide #2 was active until very recently, and even now some minor slump and flow occur in the spring. This is a likely site of future housing development because of its close proximity to Ogden and to Hill Air Force base. I would advise extreme caution in building anywhere near the bluffs above the Weber River here. The Fish Lake Plateau zone #29, Thousand Lake Mountain zone #30, and Boulder Mountain zone #31 have all had some minor recent landsliding. These areas are all so high and remote that I can foresee no future construction problems, except for certain Forest Service roads.

Finally, I would say that many of the areas of old landslides which were caused by stratigraphic or lithologic causes could become active again if precipitation increased or if man unfavorably altered ground-water or shear-strength characteristics by construction. In general, however, the areas of old slides are presently stable and likely to remain so for a long time.

Thistle Landslide

Landslide #11

Location: Between lat 39° 59' 20" and 40° 00' 10" N.; long 111° 29' 50" and 111° 31' 20" E. S½ sec. 29, SE¼ sec. 30, NE¼ sec. 31 and 32, T. 9 S., R. 4 E., Salt Lake Meridian, Utah County, Utah.

Previous Work: Map, Metter, 1955; description, Rigby, 1962; map, Hintze, 1962.

Type: Complex slump and debrisflow.

Width: About 4,000 feet at the head; about 1,000 feet in the middle; and about 900 feet at the toe.

Length: About 8,000 feet.

Thickness: About 50 feet.

Volume: About 25 million cubic yards.

Crown Elevation: About 6,800 feet.

Head Elevation: About 6,500 feet.

Toe Elevation: About 5,100 feet.

Rate of Movement: Very rapid to slow.

Slope Exposure: Northeast.

Vegetation: Sagebrush at lower elevations, scrub oak in shaded and higher elevations.

Geologic Setting: The Tertiary Colton and Flagstaff Formations and the Cretaceous-Tertiary North Horn Formation are the source materials of the landslide.

Hardy (1962, p. 58) notes that the North Horn Formation in the Thistle area is 415 feet thick and consists of conglomerate, sandstone, and red shale. I have noted that it is a soft and easily eroded unit in this area.

Hardy (p. 59) goes on to say that the Flagstaff Limestone conformably overlies the North Horn, is 100-200 feet thick, and consists of limestone, shale, and sandstone.

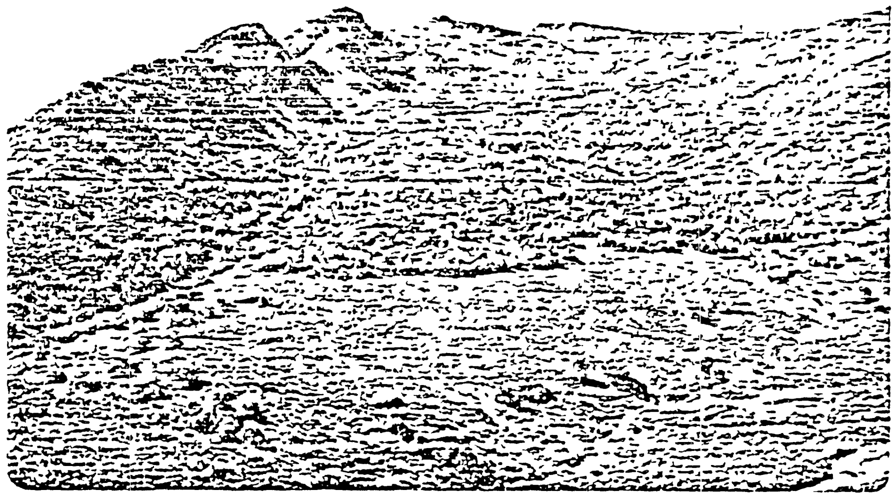

Figure 53. Middle and upper portions of the Thistle landslide. The largest and oldest of the several slides here passes out of the picture to the left. The toe of the next larger and older slide is marked by the prominent vegetation change from sagebrush to scrub oak in the middle distance. The arrow points to historic slumps and flows in the head region.

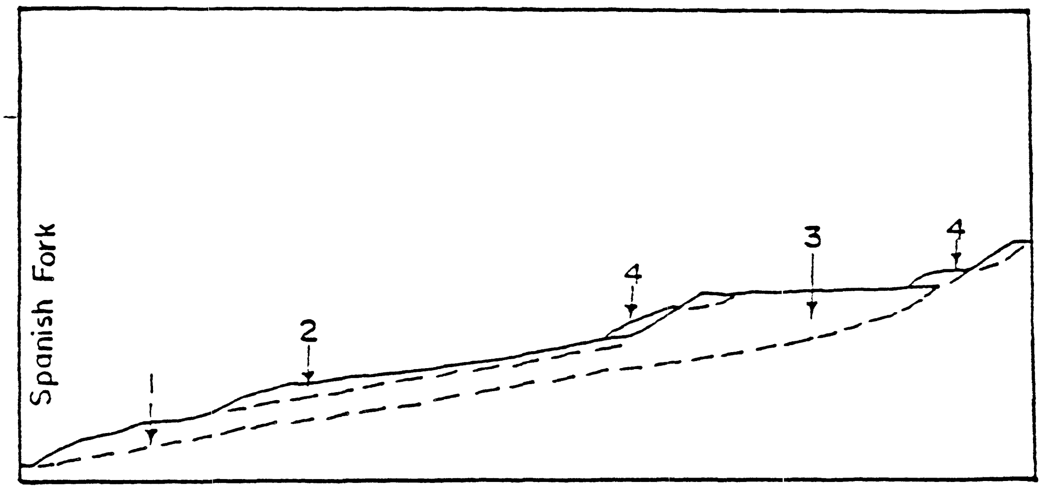

Figure 54. Schematic cross section of Thistle landslide drawn nearly to scale. 1 - first debrisflow, 2 - second debrisflow, 3 - slump block related to either first or second debrisflow, or both, 4 - mudflows and debrisflows of historic age. Refer to figure 55 for locations of these features.

Hardy points out that the Colton is not recognized in this area by some investigators, but Metter (1955, p. 27) mapped a unit of conglomerate and red beds above the Flagstaff as Colton. It is friable and easily erodable and has been the source of several minor mudflows in the past 100 years or so.

These units dip about 22° to the northwest and unconformably overlie the Nugget Sandstone which forms the southeast flank of the landslide and dips 64° to the southeast.

Causes: The North Horn Formation is a very unstable unit throughout its areal extent. It owes its instability to its poor consolidation and argillaceous composition. Where any massive beds overlie it, such as the Flagstaff in this case, failure is almost certain, especially when much water is added.

Several post-slide mudflows are located in the head area and owe their origin to the Colton Formation which is largely unconsolidated in this area.

Distinguishing Features: The Thistle slide is a good example of repetitive or retrogressive landsliding. The initial slide was quite big and involved large slump blocks of Flagstaff and Colton in the head and rapid flow of North Horn debris out from the base of the slump blocks and down the valley which had been cut by a small tributary to Spanish Fork river. The valley was located on the contact between the North Horn Formation and the Navajo Sandstone.

This flow passed through a notch in the Navajo Sandstone hogback and passed out into the valley of Spanish Fork. It undoubtedly dammed Spanish Fork river at the time but no lacustrine sedimentation has been preserved to record ponding.

The toe of this slide remained unstable after its rapid emplacement. Active creep has formed a hummocky slope area and necessitated relocation of the road from the west to the east side of the canyon (Rigby 1962, p. 81). The creep probably resulted from active undercutting by Spanish Fork river.

Some time after the emplacement of the origional slide, slumping occurred again in the head area and a new debrisflow moved forth. Due to a now more gentle gradient and a smaller supply

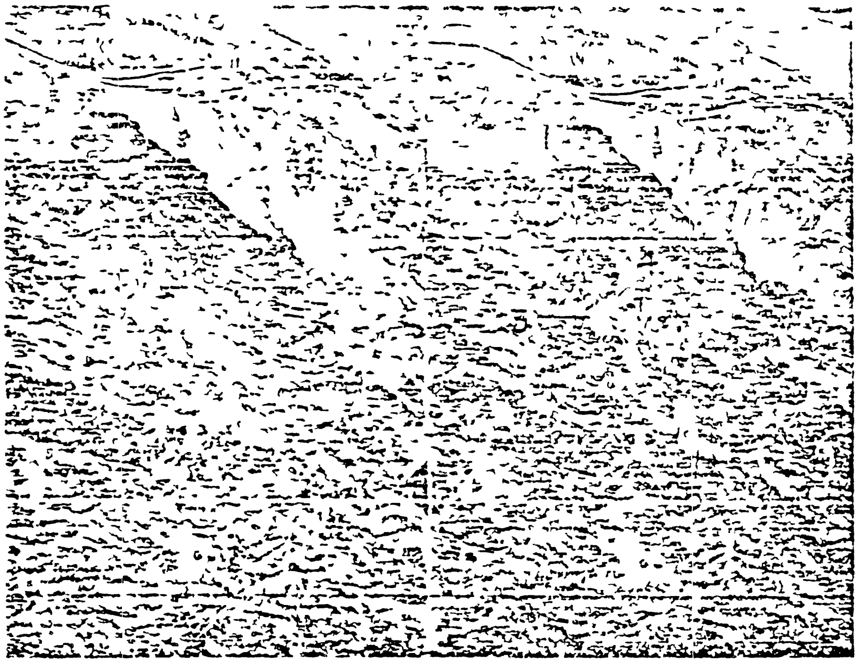

Figure 55. Stereopair of aerial photographs showing Thistle landslide. North is to the left. Refer to figure 54 for a description of the meaning of the numbers. The area in view is about 3.1 miles wide in the north-south direction.

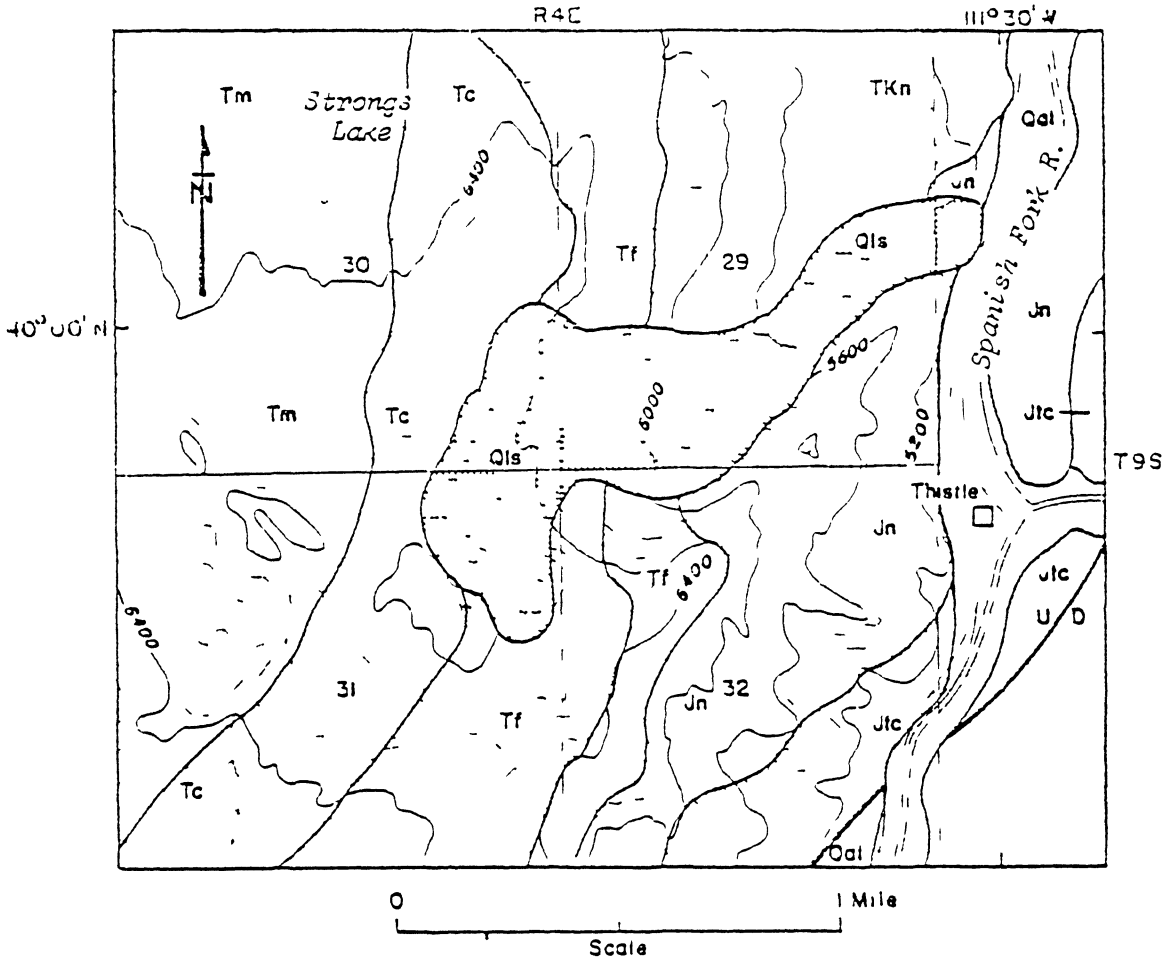

Figure 56. Geologic map of Thistle landslide. Adapted from Hintze, 1962.

EXPLANATION

Qal	Quaternary alluvium
Qls	Quaternary landslide
Tm	Tertiary Moroni Formation
Tc	Tertiary Colton Formation
Tf	Tertiary Flagstaff Formation
TKn	Cretaceous and Tertiary North Horn Formation
Jn	Jurassic Nugget Sandstone
Jtc	Jurassic Twin Creek Limestone

of unstable source material in the head, this slide was quite a bit shorter. The original flow was about 5,000 feet long, this second one measured only about 3,500 feet long. The toe of the second slide is a low mound, not more than 10 feet high, which is well marked by the scrub oak that excludes the sage-brush characteristic of the first slide (fig. 53). Perhaps the second slide is more permeable and transmits water better so that scrub oak can grow. At any rate there is a definite compositional change as noted in the vegetation. I did not notice any change in the North Horn - Flagstaff debris except that the lower slide appears to have more clay and fewer rocks.

Some time after the emplacement of the second slide a series of minor slumps and mudflows began at the crown of the main scarp and from the old slump blocks of the main slide. Four mudflows can be seen originating from near the slump blocks. One very fresh mudflow began in the crown area and flowed down to the slump blocks. This has had repeated movement and retrogression at the head as evidenced by movement before 1946 (air photo control), between 1946 and 1959 (air photo control), and again after 1959 (field work in 1966).

<u>Correlation</u>: Landsliding in this area has been continuing for some time. The first and largest flow is probably no older than late Pleistocene in age, judging from the fact that its toe is very near to the present valley bottom. If it were any older, one would expect more downcutting of the stream channel after the emplacement of the slide.

<u>Geomorphic Age</u>: Early youth to maturity, as shown by successively younger slides, headward. The first flow is probably early to middle maturity in age while the flows near the crown that occurred a few years ago are clearly in early youth.

REFERENCES CITED

IN TEXT AND APPENDIX I

Antevs, E., 1948, Climatic changes and pre-white man: Univ. Utah Bull., v. 38, p. 168-191.

________, 1952, Climatic history and the antiquity of man in California: Berkeley, Univ. California Arch. Survey Rept. 16, p. 23-31.

________, 1955, Geologic-climatic dating in the West: Amer. Antiq., v. 20, p. 317-335.

Atwood, W. W., 1909, Glaciation of the Uinta and Wasatch Mountains: U.S. Geol. Survey Prof. Paper 61, 96p.

Averitt, Paul, 1962, Geology and coal resources of the Cedar Mountain quadrangle, Iron County, Utah: U.S. Geol. Survey Prof. Paper 389, 72p.

Baker, A. A., and Crittenden, M. D., Jr., 1961, Geology of the Timpanogos Cave quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-132.

Baker, A. A., 1964, Geologic map and sections of the Aspen Grove quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-239.

Baker, A. A., Calkins, F. C., Crittenden, M. D., Jr., and Bromfield, C. S., 1966, Geologic map of the Brighton quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-534.

Baumhoff, M. A., and Heizer, R. F., 1965, Postglacial climate and archaeology in the desert west: in Wright, H. E., Jr., and Frey, D. G., 1965, The Quaternary of the United States: Review volume for VII Congress International Assoc. for Quaternary Research, p. 697-707.

Bissell, H. J., 1952, Stratigraphy and structure of northeast Strawberry Valley quadrangle: Am. Assoc. Petroleum Geol. Bull., v. 36, p. 575-634.

Burnham, R. C., 1950, The climates of Utah: Univ. Utah unpub. M.S. thesis.

Calkins, F. C., and Butler, B. S., 1943, Geology and ore deposits of the Cottonwood-American Fork area: U.S. Geol. Survey Prof. Paper 201, 152p.

Callaghan, Eugene, and Parker, R. L., 1961, Geologic map of Monroe quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-155.

Cashion, W. B., 1961, Geology and fuels resources of the Orderville-Glendale area, Kane County, Utah: U.S. Geol. Survey Coal Inv. Map C-49.

Common, R., 1966, Slope failure and morphogenic regions: in Dury, G. H., Essays in geomorphology: New York, American Elsevier, p. 53-81.

Crittenden, M. D., Jr., 1965, Geology of the Dromedary Peak quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-378.

Crittenden, M. D., Jr., Calkins, F. C., and Sharp, B. J., 1966, Geologic map of the Park City west quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-535.

Davis, S. N., and Karzulovic, J. K., 1963, Landslides at Lago Rinihue, Chile: Seismol. Soc. Am. Bull., v. 53, p. 1403-1414.

Davis, W. M., 1954, Geographical essays: ed. Johnson, D. W., reprinted from 1909 edition, Dover, 777p.

Dutton, C. E., 1880, Geology of the High Plateaus of Utah: U.S. Geog. and Geol. Survey Rocky Mtn. Region Rept., 307p.

Eardley, A. J., 1934, Structure and physiography of the southern Wasatch Mountains: Michigan Acad. Sci. Papers, v. 19, p. 377-400.

________, 1965, Erosional history of Zion Canyon: unpub. open-file report, Headquarters, Zion Canyon National Park, 20p.

Eichmeier, A. H., 1951, Snowfalls - Paul Bunyon style: Weatherwise, v. IV, p. 124-127.

Feth, J. H., 1955, Sedimentary features in the Lake Bonneville Group in the east shore area near Ogden, Utah: in Eardley, A. J., Tertiary and Quaternary geology of the eastern Bonneville Basin: Utah Geol. and Mineralog. Survey Guidebook, n. 10, p. 45-69.

Flint, R. F., and Denny, C. S., 1958, Quaternary geology of Boulder Mountain, Aquarius Plateau, Utah: U.S. Geol. Survey Bull. 1061-D, p. 103-164.

Foutz, D. R., 1960, Geology of the Wash Canyon area, southern Wasatch Mountains, Utah: Brigham Young Univ. Research Studies, Geol. Ser., v. 7, no. 2, 37p.

Fulton, R. J., 1965, Silt deposition in late-glacial lakes of southern British Columbia: Am. Jour. Sci., v. 263, p. 553-570.

Garvin, Robert, 1967, Geologic map of the Currant Creek Formation, Wasatch and Duchesne Counties, Utah: unpub. map.

Geiger, Rudolf, 1965, The climate near the ground: Cambridge, Mass., Harvard Univ. Press, 611p.

Gilbert, G. K., 1890, Lake Bonneville: U.S. Geol. Survey Mon. 1, 438p.

Goode, H. D., 1961, Quaternary system: in Morris, H. T., and Lovering, T. S., Stratigraphy of the East Tintic Mountains, Utah: U.S. Geol. Survey Prof. Paper 361, p. 129-138.

________, 1964, Reconnaissance of water resources of a part of western Kane County, Utah: Water-Resources Bull. 5, Utah Geol. and Mineralog. Survey, 63p.

Gregory, H. E., 1950a, Geology of eastern Iron County, Utah: Utah Geol. and Mineralog. Survey Bull. 37, 153p.

________, 1950b, Geology and geography of the Zion Park region, Utah and Arizona: U.S. Geol. Survey Prof. Paper 220, 200p.

________, 1951, The geology and geography of the Paunsaugunt region, Utah: U.S. Geol. Survey Prof. Paper 226, 116p.

Hadley, J. B., 1964, Landslides and related phenomena accompanying the Hebgen Lake earthquake of August 17, 1959: in The Hebgen Lake, Montana, earthquake of August 17, 1959: U.S. Geol. Survey Prof. Paper 435, p. 107-138.

Hall, W. B., 1960, Mass-gravity movements in the Madison and Gallatin Ranges, southwestern Montana: in Billings Geol. Soc. Guidebook 11th Ann. Field Conf., p. 200-206.

Hansen, W. R., 1961, Geologic map of the Dutch John Mountain and Goslin Mountain Quadrangles, Utah-Wyoming: U.S. Geol. Survey Misc. Geol. Inv. Map I-324.

________, 1965, Geology of the Flaming Gorge area, Utah-Colorado-Wyoming: U.S. Geol. Survey Prof. Paper 490 196p.

Hardy, C. T., 1962, Mesozoic and Cenozoic stratigraphy of north-central Utah: in Geology of the southern Wasatch Mountains and vicinity, Utah - A symposium: Brigham Young Univ. Geol. Studies, v. 9, p. 1, p. 50-64.

Hintze, L. F., 1962, Geology of the southern Wasatch Mountains and vicinity, Utah: Brigham Young Univ. Geol. Studies, v. 9, pt. 1, p. 70-79.

Hooper, W. G., 1951, Geology of the Smith and Morehouse-South Fork area, Utah: Univ. Utah unpub. M.S. thesis.

Johnson, K. D., 1959, Structure and stratigraphy of the Mount Nebo-Salt Creek area, southern Wasatch Mountains, Utah: Brigham Young Univ. Research Studies, Geol. Ser., v. 6, no. 6, 49p.

Kjellman, W., 1955, Mechanics of large Swedish landslips: Geotechnique, v. 5, no. 1, p. 74-78.

Lahee, F. H., 1941, Field geology: New York and London, McGraw-Hill, 853p.

Lamb, H. H., 1961, Fundamentals of climate: in Nairn, A. E. M., Descriptive paleoclimatology: New York, Interscience Pub., 380p.

Lawrence, D. B., 1950, Estimating dates of recent glacier advances and recession rates by studying tree growth layers: Amer. Geophys. Union, Tr., v. 31, p. 243-248.

Lawrence, J. C., 1963, Stratigraphy of the Dakota and Tropic Formations of Cretaceous age in southern Utah: in Geology and resources of south-central Utah, Guidebook to geology of Utah, no. 19, Utah Geol. Soc. and Intermtn. Assoc. Petroleum Geol., p. 71-91.

Liang, T., and Belcher, D. J., 1958, Airphoto interpretation: in Eckel, E. B., Landslides and engineering practice: Washington, Highway Research Board Spec. Report 29, NAS-NRC Pub. 544, p. 69-92.

Lovering, T. S., and others, 1960, Geologic map of the East Tintic District, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-230.

McFall, Carew, 1956, Geology of the Escalante-Boulder area, Garfield County, Utah: Yale Univ. unpub. Ph.D. thesis.

McGookey, D. P., 1958, Geology of the northern portion of the Fish Lake Plateau, Utah: Ohio State Univ. unpub. Ph.D. thesis.

________, 1960, Early Tertiary stratigraphy of part of central Utah: Am. Assoc. Peteroleum Geol. Bull., v. 44, p. 589-615.

Marshall, C. H., 1956, Photogeologic map of the Virgin NE quadrangle, Washington County, Utah: U.S. Geol. Survey Misc. Geol. Inv. Map I-161.

Metter, R. E., 1955, Geology of the northern part of the southern Wasatch Mountains, Utah: Ohio State Univ. unpub. Ph.D. thesis.

Morrison, R. B., and Frye, J. C., 1965, Correlation of the middle and late Quaternary successions of the Lake Lahontan, Lake Bonneville, Rocky Mountain (Wasatch Range), southern Great Plains, and eastern midwest areas: Nevada Bureau of Mines Rept. 9, 45p.

Naismith, H., 1964, Landslides and Pleistocene deposits in the Meikle River valley of northern Alberta: Canadian Geotechnical Jour., v. 1, no. 3, p. 155-166.

Reiche, P., 1937, The Toreva-block, a distinctive landslide type: Jour. Geol., v. 45, no. 5, p. 538-548.

Retzer, J. L., 1954, Glacial advances and soil development, Grand Mesa, Colorado: Am. Jour. Sci., v. 252, no. 1, p. 26-37.

Richmond, G. M., 1964, Glaciation of Little Cottonwood and Bells Canyons, Wasatch Mountains, Utah: U.S. Geol. Survey Prof. Paper 454-D, 41p.

Rickmers, W. R., 1913, The duab of Turkestan: Cambridge, England, Cambridge Univ. Press.

Rigby, J. K., 1962, Some geomorphic features of the southern Wasatch Mountains and adjacent areas: in Geology of southern Wasatch Mountains and vicinity, Utah - A symposium: Brigham Young Univ. Geol. Studies, v. 9, pt. 1, p. 80-84.

Ritchie, A. M., 1958, Recognition and identification of landslides: in Eckel, E. B., Landslides and engineering practice: Washington, Highway Research Board Spec. Rept. 29, NAS-NRC Pub. 544, p. 48-68.

Schumm, S. A., 1965, Quaternary paleohydrology: in Wright, H. E., Jr., and Frey, D. G., The Quaternary of the United States: Review Vol. for VII Congress Internat. Assoc. for Quaternary Research, p. 783-794.

Sharpe, C. F. S., 1938, Landslides and related phenomena; a study of mass-movements of soil and rock: New York, Columbia Univ. Press, reprinted 1960, New Jersey, Pageant Books, 137p.

Sharp, R. P., 1942, Mudflow levees, Jour. Geomorph., v. 5, p. 222-227.

Shreve, R. L., 1959, Geology and mechanics of the Blackhawk landslide, Lucerne Valley, California: Calif. Inst. Technology unpub. Ph.D. thesis.

Smith, J. F., Jr., Huff, L. C., Hinrichs, E. N., and Luedke, R. G., 1963, Geology of the Capitol Reef area, Wayne and Garfield Counties, Utah: U.S. Geol. Survey Prof. Paper 363, 102p.

Strahler, A. N., 1940, Landslides at the Vermilion and Echo Cliffs, northern Arizona: Jour. Geomorph. v. 3, p. 285-300.

Stringham, B. F., 1961, Geologic map of the Grouse Creek Mountains and vicinity, Box Elder County, Utah: unpub.

Terzaghi, Karl, 1950, Mechanics of landslides: in Paige, Sidney, Application of geology to engineering practice, Berkey volume: Geol. Soc. America, p. 83-123.

Thomas, H. E., and Taylor, G. H., 1946, Geology and ground-water resources of Cedar City and Parowan valleys, Iron County, Utah: U.S. Geol. Survey Water-Supply Paper 993, 210p.

Trewartha, G. T., 1954, An introduction to climate: New York, McGraw-Hill, 402p.

________, 1961, The earth's problem climates: Madison, Wisconsin, Univ. Wisconsin Press, 334p.

Varnes, D. J., 1958, Landslide types and processes: in Eckel, E. B.. Landslides and engineering practice: Washington, Highway Research Board Spec. Rept. 29, NAS-NRC Pub. 544, p. 20-47.

Watson, R. A., and Wright, H. E., Jr., 1963, Landslides on the east flank of the Chuska Mountains; northwestern New Mexico: Am. Jour. Sci., v. 261, p. 525-548.

Weir, G. W., and Dodson, C. L., 1958a, Preliminary geologic map of the Mount Peale 3 SW quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-146.

________, 1958b, Preliminary geologic map of the Mount Peale 3 NE quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-145.

________, 1958c, Preliminary geologic map of the Mount Peale 4 SW quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-148.

________, 1958d, Preliminary geologic map of the Mount Peale 3 SE quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-147.

Weir, G. W., and Puffett, W. P., 1960, Preliminary geologic map of the Mount Peale 4 SE quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-149.

Weir, G. W., Puffett, W. P., and Dodson, C. L., 1961, Preliminary geologic map of the Mount Peale 4 NW quadrangle, San Juan County, Utah: U.S. Geol. Survey Mineral Inv. Field Studies Map MF-151.

Wiggin, B. L., 1950, Great snows of the Great Lakes: Weatherwise, v. III, p. 123-126.

Willard, M. E., and Callagham, Eugene, 1962, Geology of the Marysvale quadrangle, Utah: U.S. Geol. Survey Geol. Quad. Map GQ-154.

Williams, P. L., 1964, Geology, structure and uranium deposits of the Moab quadrangle, Colorado and Utah: U.S. Geol. Survey Misc. Geol. Inv. Map I-360.

Yeend, W. E., 1966a, Fabric analyses of till, mudflow and landslide deposits, Grand Mesa area, western Colorado (abst.): Geol. Soc. America, Rocky Mtn. Sec., Program 1966 Ann. Meeting. p. 60.

________, 1966b, Quaternary glaciation of Grand Mesa area, western Colorado (abst.): Geol. Soc. America, Rocky Mtn. Sec., Program 1966 Ann. Meeting, p. 60.

VITA

Name	John Ford Shroder, Jr.
Birthplace	Troy, New York
Birthdate	5 July 1939
Elementary School	Dorset Elementary Dorset, Vermont
High School	Vermont Academy Saxtons River, Vermont
College	Union College Schnectady, New York 1957-1961 B.S. in geology, 1961
University	University of Massachusetts Amherst, Massachusetts 1961-1963 M.S. in geology, 1963
	University of Utah Salt Lake City, Utah 1963-1967 Ph.D. in geology, 1967
Academic Honors	Sigma Gamma Epsilon, 1962 University of Massachusetts
	Sigma Xi, 1965 University of Utah
	Phi Kappa Phi, 1967 University of Utah
Academic Awards	Sigma Xi-RESA grant, 1962
	Sigma Xi-RESA grant, 1964
	Socony-Mobil Scholarship, 1964-1965
	Utah Uniform School Fund grant, 1965-1967

Professional Societies	American Association of Petroleum Geologists Society of Economic Mineralogists Paleontologists INQUA (International Quaternary geology) Geological Society of America American Association for the Advancement of Science

APPENDIX B

Proposed Pretrial Order submitted by defendant's counsel to plaintiffs' counsel

Letter from defendant's counsel to plaintiffs' counsel concerning notice of witnesses to be called, July 12, 1989

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IN THE FOURTH JUDICIAL DISTRICT COURT OF UTAH COUNTY

STATE OF UTAH

ROBERT BERRETT, GERALD ARGYLE, et al, Plaintiff, vs. DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY, INC., Defendant.	PRETRIAL ORDER Civil ~~No. CV-86-616~~ Judge Cullen Y. Christensen

This matter having come before the Court for pretrial and the Court being sufficiently advised, the following action is taken:

1. JURISDICTION. The Court has jurisdiction over this action because the alleged wrongful conduct took place in Utah County and the property allegedly damaged is located in Utah County.

2. CLAIMS OF THE PARTIES.

Plaintiffs' Claims:

The ~~plaintiffs claim that the~~ defendant the Denver and Rio Grande Western Railroad Company, (the "D&RGW") owns railroad lines and property near the town of Thistle, Utah, and did so on or about April 13, 1983, and for decades previous thereto.

The plaintiffs allege that prior to the April 1983 earth movement, the defendant Railroad knew or should have known of the unstable nature of the land mass known as the Thistle Slide, located at or near the town of Thistle. Despite such knowledge, it failed to take action that would have prevented or mitigated the results of the earth movement that eventually occurred. Moreover, the actions it did take prior to and subsequent to April 10, 1983, were undertaken in a negligent fashion and were a cause of the plaintiffs' damages.

The plaintiffs seek compensation for the loss and damage of and to their property, interest at the statutory rate from the date of damage or destruction to the date of judgment herein, and also seek attorney fees and court costs.

Defendant's Claims:

D&RGW claims as follows: Between 1877 and 1879, the Utah and Pleasant Valley Railroad Company constructed a railroad line through Spanish Fork Canyon across the base of the geologic formation that became the Thistle slide. When the D&RGW purchased the assets of the Utah and Pleasant Valley at a foreclosure sale in 1882, it obtained the line through Spanish Fork Canyon that had been built at the base of the geologic formation. Originally, at that location, the Spanish Fork River ran adjacent to Billies Mountain with the railroad tracks immediately uphill to the west of the river and with a state maintained road above the tracks. Sometime in the early twentieth century the State of Utah moved the river to the west and placed a highway next to Billies Mountain. This put the D&RGW tracks to the west of both the river and the state road. The maintenance of a narrow right of way and a shallow cut for passage of the D&RGW's tracks was the D&RGW's sole activity in this area.

The geologic formation that became the Thistle slide was located on the property of persons other than the D&RGW. The Thistle slide was an ancient landslide over a mile long and averaging a thousand feet in width. It consisted of clay material held in place at minimum levels of cohesion. Nothing that the D&RGW did before the catastrophic slide occurred had any impact on the slide. The movement of the Thistle slide that allegedly injured the plaintiffs resulted from an act of God--specifically, the record high moisture levels for the two years preceding the slide combined with the characteristics of the geologic formation at Thistle.

The plaintiffs cannot prove that, at any time before the commencement of the Thistle disaster, the D&RGW had or undertook a duty to recognize or to remedy any risk posed to the plaintiffs by the geologic formations in the Thistle area. Certainly neither the D&RGW nor anyone else (including the plaintiffs) foresaw or could have foreseen the risk of a catastrophic slide of such a size that it would jeopardize the plaintiffs' property. Further, the plaintiffs cannot prove that, even if the D&RGW had known of the potential for destruction posed by the geologic formation at Thistle and had a duty to act upon that knowledge, there were any reasonable remedial measures that the D&RGW could have taken to prevent the occurrence of the Thistle disaster.

When the major movement of the slide commenced on April 13, 1983, the D&RGW immediately retained professional engineers to advise it concerning the actions to be taken in response to the slide. The D&RGW consistently followed the advice of these experts. The Thistle slide was an unprecedented geologic disaster that affected not only the D&RGW but the State of Utah and its political subdivisions. On the second day of the operation of earthmoving equipment on the face of the slide, the State of Utah took over the management of the slide mass. The D&RGW acted on behalf of and at the direction of the State of Utah in responding to the slide. The State and County observed the D&RGW's actions and approved or ratified all actions taken by the D&RGW in response to the slide.

Under Utah law and public policy, even if the D&RGW were negligent, such negligence in the face of emergency conditions is not actionable. Alternatively, the reasonableness of the D&RGW's actions must be measured by the circumstances existing in April, 1983. The plaintiffs cannot prove that anything the D&RGW did at the base of the slide caused the slide to be any greater than it would have been had the D&RGW done nothing. Only those plaintiffs with property at higher elevations (the Paces and the Jacksons) could possibly have been affected by actions that anyone took at the base of the slide. In that regard, the ultimate decision to fortify the buttress created by the slide was made by the State of Utah in order to prevent a failure of the buttress and massive downstream flooding.

Some of the plaintiffs do not presently hold title to the property for which they seek recovery in this matter. Evan Nelson has signed documents releasing his claims or is a party to an action in which these claims should have been brought. By failing to raise the claims in said actions, he is barred from the recovery now sought. One plaintiff, Mrs. Gourley, has no existing interest in any property affected by the Thistle slide.

3. UNCONTROVERTED FACTS. The following facts are established by admissions in the pleadings or by stipulation of counsel:

(a) For approximately one hundred years prior to April 13, 1983, the D&RGW maintained railroad lines north of Thistle, Utah at the base of the geologic feature that became the Thistle slide.

4. CONTESTED ISSUES OF FACT. The following facts are in dispute between the parties:

(a) If there had been no cut slope at the base of the Thistle slide, would the catastrophic earth movement of 1983 have occurred?

(b) Given the lack of integrity in the Thistle slide mass, would the slide have occurred even without the presence of the cut slope?

(c) Were there any actions that the D&RGW could have reasonably taken on or after April 13, 1983 that would have prevented the catastrophic slide and the resulting damage to the plaintiffs?

(d) But for the action or inaction of the D&RGW on or after April 13, 1983, would the Thistle slide have occurred or would the plaintiffs have suffered injury to the extent alleged in this action?

(e) At any time, did the D&RGW act or fail to act in such a way that it breached any duty that it owed to the plaintiffs?

(f) Was the cause of the catastrophic earth movement of 1983 the combination of high levels of precipitation in the Thistle area for the two years prior to the disaster and the existence of an ancient landslide on land not owned by the D&RGW?

(g) Were the actions of the D&RGW in connection with the Thistle slide undertaken in the context of an emergency?

(h) But for any fortification of the Thistle slide buttress that occurred, would the Spanish Fork River have broken through the buttress at a point in time sufficiently early that the plaintiffs' property would have been left above any flooding?

(i) Did the activities of earthmoving equipment at the base of the Thistle slide, prior to the State of Utah taking over such activities, at any time significantly increase the amount of material involved in the slide in such a way as to cause any increased damage to the plaintiffs' property?

(j) Did the D&RGW act reasonably in retaining the services of David Hilts and Shannon & Wilson?

(k) If David Hilts and Shannon & Wilson were not sufficiently competent and trained in geotechnical engineering to advise the D&RGW in connection with the slide, did such deficiency cause the plaintiffs any damage?

(l) Did the D&RGW act reasonably in retaining the services of third party independent contractors to conduct earthmoving at the slide?

(m) Under all of the circumstances, was the D&RGW negligent?

(n) Was such negligence, if any, the proximate cause of the plaintiffs' damages?

(o) What are the extent of plaintiffs' damages?

5. CONTESTED ISSUES OF LAW. The contested issues of law in addition to those implicit in the foregoing issues of fact are:

(a) Is the D&RGW liable for the existence of or effect of a cut slope on its right of way that was created by a third party?

(b) Is the D&RGW entitled to the entry of summary judgment or dismissal because the D&RGW did not owe any plaintiff a duty to act with respect to any risk posed by the the geologic formation at Thistle?

(c) If the cut slope was not a cause of the catastrophic earth movement of 1983, either proximately or in fact, did the D&RGW owe the plaintiffs any duty of care?

(d) Is the D&RGW entitled to the entry of summary judgment or dismissal inasmuch as the Thistle slide was an emergency situation and, under such circumstances, the D&RGW

did not owe any plaintiff a duty of reasonable care in responding to the slide?

(e) Were the damages claimed by the plaintiffs proximately caused by the D&RGW's breach of any duty of care owing to the plaintiffs?

(f) Can the D&RGW be held liable for the negligent acts of third party independent contractors?

(g) For what property damages may the plaintiffs seek recovery in a negligence action?

(h) Can the plaintiffs recover prejudgment interest or attorney's fees?

6. EXHIBITS. The parties expect to seek to introduce the following exhibits at trial:

(a) Plaintiffs' Exhibits (See Exhibit A hereto.

(b) D&RGW's Exhibits (See Exhibit B hereto.

Exhibits identified or received in evidence may be withdrawn from the Clerk's office upon the signing of receipts therefore by the respective parties offering them to be returned to the Clerk's office within the reasonable time and in the meantime to be available for inspection at the request of other parties.

Except as otherwise indicated, the authenticity of received exhibits has been stipulated, but they have been received subject to objections, if any, by the opposing party at the trial as to their relevancy and materiality. If other exhibits are to be offered and their necessity reasonably can be anticipated, they will be submitted to opposing counsel at lease 10 days prior to trial.

7. WITNESSES.

(a) In the absence of reasonable notice to opposing counsel to the contrary, the plaintiffs will call or will have available at trial the following witnesses:

Joseph Olsen, Blaine Leonard, Blaine Hales or Reed Snar, Robert Berrett, Gerald Argyle, Loyd Jackson, Helen Faye Jackson, William Jackson, Maurice Jackson, Calvin Woodcock, Edward Jones, Evelyn Colleen Pace Keller, Madge Black (Haymond), Shirley Roberta Pace Gourley, James Moore, David J. Pace, Evan Nelson, Von Gardner, Alan Leifson, and Robert Hatch.

Plaintiffs may call at trial the following witnesses: James E. Slosson, Horst Eublocker, Vern Jeffers, Oneita Sumsion, Charles Anderson, Larry Lunnen, Robert Morgan, David Hiltz, Jim Ozment, Coombs Hall, Gerald Shuirman, and Cameron E. Hansen.

The plaintiffs intend to read the depositions of the following persons at trial:

(b) In the absence of reasonable notice to opposing counsel to the contrary and in addition to these witnesses listed by the plaintiffs, the D&RGW will call or will have available at trial the following witnesses:

David Hilts
Bob Nance
Orlando Miera
George Beckwith
Colin Rupel
Larry Listello
Norbert Morganstern
Larry Lunnen

The D&RGW may call at trial the following witnesses:

J. J. Gonzales
Bob Morgan
John Werner
Coombs Hall
David Farr
Scott Matheson
James E. Slosson
Jim Ozment
Larry Hansen
William Alder
Bruce Kaliser
Gerald Peterson
Jeff Keaton

In the event that other witnesses are to be called at trial, a statement of their names and addresses and the general subject matter of their testimony will be served upon opposing counsel and filed with the Court at least 10 days prior to trial. This restriction shall not apply to rebuttal witnesses, the necessity of whose testimony reasonably cannot be anticipated before the time of trial.

8. DEADLINES. All deadlines for completion of all matters in anticipation of trial are set forth in the accompanying proposed Scheduling Order to be entered by this Court.

9. OTHER MATTERS. The D&RGW intends to amend and renew its motion for summary judgment previously filed with the Court.

10. MODIFICATION-INTERPRETATION. This pre-trial order has been formulated after conference at which counsel for the respective parties have appeared. Reasonable opportunity has been afforded counsel for corrections or additions prior to signing by the Court. Hereafter, this Order will control the course of the trial and may not be amended, except by consent of the parties or by order of the Court to prevent manifest injustice. The pleadings will be deemed merged herein. In the event of ambiguity in any provision of this Order, reference may be made to the record of this conference to the extent reported by stenographic notes, and to the pleadings.

11. TRIAL SETTING. This case has been set for trial with a jury on August 14, 1989, at the hour of 9:00 a.m. Estimated length of trial is 10 days.

12. POSSIBILITY OF SETTLEMENT. The possibility of settlement is considered poor.

DATED this _____ day of July, 1989.

Cullen Y. Christensen, Judge
Fourth Judicial District

Approved by:

Attorneys for Plaintiffs

Attorneys for D&RGW

71600

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July 12, 1989

PLAINTIFF'S EXHIBIT
Cu 86 616
NO. 1

Allen K. Young, Esq.
YOUNG & KESTER
101 East 200 South
Springville, Utah 84663

Re: D&RGW adv. Berrett, et al.

Dear Allen:

This letter is to confirm our telephone conversation of July 11 and 12, 1989. I advised you that Jim Ozment will be the Railroad's representative at trial and that he will be present throughout the trial. You advised me that, contrary to your previous statements, you now wished to review Mr. Ozment's photographs. I informed you of Mr. Ozment's position that he would produce photographs only if served with a subpoena. I offered to approach him about abandoning this requirement. I subsequently advised you that I had spoken further with Mr. Ozment and he has agreed to make the photographs available on July 31, 1989 in Denver, Colorado.

You requested copies of the materials promised at Dr. Morgenstern's deposition. Copies of these are being made and will be forwarded shortly. We agreed to exchange exhibit lists no later than August 1, 1989. At that time, you will also supply us with your final witness list including the identity of any depositions that you propose to read. As we have previously discussed, within two days of receiving your list, we will provide you with our final witness list. You advised me that, as of July 12, 1989, you had not identified with certainty those witnesses that you plan to call whose names do not appear in the latest draft of the pretrial order.

I confirmed the dates of July 19, and 21, 1989 respectively for the termination of the depositions of Blaine Leonard and Joseph Olsen. Larry Hansen will be available at the completion of Mr. Leonard's deposition for you to depose. George Beckwith will be deposed on August 3, 1989 in your offices.

As to the interrogatories that you deem to remain unanswered, I agreed to identify specifically the portions of the Utah Railway materials that are responsive. The answers to Interrogatories Nos. 15 through 17 relating to Mr. Ueblacker are found in Exhibits 1 through 32 to Mr. Ueblacker's Utah Railway deposition. He identified those exhibits as the entirety of his correspondence with and work produced for the Railroad. As to Interrogatory No. 14, the requested insurance information (except for the actual prior policy) is set forth in the answer to Interrogatory No. 13 of the Railroad's Answers to the Utah Railway's First Set of Interrogatories dated January 16, 1984. You contend that Interrogatory No. 2 requests the production of documents but it says nothing about documents. Finally, with respect to Interrogatory No. 20, there was no "job authorization" prepared to employ Shannon and Wilson.

On the issue of the Pretrial Order, you indicated that you are preparing a new draft. I requested that you not alter those portions of the previous draft that set forth the Railroad's contentions and the issues of fact and law that the Railroad placed in the draft. I look forward to receiving your new draft.

Sincerely,

Eric C. Olson

ECO:sw
cc: Michael F. Richman, Esq.

CERTIFICATE OF SERVICE

I hereby certify that I mailed a true and correct copy of the foregoing, postage prepaid, this 5th day of July, 1990, to the following:

Eric C. Olson, Esq.
VanCott, Bagley, Cornwall & McCarthy
Attorneys for Respondent
50 South Main Street, Suite 1600
P. O. Box 45340
Salt Lake City, UT 84145

____