DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-626
SHEET 2 OF 3

INTRODUCTION

This report and map are designed to provide Santa Cruz County with basic data on the location, pattern, recency of movement, potential for future surface rupture, and anticipated earthquake magnitudes and recurrence intervals for several of the faults located there for consideration in the county's land-use planning program and the preparation of its seismic safety element. This report does not consider other seismic hazards such as ground shaking, seismically induced ground failure, or tsunamis (seismically generated sea waves) that can accompany offshore earthquakes of large magnitude.

This study is a compilation of both pre-existing data on the known faults in Santa Cruz County and information on several faults and fault-related features discovered by the authors. Table 1 summarizes the pertinent planning data for each of the seven important fault zones in the county. The fault map shows the distribution of the faults, the age of their most recent movements, and the zones in which future surface rupture is likely to occur. This map presents data on a regional scale of 1:62,500 and is not intended to be a substitute for on-site geologic investigations.

ACKNOWLEDGMENTS

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SAN ANDREAS FAULT SYSTEM

Santa Cruz County, like much of western California, is situated within one of our planet's most geologically active regions--the complex shear zone that forms the boundary between two large blocks of the earth's crust, the Pacific and American plates. These plates move past each other at a rate of several centimetres per year, displacing the land surface at their zone of juncture and accumulating elastic energy that is sporadically released in the form of earthquakes. The traces of the breaks at the earth's surface that make up this plate boundary are collectively called the San Andreas fault system. This system consist of several major fault zones, together with several smaller individual faults. In the San Francisco Bay area the Hayward, Calaveras, and Concord faults are parts of the overall system, as well as the San Andreas fault proper on the San Francisco peninsula (fig. 1). Most of Santa Cruz County lies between two of these major fault zones, the San Andreas on the northeast, and the San Gregorio, a branch of the San Andreas, offshore to the southwest.

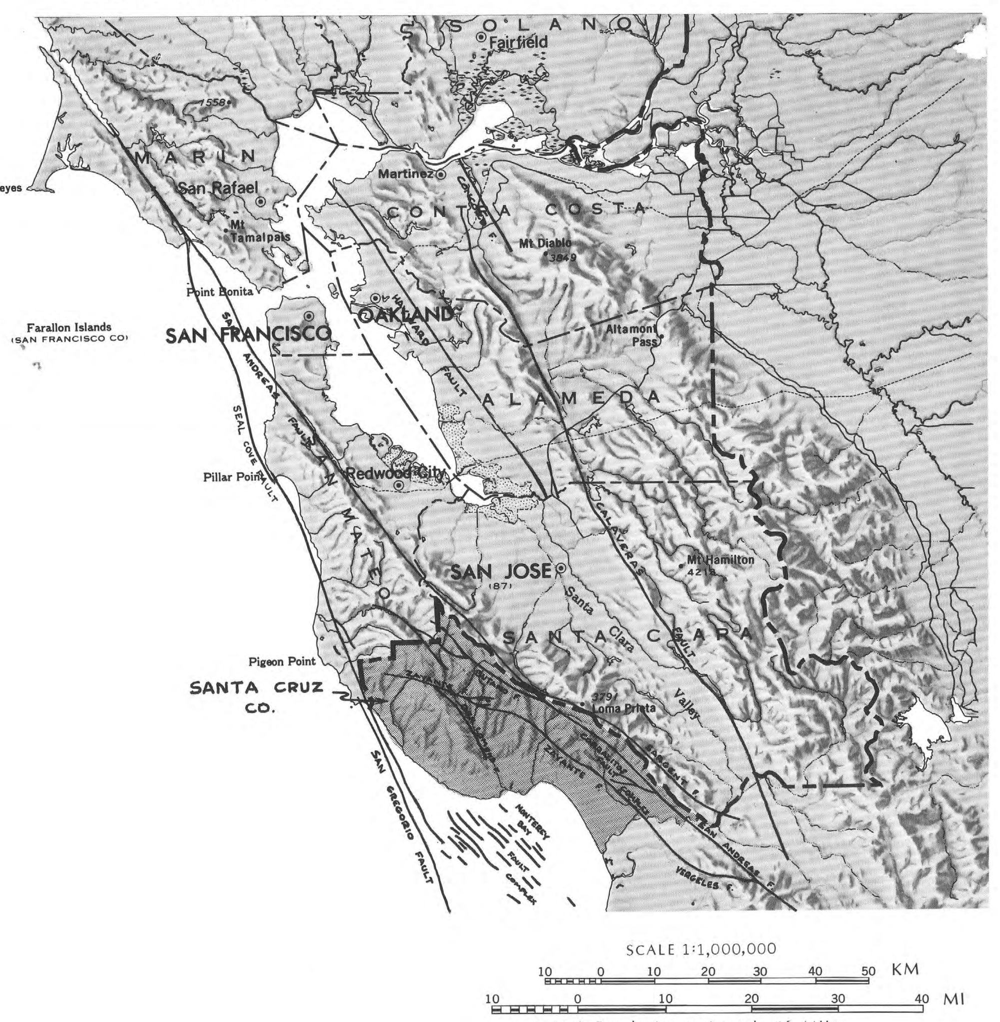


Figure 1. San Andreas fault system in central California

The San Andreas fault zone, the dominant zone of the system, is more than 1000 km (600 mi) long and up to 3 km (1½ mi) wide. Traces of individual fault breaks within the fault zone form an intricate and complicated pattern that varies along the length of the fault zone. Along some segments of the fault zone, the traces of the faults are straight and parallel or subparallel; along others, they are curved, splaying out and joining in an anastomosing pattern.

Historic movement on the San Andreas fault zone is predominantly in the horizontal plane, with the earth's crust southwest of the zone relatively displaced towards the northwest. This type of movement is termed right-lateral strike-slip, or for brevity, right slip, because to an observer standing on one side of the fault, the land surface on the opposite side is displaced to his right (fig. 2). The right-slip character of movement on the San Andreas fault is well established by observations of the surface faulting accompanying numerous earthquakes, by precision surveys of triangulation nets that cross the fault, by geodimeter measurements across the fault, and by linear features--both manmade and natural--that are displaced right-laterally where they cross the fault. Vertical movements along the San Andreas fault are also known, but historically these have been small and localized compared with right-slip movements.

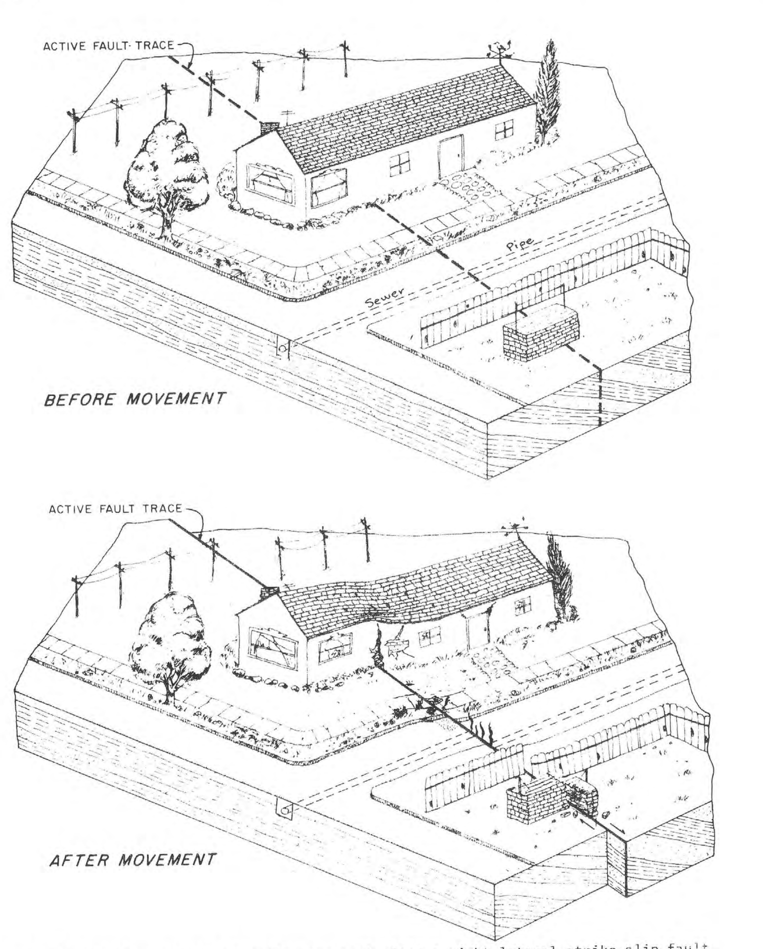


Figure 2. Surface effects of sudden movement along a right-lateral strike-slip fault

A total horizontal displacement of at least 300 km (186 mi) on the San Andreas fault system has been well documented from detailed geologic studies of rock units that were cut by the San Andreas fault, moved laterally, and are now situated far apart on opposite sides of the fault (Grantz and Dickinson, 1968). This movement has been taking place more or less continuously during at least the last 20 to 30 million years and is the same as that observed in historic time. Consequently, it is reasonable to assume that the same kind of movement will continue in the future.

Ground rupture and shift along active faults in the San Andreas system can take two forms: (1) nearly continuous slow slip, or creep, unaccompanied by major earthquakes, and (2) sporadic fast slip or sudden offset accompanied by major earthquakes. Slip presumably occurs when the buildup of stress across the fault exceeds the strength of the rocks in the fault zone. The buildup occurs as the plates shift position with respect to each other, bend the rocks at their juncture, and store elastic energy. When the friction that temporarily locks a fault is overcome, creep or sudden offset occurs. If the offset is sudden, the rock masses adjacent to the fault generate earthquake vibrations as they snap past each other. Either style of slip can dislodge structures built across an active fault, although the creep style of movement disrupts gradually, whereas sporadic sudden slip causes virtually instantaneous disruption. The segment of the San Andreas fault zone in Santa Cruz County apparently has not undergone any appreciable creep since the major offset associated with the earthquake of 1906, when fault movements of from 1 to 2 m (3-6 ft) were noted. Larger offsets of up to 6 m accompanying this same earthquake were recorded to the north in Marin County (Lawson, 1908).

Since fault movement on the grand scale of the San Andreas system cannot be prevented, proper use of land and careful engineering of structures are essential to prevent or mitigate the destruction caused by ground rupture and seismic shaking (Nichols and Buchanan-Banks, 1974). At present, no one can accurately predict when movement on the San Andreas fault system will recur, or which fault within the system will move next, but studies in the Carrizo Plain west of Bakersfield (Wallace, 1968) show that during approximately the last 10,000 to 20,000 years, displacements occurred over and over again along the same break of the San Andreas fault. Along this break or active trace a major destructive earthquake occurred in 1857 accompanied by a surface shift that probably was as large as 9 m (30 ft). These observations suggest that lines of most recent ground breakage are likely to be the locations of ground breakage during future earthquakes. Future movement, however, will not necessarily be confined to mapped faults; indeed surface breakage could develop anywhere within the major fault zones. Furthermore, as the experience of the 1971 San Fernando earthquake has shown us, rupture may occur on branching or otherwise related faults within the San Andreas system. Consequently, faults that form part of the San Andreas fault system in Santa Cruz County such as the San Gregorio, Butano, Corralitos, and Zayante faults are carefully evaluated in this report.

CONSERVATIVE ANALYSIS FOR LAND-USE PLANNING

Engineers and planners should be alerted to geologic phenomena that may prove hazardous to man so that the presence or absence of such phenomena can be investigated and so that design and construction plans can be modified if necessary. This fault map has been prepared with a conservative philosophy that portrayal of questionable geologic features which could adversely affect an engineered structure will lead to their investigation, whereas omission of such questionable features might lead to the inference that no problem exists. To this end, information has been included on the map even if it seemed questionable or was not verified, as long as it had some scientific basis and was consistent with the currently available information (Wentworth and others, 1970). Thus possible faults and connections between faults have been shown where reasonable, even though conclusive evidence for their existence may be lacking.

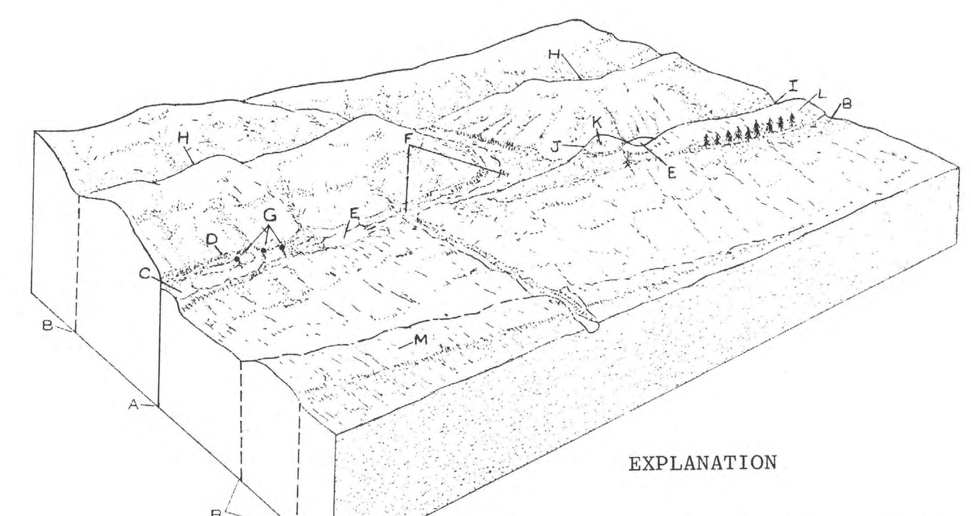
LOCATIONS OF FAULTS AND FAULT-RELATED FEATURES

Map users should consider a line on the map not as a precisely located fault, but as an approximate guide to the field locations of fault breaks or potential fault-break features. Where such features are large enough or distinctive enough to be shown by the contours of the topographic map, the fault break is located to within 30 m (100 ft). Where fault-related features are more subtle, where topographic maps show comparatively little detail, or where the land is densely vegetated, the mapped line may be as much as 60 m (200 ft) from the actual fault break; in areas of featureless topography, the accuracy may be even less. Since this map is not intended to be a substitute for on-site geologic investigations, consulting geologists, engineers, and others making use of this map will need to make ground surveys to analyze and confirm these fault lines and to refine their positions in relation to engineered structures and land boundaries.

RECOGNITION OF FAULT FEATURES BY MEANS OF PHOTOINTERPRETATION

This map is a compilation of previously mapped bedrock faults, offshore faults, and previously unmapped faults and fault-related features recognized by study of several sets of aerial photographs. These photographs include both black-and-white and color sets made at different times of the day and seasons of the year between 1939 and 1972, at scales ranging from 1:6,000 to 1:80,000. Faults and fault-related features identified by photointerpretation were verified by extensive field inspections, though owing to time limitations, probably only 30-40% of the photolineaments noted on the map have been field checked. Lineaments, linear alignments of sag ponds, scarps, and vegetation lineations as well as other fault-related features were transferred from the photographs to 1:24,000 topographic maps by visual inspection and subsequently photoreduced and transferred to the 1:62,500 base map of this report. Unfortunately, low angle (horizontal or near-horizontal) dip-slip faults tend not to produce linear surface features and, consequently, are very difficult to detect on aerial photographs.

Fault breaks generally can be recognized by topographic discordances or contrasts in vegetation that reflect varying depths to ground water or soil color differences across fault traces. Recently active fault breaks are recognized chiefly by landscape features that are relatively short-lived. The preservation of such features is dependent on climate, topographic position, physiographic relief and nature of the underlying geologic materials. The most commonly observed features indicative of recent movement are scarps, trenches, notches, ridges, offset streams, sag ponds and other small undrained depressions, linear valleys, and lines of springs (fig. 3). These features develop in complex and different ways, but they are all controlled by repeated movements along a fault, or by erosion along its trace. The degree of preservation of these features is the key in estimating the recency of activity. Horizontal and vertical displacements of a few inches or a few feet accumulate from successive displacements accompanying earthquakes, from slow tectonic creep between earthquakes, or from a combination of both. Whether they are caused by slow creep or by intermittent rapid movements, the displacements produce scarps and other topographic features that delineate the fault lines shown on the map. As the edges of opposing horizontally moving fault blocks such as those along the San Andreas fault zone slide by one another, topographic irregularities are juxtaposed to form sags, sag ponds, and low ridges that alter normal drainage patterns. Notches and trenches along fault lines commonly reflect increased erosion of the less resistant crushed and broken rock of a fault zone, or they may be downdropped slivers of rock lying between parallel breaks in a fault zone.



EXPLANATION

A. Right-lateral fault like the San Andreas	G. Line of springs
B. Inferred fault	H. Linear valley
C. Bench	I. Trench
D. Scarp	J. Notch
E. Sag pond	K. Knob
F. Offset drainage channel	L. Vegetation lineation
	M. Elongate ridge

Figure 3. Diagram showing some of the landscape features resulting from faulting.

In Santa Cruz County, fault-related topographic features are best preserved along gently sloping ridge tops, notches, saddles and spurs, sites at which erosion and mass wasting processes operate slowly, or in low-lying depositional areas where rates of sediment deposition are slow relative to rates of fault displacement. Fault-related features are poorly preserved or completely absent along slopes where erosion and mass-wasting processes such as soil creep and landsliding are active. In some parts of the county, generally the mountainous regions, fault break features are obscured by the dense vegetation cover. Because the recognition of faulting by photointerpretation depends both on the visibility of the ground and on the degree to which local erosional and depositional processes have allowed preservation of fault-related landscape features, the absence of identifiable evidence of recent displacement in places along a fault zone does not necessarily imply that the fault is inactive and safe.

ZONES OF POTENTIAL SURFACE RUPTURE DUE TO FAULTING

We have outlined on the map those areas in Santa Cruz County that, on the basis of presently available evidence, may be prone to surface rupture due to faulting. These areas are represented on the map by several zones of potential surface rupture. For the purpose of land-use planning and fault-hazard zonation, it is important to distinguish between a fault zone, and a zone of potential surface rupture. A fault zone such as the San Andreas is an area, generally narrow and linear, that contains within it several parallel and subparallel fault traces, some of which have moved more recently than others. A zone of potential surface rupture is an area of elevated risk outlined for the purpose of fault-rupture hazard zonation and represents a delineation of those areas where rupture is likely to occur in the future. Zones of potential rupture have been outlined by considering five variables that affect the probability of ground rupture at any particular point within the area of study: 1) the presence or absence of faults, 2) the recency of fault activity (that is, historic, Holocene, Quaternary, etc.), 3) the degree of certainty regarding fault activity, 4) the degree of certainty regarding fault location and 5) relations between fault lengths and potential earthquake magnitudes, based on available estimates complied from the historic record. From consideration of these variables, four categories of zone of potential surface rupture have been distinguished. These are: 1) zone of HIGH potential surface rupture, 2) zone of MODERATE potential surface rupture, 3) zone of LOW potential surface rupture, and 4) zone of uncertain potential surface rupture called INSUFFICIENT DATA.

Since for any particular area there is usually a considerable degree of uncertainty or error in evaluating the above-mentioned variables, any zone of potential surface rupture that is outlined on the basis of these variables will have a corresponding uncertainty or error. For this reason, we have incorporated a safety margin into the zoning procedure and enlarged each zone by an amount which we believe reflects the uncertainty inherent in evaluating all the different variables on which that zone is based. The category to which a particular potential rupture zone is assigned is largely a function of the recency of faulting observed on faults within that zone, that is, the more recent the faulting, the higher the potential for future rupture. The width of a particular zone of potential surface rupture is dependent on 1) the geometric distribution of individual fault breaks within that zone with 2) a safety margin added to compensate for the uncertainties of the recency of fault activity, fault break location, and sense of fault movement.

Within the Santa Cruz County, we found a spectrum of fault types, ranging from those which have been active in historic time and whose locations and features are well known to faults whose activity is uncertain and whose locations can be inferred only from indirect evidence. For faults of the latter type, it is very difficult to estimate their future rupture potential or the probable width of their associated zone of deformation.

BOUNDARIES OF POTENTIAL SURFACE RUPTURE ZONES

Since the relations between earthquake magnitude, type of fault movement, and width of the zone of deformation are at least partly understood, the historic record of faulting can provide some rough guidelines for estimating both the width of potential rupture zones and the recurrence intervals for faults that have not moved in historic time. From a study of 14 episodes of North American faulting that occurred before 1968, Bonilla (1970) found that the maximum distances from the centerline of the main fault to the outer edge of its zone of rupture depended partly on the sense of fault movement. Horizontally moving (strike-slip) faults like the San Andreas tended to have narrower rupture zones than vertically-moving (dip-slip) faults (fig. 4). We have used Bonilla's 92 m and 425 m figures (half-widths of rupture zones) in establishing the boundaries of the potential rupture zones for strike-slip and dip-slip faults, respectively, in Santa Cruz County.[1] Boundaries for the potential rupture zones for the major faults in Santa Cruz County are based on the following criteria:

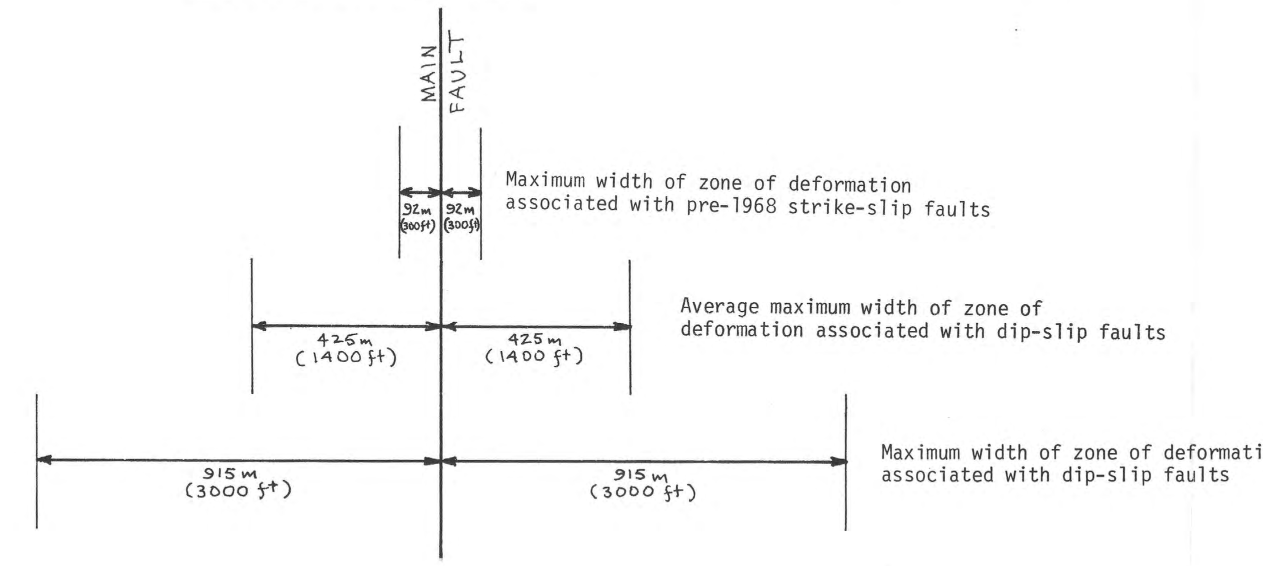


Figure 4. Maximum widths of main fault rupture zones (modified from Bonilla, 1970)

1. Where a high density of genetically related fault lineaments associated with strike-slip movement has been found, as for example, along the San Andreas fault zone, it was relatively easy to establish the boundaries of potential rupture zone. The edge of a category A zone (HIGH) has been plotted 92 m (300 ft) beyond the outermost lineaments. Even though individual lineaments in a fault zone may be mapped as discontinuous, the rupture zone surrounding them was plotted as continuous.

2. Along faults such as the Zayante it was more difficult to outline potential rupture zone boundaries since lineaments are fewer and not as uniformily distributed as they are along the San Andreas fault zone. Also, some evidence suggests (Table 1) that the Zayante fault has moved with both horizontal (strike-slip) and vertical (dip-slip) components. Consequently an 850 m (2800 ft)-wide potential rupture zone assigned to category D (INSUFFICIENT DATA) was drawn along the entire fault and was centered on the best established throughgoing strand or on the approximate midline of the currently known breaks of the fault zone. For those segments of the fault zone defined by lineaments most confidently established as being faults (that is, what are shown as faults and probable faults on the map), a potential rupture zone of category B (MODERATE) was drawn around these lineaments and extended 92 m (300 ft) beyond them. Thus faults like the Zayante, Corralitos, and Butano, which have many similarities (Table 1), are depicted by a zone assigned to category D that is at least 850 m wide and in some places by a wider zone (assigned either to category B or D) where there is supporting geologic evidence.

3. For the additional faults in Santa Cruz County whose degree of potential hazard is currently unknown but could possibly be substantial, an 184 m (600 ft)-wide potential rupture zone of category D was assigned.

4. For simplicity, faults in category C (LOW) are shown only as lines on the map and lack an overprint pattern to depict their potential rupture zones.

CATEGORIES OF POTENTIAL RUPTURE ZONES AND THEIR IMPLICATIONS FOR LAND-USE PLANNING

The degree of hazard posed to man and his works within a region designated as a potential rupture zone depends heavily on the nature of the activity of the faults within that zone. Consequently, potential rupture zones have been categorized according to the faults they enclose and the anticipated behavior of those faults (fig. 5).

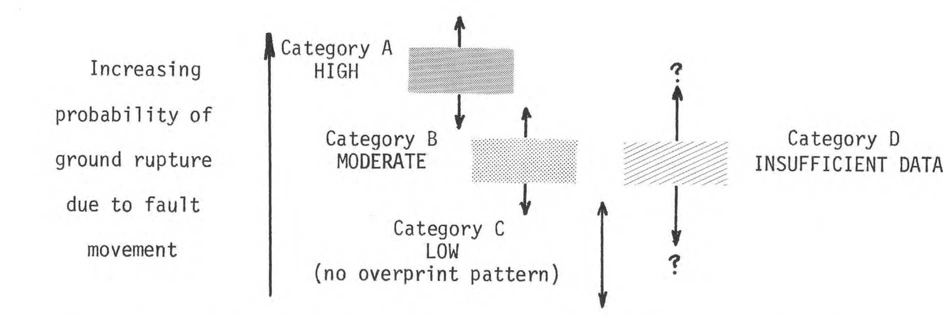


Figure 5. Zones of potential surface rupture due to faulting. The arrows indicate the gradational nature of this classification and the uncertainty inherent in assigning a particular fault or segment of a fault to a given potential rupture zone.

Category A. HIGH potential rupture zone - Surface rupture is considered probable within this zone during the anticipated engineering life of permanent structures such as large dams, bridges, and public buildings that might be located there. The San Andreas fault is the only fault in the county delineated by the HIGH potential rupture zone.

1. Fault characteristics:

   Faults in the HIGH potential rupture zone are considered ACTIVE and meet two or more of the following criteria (modified after Brown, 1972):

   a. length of at least 10 km (6 mi)[2]
   b. historic records of surface faulting and large magnitude earthquakes
   c. fault traces marked by abundant topographic features that are geologically ephemeral (for example, sag ponds) or that demonstrate repeated and systematic displacements (for example, offset drainage channels)
   d. frequent small-magnitude earthquakes along or adjacent and parallel to fault zone
   e. systematic displacement of Holocene strata (deposits less than 10,000 years old)
   f. current and measurable systematic displacement across the surface of the fault zone (fault creep or accumulation of elastic strain)

2. Anticipated fault behavior:

   a. recurrence interval for faulting measured in tens to hundreds of years
   b. surface movements predominantly horizontal up to 6 m (20 ft), but vertical displacements of a few metres also possible[3]
   c. within the HIGH potential rupture zone probability of rupture is highest on the lines shown as faults, less high on probable faults, still less on possible faults, and least in areas between the lines

Category B. MODERATE potential rupture zone - Surface rupture is considered possible within this zone during the anticipated engineering life of large permanent structures located there.

1. Fault characteristics:

   Faults in the MODERATE potential rupture zone are considered POTENTIALLY ACTIVE and meet two or more of the following criteria:

   a. length of at least 10 km (6 mi)
   b. connected at the earth's surface to a major ACTIVE fault such as the San Andreas
   c. associated with small magnitude earthquake activity
   d. systematic displacement of late Pleistocene (between about 500,000 and 10,000 years old) or younger deposits that cross the fault or fault zone
   e. topographic features in the fault zone indicative of recent faulting are present but most are substantially modified by erosion or deposition

2. Anticipated fault behavior:

   a. recurrence interval for faulting possibly measured in hundreds to thousands of years (that is, possibly an order of magnitude less frequent than ACTIVE faults like the San Andreas)
   b. surface movements involving either horizontal or vertical displacements or both of several centimetres to a metre or more may be possible
   c. within the MODERATE potential rupture zone, probability of rupture is inferred to be highest on the lines shown as faults, lower on probable faults, still lower on possible faults, lower yet on photolineaments of unknown origin, and least within the area between lines

Category C. LOW potential rupture zone - Surface rupture is considered unlikely within this zone during the anticipated engineering life of large permanent structures located there. Overprint patterns have not been used to delineate faults in this category on the map.

1. Fault characteristics:

   Faults in this category are considered INACTIVE and should meet two or more of the following criteria:

   a. length less than 10 km (6 mi)
   b. not visibly connected or closely related to a known ACTIVE fault or POTENTIALLY ACTIVE fault
   c. no associated earthquake activity
   d. late Pleistocene or younger deposits not offset by the fault
   e. fault-produced landforms absent

2. Anticipated fault behavior:

   a. recurrence interval for faulting unknown; possibly thousands to tens of thousands of years or more (that is, possibly an order of magnitude less frequent than faults within the MODERATE potential rupture zone)
   b. if fault is shorter than 10 km (6 mi), offsets greater than 12 cm (5 in) are not likely
   c. if it can be satisfactorily established that the fault has not moved in the last 2,000,000 years (Quaternary time), it can be considered INACTIVE

Category D. INSUFFICIENT DATA potential rupture zone - The potential for ground rupture in this zone is unknown.

1. Fault characteristics:

   Includes faults, probable faults, and inferred faults longer than 10 km (6 mi) which, if ACTIVE or POTENTIALLY ACTIVE, could be included in the HIGH or MODERATE potential rupture zones. It also includes segments of fault zones that lack well-defined fault-related lineaments such as parts of the Zayante, Corralitos, and Butano fault zones.

2. Anticipated fault behavior:

   Unknown

IMPLICATIONS FOR LAND-USE PLANNING

Fault rupture and associated ground deformation can have serious consequences on man's use of the land. Although the area directly affected by faulting is small compared to the shaking effects of an earthquake, structures such as buildings, bridges, dams, tunnels, and pipelines have been severely damaged by surface faulting associated with large historic earthquakes in many parts of the world. Slower movements such as fault creep also have damaged structures. Depending on the amount and mode of displacement, structures astride or immediately adjacent to active faults may undergo shearing, compressional, extensional, or rotational strains and thus can be severely damaged or even destroyed.

The potential surface rupture zones delineated on the map represent areas of varied likelihood of future fault movement as determined from their geologic characteristics. Some faults within these zones may pose extreme hazard to the integrity of structures built upon them. Thus, thorough site investigations to evaluate the local level of risk from future fault movement are needed to guide land use and engineering development within the zones.

The consequences of surface rupture and deformation to different types of land use within the identified potential rupture zones can be best assessed by public officials in consultation with engineers, geologists, and seismologists. Where the consequences of ground displacement suggest unacceptable levels of risk to property or life, alternative land uses that would be compatible with fault rupture could be recommended (Nichols and Buchanan-Banks, 1974). The alternatives may include (1) establishment of a fault hazard easement for new construction that would require a setback distance from the trace of an active fault; (2) prohibition of certain uses--such as high-occupancy structures or critical facilities--while permitting other types that are compatible with the high level of hazard; (3) encouragement of removal of hazardously located structures through application of nonconforming building ordinances; and (4) extraordinary engineering design provisions to accommodate for potential surface rupture and deformation.

FUTURE MODIFICATION OF ZONES

It is anticipated that future detailed geologic site studies will indicate that the length or width of certain zone boundaries should be modified, or that they may delineate areas within the zones that are relatively safe from tectonic deformation because they are underlain by unfractured rock. As more information is gathered about the important faults or segments of faults in Santa Cruz County, it may become necessary to reassign them to different zones of potential surface rupture. Detailed site studies or regional geologic studies also might reveal new, and yet unsuspected, active faults or other geologic hazards that must be recognized and evaluated for land development and use.

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[1] In addition to Bonilla's (1970) findings, the 92 m half-width is attractive for the following other reasons:
1. 92 m is just slightly larger than our maximum anticipated error in locating fault-break features on the map and thus provides a reasonable safety factor.
2. 92 m was also used in delineating the active fault zones in San Mateo County (Brown, 1972).

Both the 92 m and 425 m figures are not maximum values because greater rupture zone widths have been observed. 425 m is the average maximum, not the greatest maximum observed, for rupture zone widths along dip-slip faults. The width of the surface rupture zone accompanying the Borrego Mountain earthquake of April 9, 1968, exceeded 100 m along 25 percent of this strike-slip fault break (Clark, 1972). Analysis of earthquakes and their associated surface ruptures for faults outside North America also indicates a figure greater than 92 m could be justified for strike-slip faults (Bonilla, 1971).

[2] In this study faults and fault zones longer than 10 km (6 mi) are considered to pose the most significant potential hazards to Santa Cruz County both in terms of generating large surface displacements and destructive earthquakes. Using the half-length assumed by Wentworth, Bonilla, and Buchanan (1972), a 10 km-long fault has an inferred potential of producing a 4.5 magnitude quake (the approximate threshold of structural damage) with anticipated displacements on the order of 3 to 12 cm (1 to 5 in) (Bonilla and Buchanan, 1970, fig. 2). Shorter faults should not be ignored, however, because the relations between magnitude, fault length, and sense of displacement are not well understood and because the actual length of a fault might greatly exceed its mapped length, thus suggesting a capability for a larger magnitude earthquake than anticipated.

[3] Insight into what future ruptures along the San Andreas fault might be like in northern California can be gained from accounts of the 1906 event (Lawson, 1908, p. 53):

> "The width of the zone of surface rupturing varied usually from a few feet up to 50 feet or more. Not uncommonly there were auxiliary cracks either branching from the main fault-trace obliquely for a few hundred feet or yards, or lying subparallel to it and not, so far as disturbance of the soil indicated, directly connected with it. Where these auxiliary cracks were features of the fault-trace, the zone of surface disturbance which included them frequently had a width of several hundred feet. The displacement appears thus not always to have been confined to a single line of rupture, but to have been distributed over a zone of varying width. Generally, however, the greater part of the dislocation within this zone was confined to the main line of rupture, usually marked by a narrow ridge of heaved and torn sod."

It is particularly important to note that surveys of the railroad tunnel at Wrights, made before and after the 1906 earthquake, indicated that the zone of deformation across the San Andreas fault in northeastern Santa Cruz County was at least 1220 m (4000 ft) wide (Lawson, 1908, fig. 42).

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