

Alluvial Fans and Regulated Land Use Planning

Alluvial Fan Task Force Plenary Meeting 1

Presentation by:

Boykin Witherspoon III

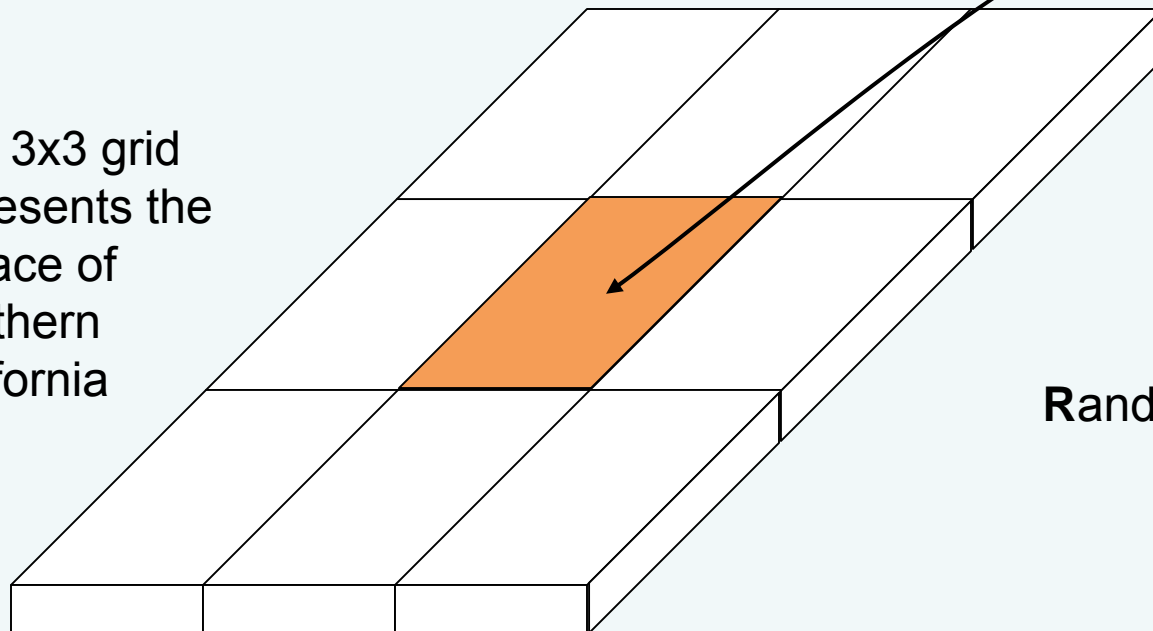
*Center for Geographic Information
Science and Research, California
State Polytechnic University Pomona
(909) 869-6913*

bwitherspoon@csupomona.edu

**Technical Consultant to the
Alluvial Fan**

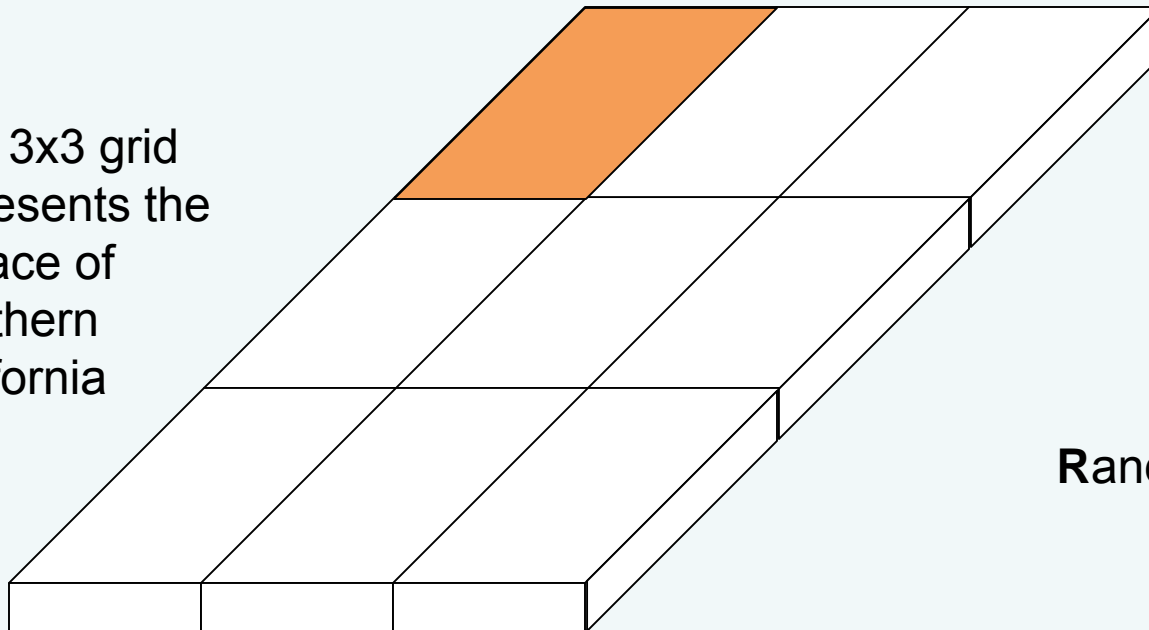


This 3x3 grid
represents the
surface of
Southern
California



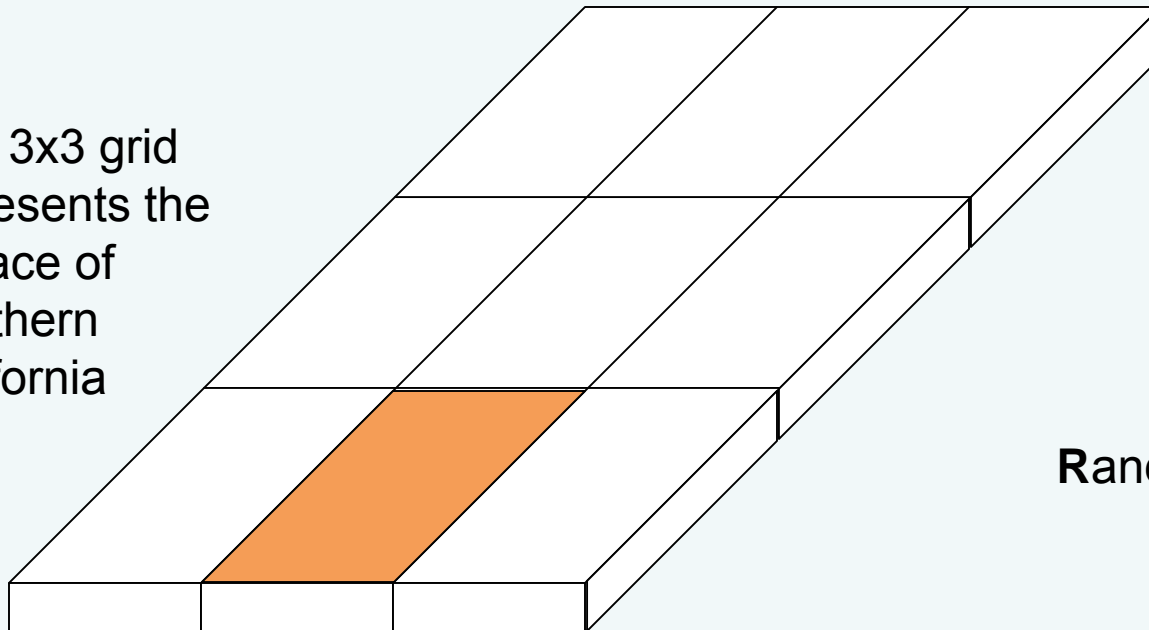
Random **H**azard **G**enerator

This 3x3 grid
represents the
surface of
Southern
California



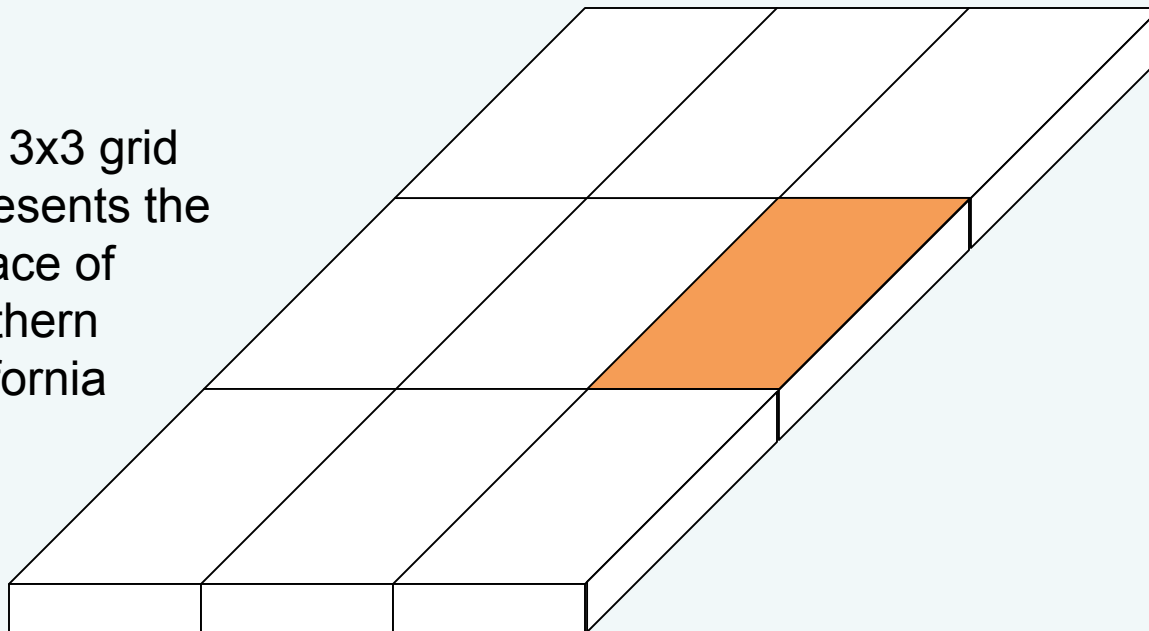
Random Hazard Generator

This 3x3 grid
represents the
surface of
Southern
California

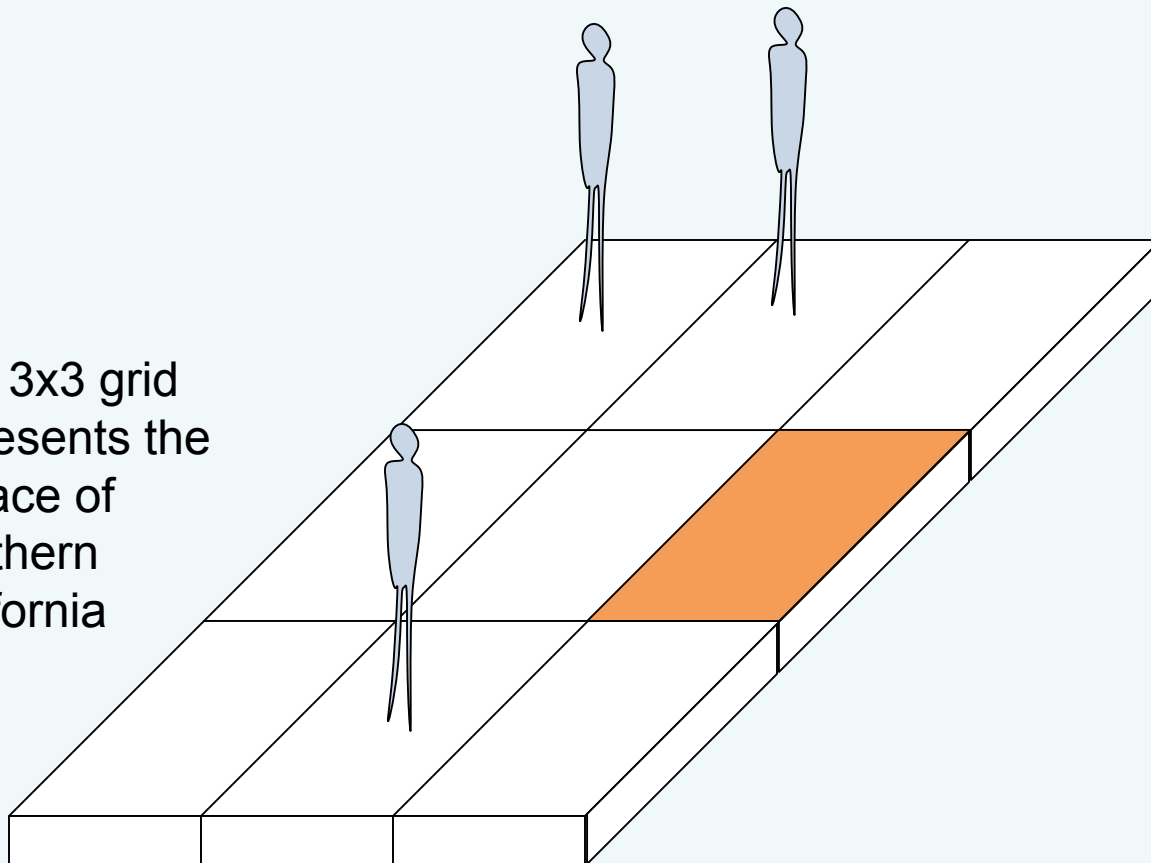


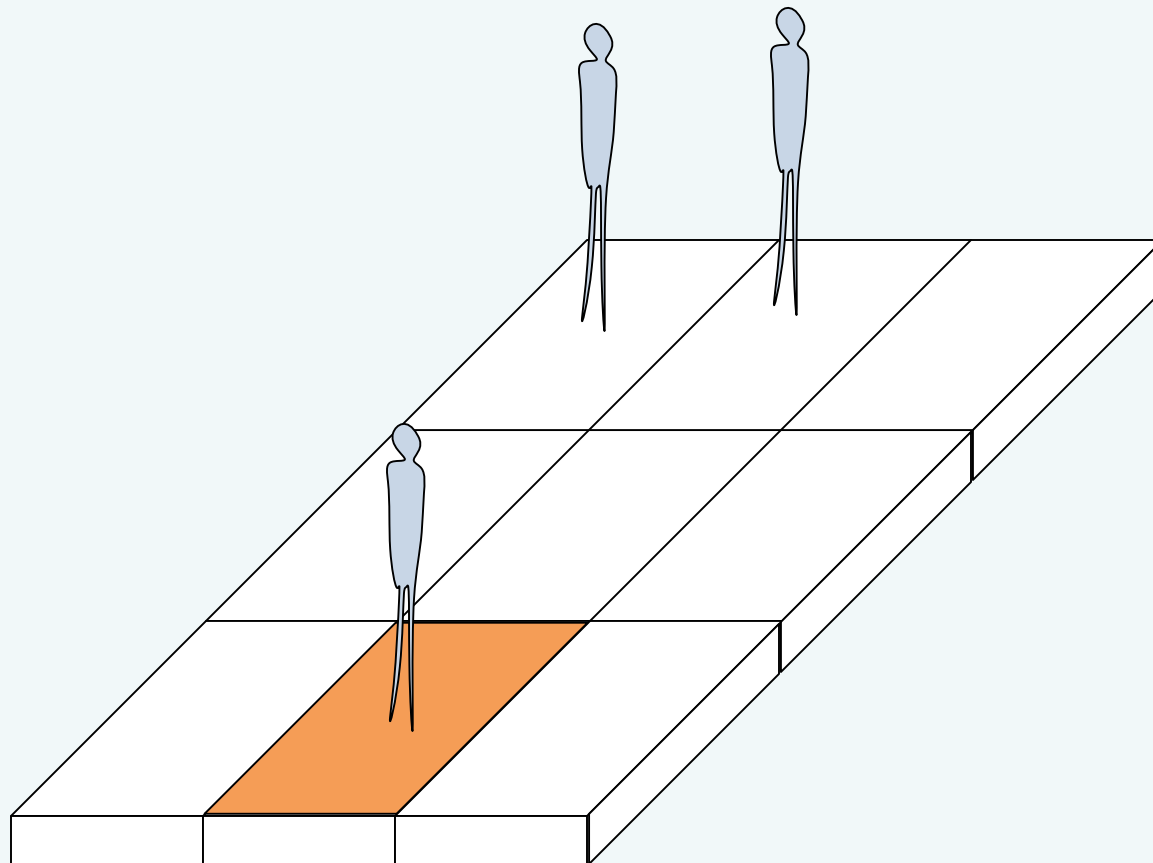
Random Hazard Generator

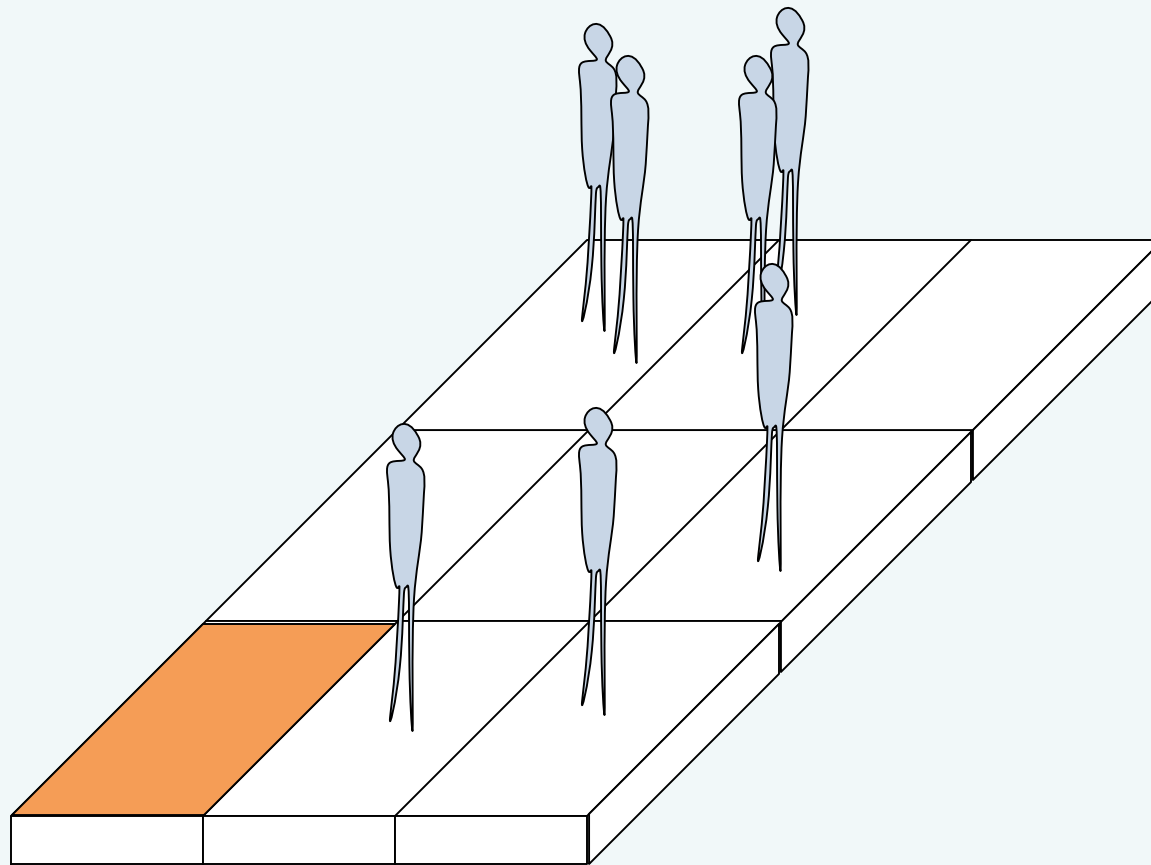
This 3x3 grid
represents the
surface of
Southern
California



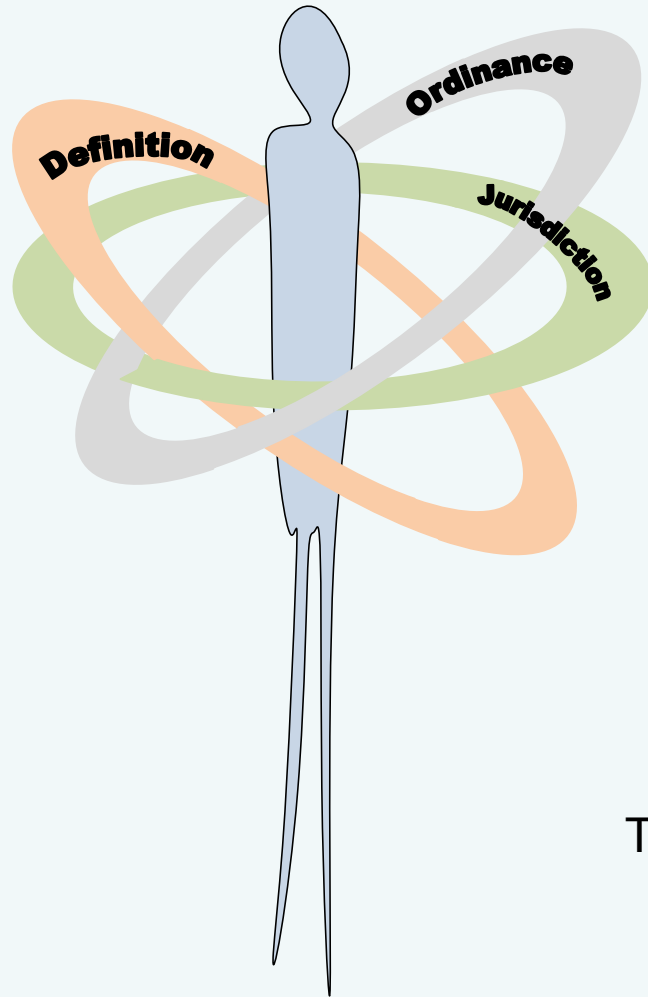
This 3x3 grid
represents the
surface of
Southern
California







Over time we collectively self impose all of these conditions



Definitions define geographies

where are alluvial fans

Jurisdictions define enforcement

who makes and enforces the rules

Ordinances defined, are the rules

*Collectively, we have used our values
These three mechanism insolate us from risk
to shape these mechanisms
to determine our tolerance for risk*

Definition

San Diego County Code of Regulatory Ordinances

http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:sandiegoco_ca_mc

Division 11- Flood Damage Prevention

Chapter 2- Definitions

- (a) "Alluvial fan" means a desert phenomenon where streams emerge from canyons and deposit sand and rock in a cone-shaped formation fanning out from the canyon mouth.
- (b) "Alluvial apron" means an area formed by alluvial deposits with essentially the same characteristics as alluvial fans but generally in smaller watersheds where the flow lines tend to be straighter. Alluvial aprons are designated on the Borrego Valley alluvial fans map.
- (c) "Alluvial wash" means a recent flow path on an alluvial fan which is identified usually by an inspection of maps or aerial photographs or by a ground survey.
- (d) "AO Zone" - See "Area of shallow flooding".
- (f) "Area of shallow flooding" means a designated AO Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and velocity flow may be evident.
- (g) "Area of special flood hazard" - See "Special flood hazard area".
- (k) "Fan Terminus Alluvial Wash" means the flow path where the bottom of an alluvial fan intersects with the edge of another alluvial fan.
- (gg) "Special flood hazard area (SFHA)" means an area having a special flood or flood-related erosion/sedimentation hazard, and shown on FIRM as Zone A, AO, A1-30, or on a County flood plain map as within a 100-year flood plain or on a County alluvial fan map within an alluvial fan area.

Jurisdiction

Continued:

San Diego County Code of Regulatory Ordinances

http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:sandiegoco_ca_mc

SEC. 1. ESTABLISHMENT OF ADMINISTRATIVE CODE.

There is established by this Ordinance and any amendments or supplements thereto or modifications thereof, a Code for the government of the County of San Diego, a Political Subdivision of the State of California, pursuant to its Charter, which Code shall be known and referred to as the “ADMINISTRATIVE CODE,” and which shall be the rules and regulations prescribing the duties and the qualifications of officers, assistants, deputies and employees, and the systems of office, departmental and institutional management of the offices, departments and institutions of the County of San Diego.

SEC. 2. PROVISIONS TO BE CONSTRUED AS RESTATEMENTS.

The provisions of this Code insofar as they are substantially the same as existing provisions of ordinances or codes of the County of San Diego relating to the same subject matter shall be construed as restatements and continuations and not new enactments.

SEC. 3. OFFICES AND EMPLOYMENTS CONTINUED.

All persons who, at the time this Code goes into effect, hold an office or employment under any ordinance or code repealed by this Code, which office or employment is continued by this Code, continue to hold such office or employment according to their former tenure.

Ordinance

Continued:

San Diego County Code of Regulatory Ordinances

http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:sandiegoco_ca_mc

Division 11- Flood Damage Prevention

(2) Alluvial Fans

a. New construction and substantial improvement of any structure in Zone AO or within the alluvial fan boundaries shown on the Borrego Valley Alluvial Fans map and FIRM, **shall have the lowest floor elevated above the highest adjacent grade at least as high as the depth number specified in feet on the Borrego Valley Alluvial Fans map and FIRM when the zoning provides for one-half acre lots or larger and where the alluvial fan depths are two feet or less.** A special engineering analysis is required for areas which have greater alluvial fan depths or more intense land use. Nonresidential structures may meet the standards in Section 811.501(c)(3). Construction of substantial improvement shall not cause a major disruption to the natural alluvial fan process. Foundations of structures shall be protected from erosion. Upon the completion of the structure, the difference in elevation between the lowest floor and the highest adjacent grade shall be certified by a registered professional engineer, architect, surveyor, or by the community official to be properly elevated. Such certification shall be provided to the Flood Plain Administrator.

In case of conflict(s) between the Borrego Valley Alluvial Fans map and FIRM, the more stringent of restrictions shall prevail and be deemed to govern.

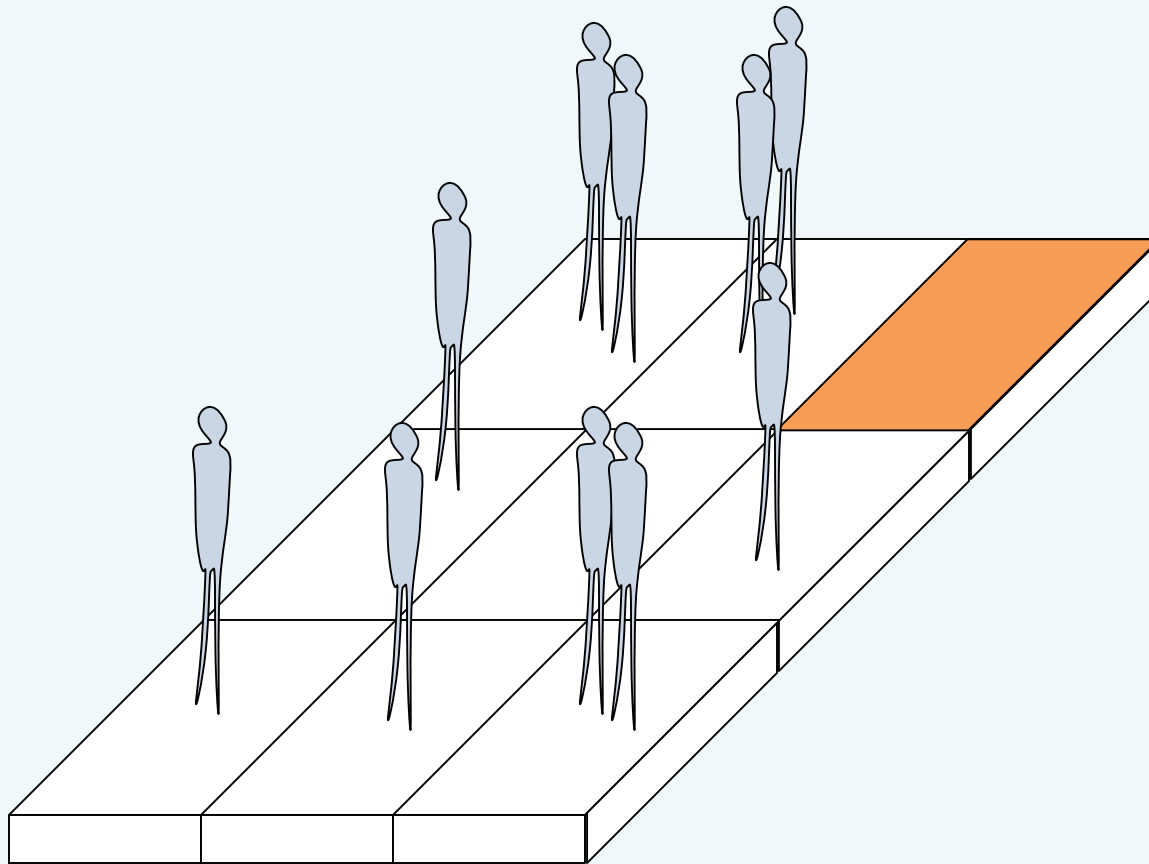
b. The above criteria apply to alluvial aprons. Depths of one foot and velocity of 8 feet/second are to be used unless more specific information is available.

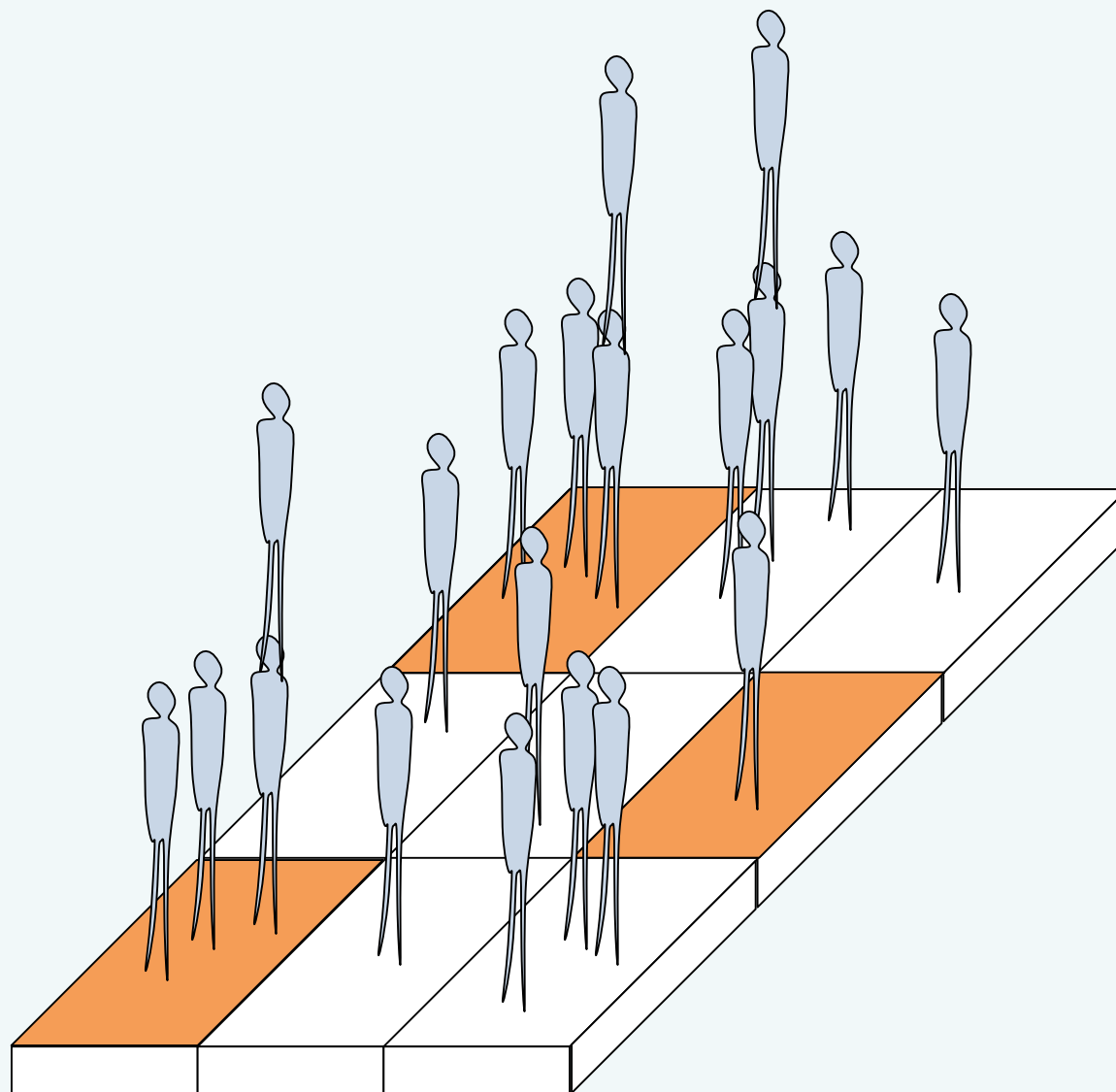
c. Projects which impact alluvial washes must carry the flow from the wash around any structure or obstruction and redistribute the flow without adversely affecting adjoining property.

d. Projects in fan terminus alluvial washes shall be designed so that any obstruction to flow will not cause a cumulative increase in the 100-year water surface of more than 0.5 feet.

e. A preliminary approval of the flood insurance rating should be obtained before construction approval.

We have basically engineered away geographical limitations to where we can live



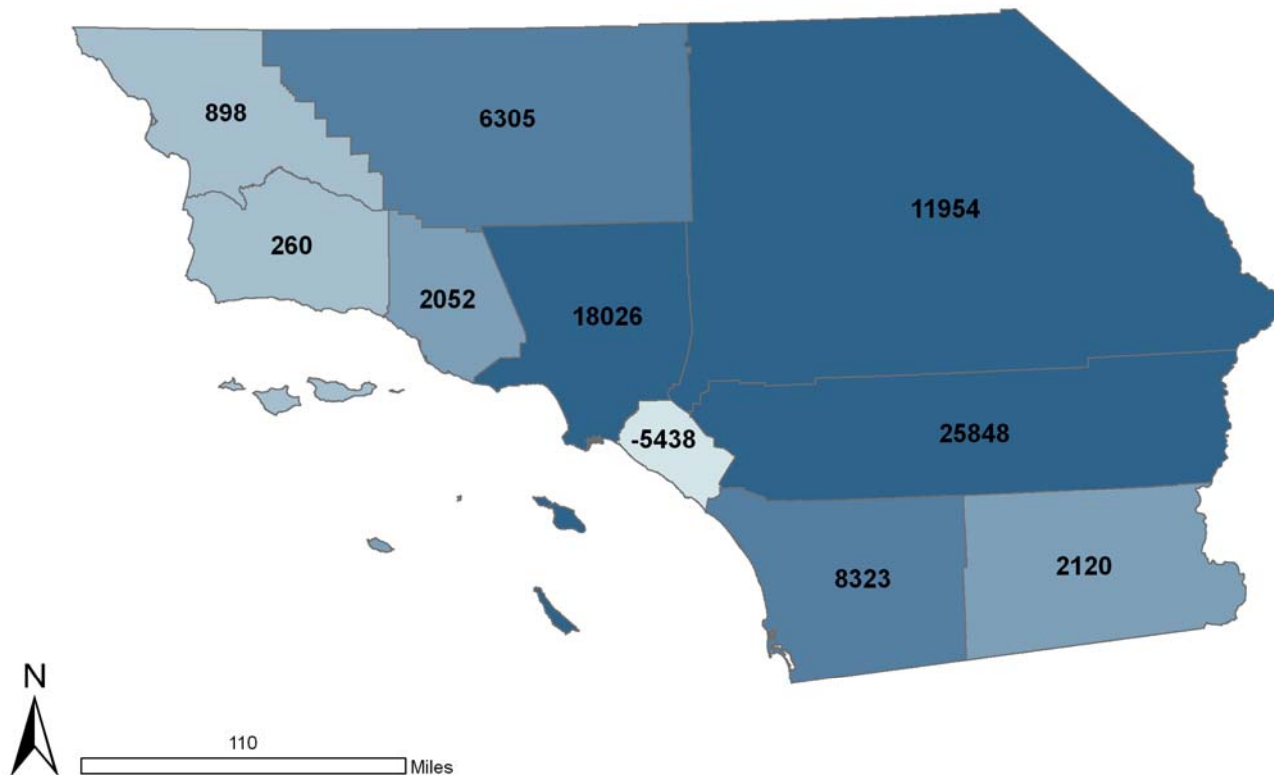


Population Growth in California

- 1990-2000: 58% of state's total population growth was in Southern CA
- 2000 to 2004: 67% of state's total population growth was in Southern CA
- 5 of the top 20 fastest growing counties in the nation are in Southern CA

Source: <http://www.fpm.water.ca.gov/>

Change in the Number of Residential (single/multiple) Construction Starts in California By County Between 1994 and 2004



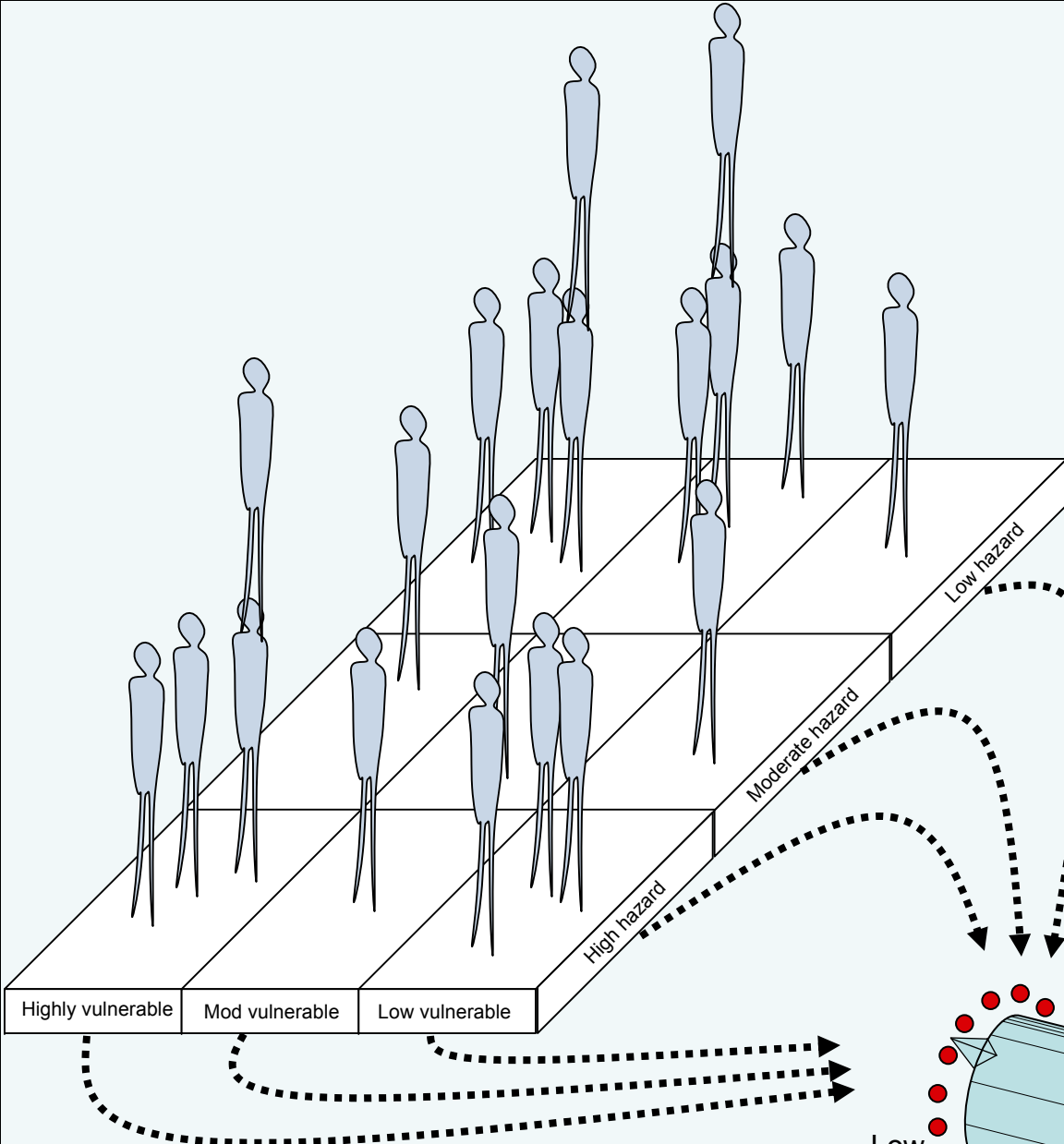
Source: Construction Industry Research Board, <http://www.cirbdata.com>

For example:

In 1994 Riverside County had 8266 starts.

In 2004 Riverside County had 34134 starts.

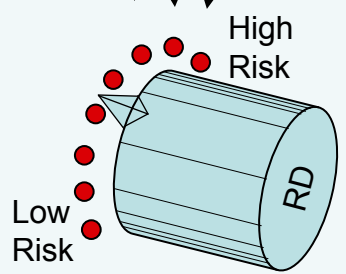
That's **25848** more starts in 2004 than in 1994.



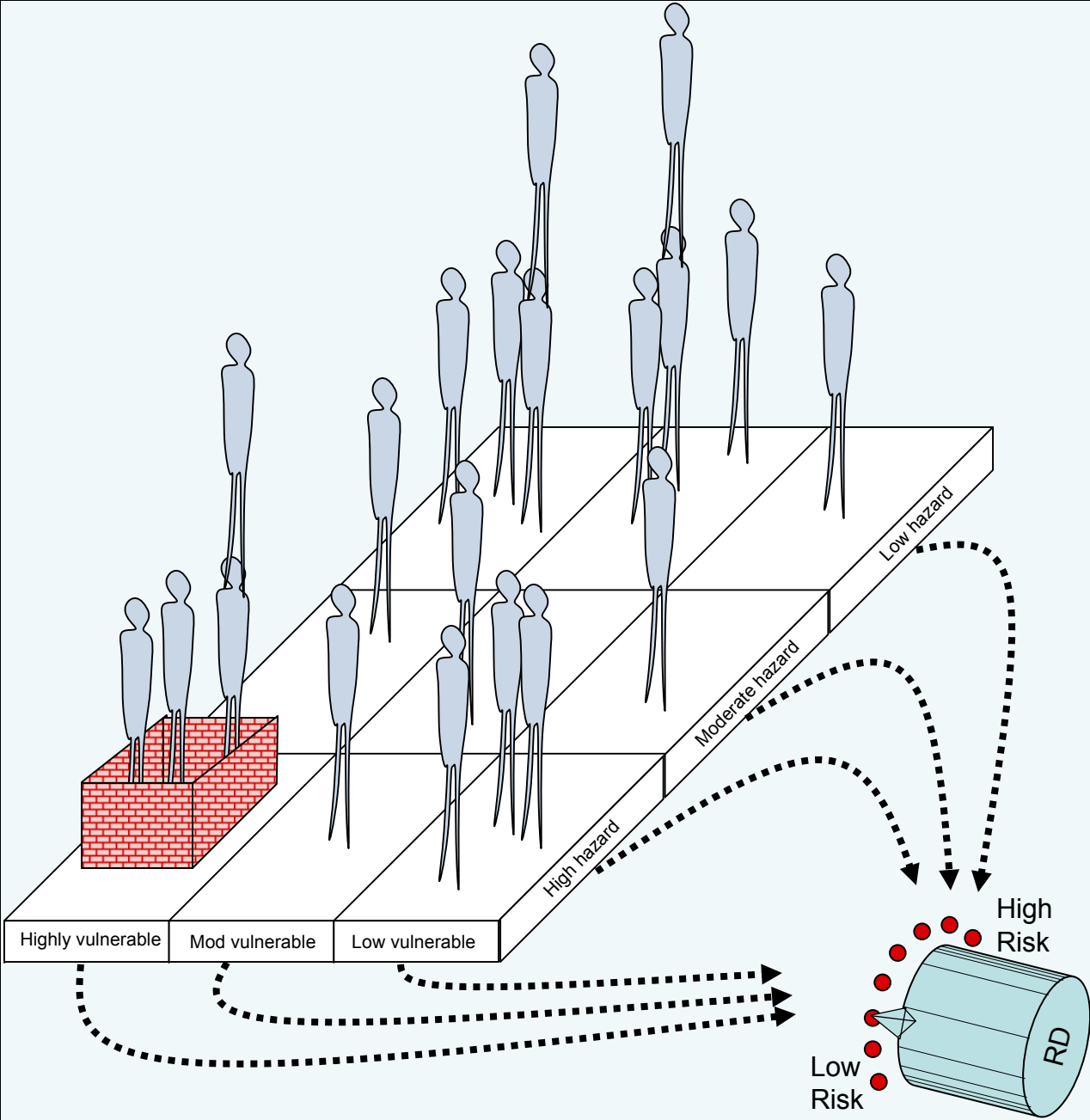
Risk = Probability x Consequences

- Probability is the percent chance of something happening in a given time period (generally measured as a percentage)
- Consequences can be economic loss, loss of life, loss of habitat (generally measured as \$ or loss of life)

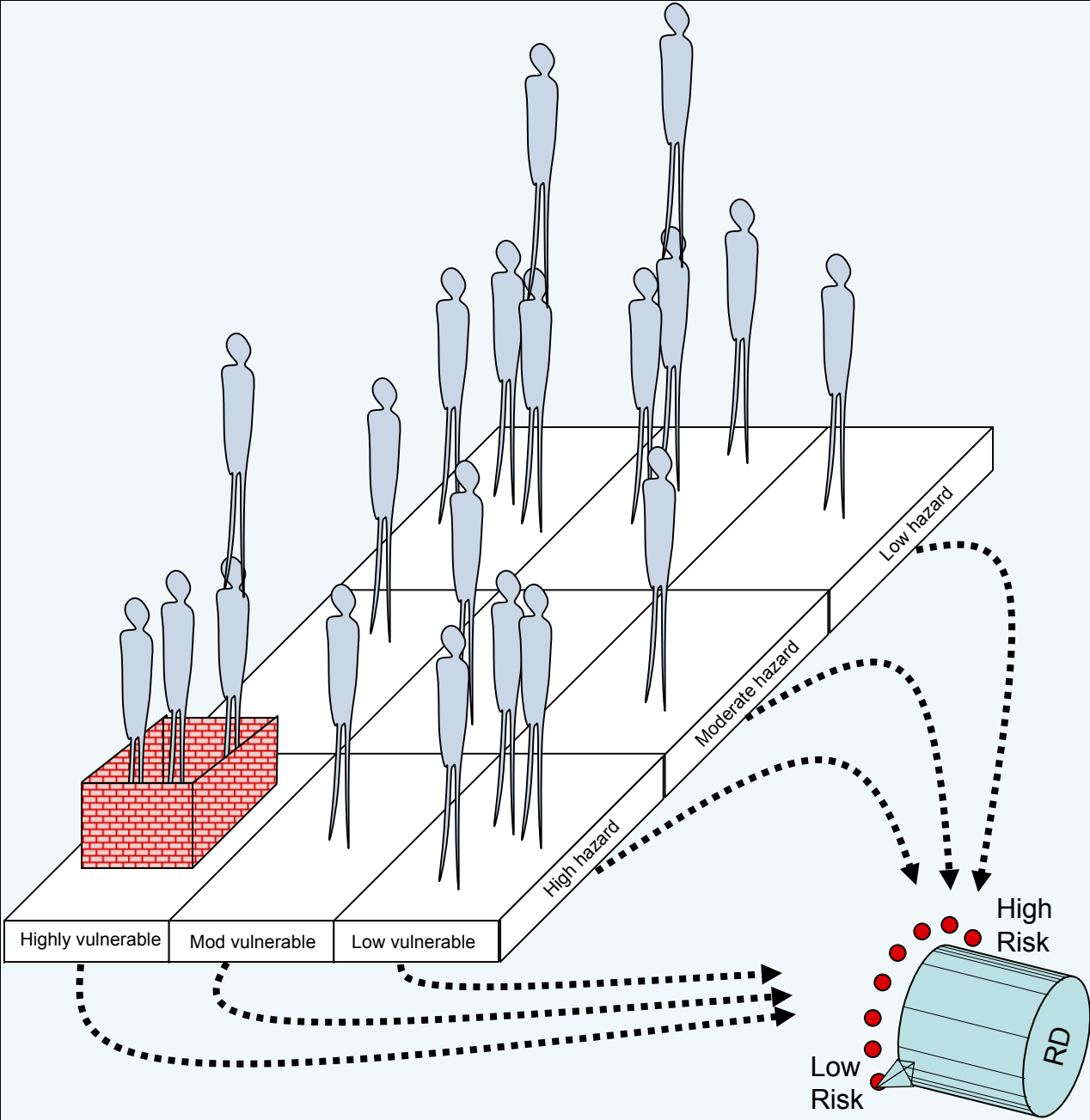
Source, <http://www.fpm.water.ca.gov/index.cfm>



Risk Dial

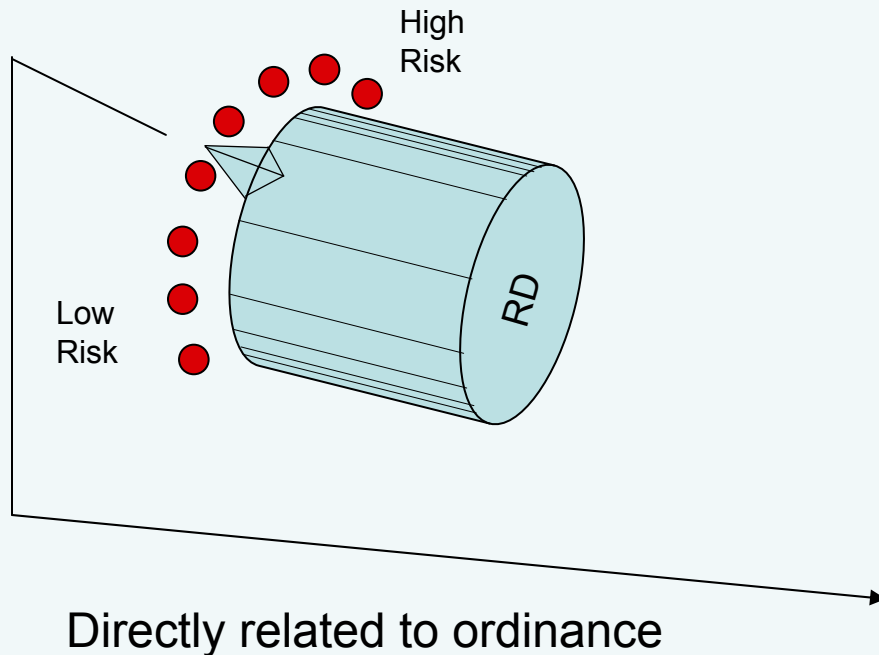


**Risk
Dial**



**Risk
Dial**

This dial basically reflects our human values toward acceptable risk.
Under 1995 values this was an acceptable risk:



Major Flood Event of 1995

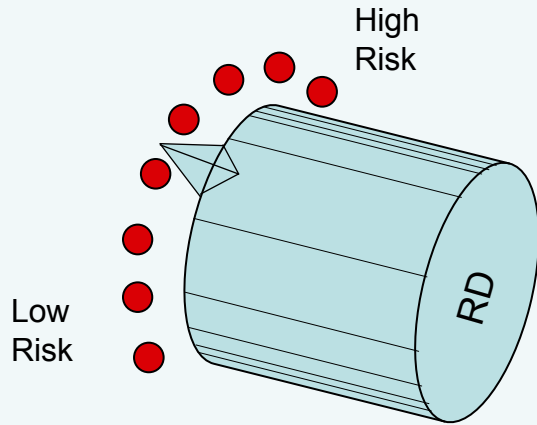
28 people were killed and the flood cost **\$1.8 billion**.

During the events of January and March, over 100 stations recorded their greatest 1-day rainfalls in the station's history.

The major brunt of the January storms hit the Sacramento River Basin and resulted in small stream flooding **primarily due to storm drainage system failures.**

Source: <http://fpmtaskforce.water.ca.gov/Historical%20Events/Historical%20Events.PPT#610,19,Major Flood Event of 1997>

What changes when we collectively change this dial?



Remember this ordinance?

“shall have the lowest floor elevated above the highest adjacent grade at least as high as the depth number specified in feet on the Borrego Valley Alluvial Fans map and FIRM when the zoning provides for one-half acre lots or larger and where the alluvial fan depths are two feet or less. ”

Lowering the risk dial could result in this:

“shall have the lowest floor elevated above the highest adjacent grade at least as high as the depth number specified in feet on the Borrego Valley Alluvial Fans map and FIRM when the zoning provides for one-half acre lots or larger and where the alluvial fan depths are **ONE** foot or less. ”

