Monterey Peninsula
Water
Management
District

The Carmel River
Past, Present, and Future

A presentation to the
Carmel Valley Association

To preserve, protect, and defend the beauty and natural resources of Carmel Valley and the County of Monterey

August 10, 2008

by Larry Hampson, Water Resources Engineer

Monterey Peninsula
Water
Management
District

Carmel River – Past, Present and Future
A presentation to the Carmel Valley Association
Sunday, August 10, 2008

Wild Times

- Influence of local geology on the formation of the river
- Evidence of Native American stewardship along the river

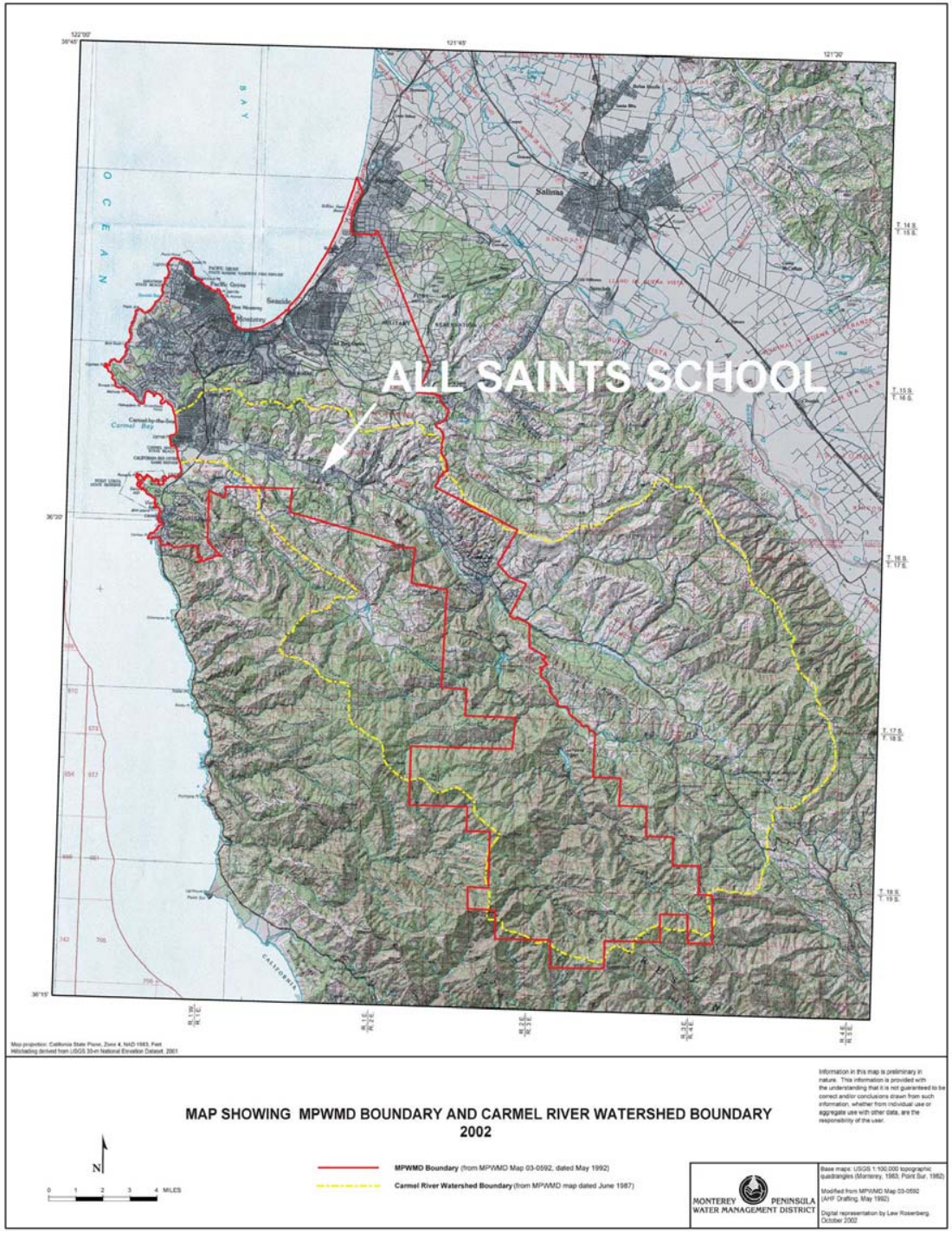
  (note: there is limited information about this)

Spanish Era

- Influence of Father Serra and the Missionary period

Modern Times

- 20th and 21st century water resource development
- Rise of environmental activism
- Flooding in Carmel Valley
- Current trends and resource status of the river
- What's on the horizon



BASIN MAP

Population

(rounded, year 2000)

- Cachagua Valley = 2,000
- Carmel-by-the-Sea = 4,000
- Carmel Valley main = 14,000

Carmel Valley =(about) 20,000

- Monterey Peninsula and Carmel Valley total = 115,000

- Watershed area = 255 square miles or about 163,000 acres

- Basin Complex fire area = 255 square miles (2008)

Basin Geology

- Upper Carmel River dates from the Cretaceous period (shortly after the end of dinosaurs in the the Jurassic period)
- A complex quilt of rocks stitched together by faults of varying ages and other kinds of contacts (i.e., differences in horizontal layers)
  - Igneous
  - Metamorphic
  - Sedimentary in part
- Carmel Valley was carved into the Salinian Block, a piece of crust that began its existence near the Mojave desert and moved northward, dragged by the Pacific plate for the past 20 million years.

Basin Geology

- The Santa Lucia Range has experienced substantial uplift rates for the past two million years (Quaternary time).

- The uplift of the mountains keeps the rivers in a state of general downward incision.

- Many of the headwater streams and larger tributaries of the Carmel watershed occupy geologically youthful “V”-shaped canyons with sharp dividing ridges

Carmel Canyon – Tertiary Age (?)

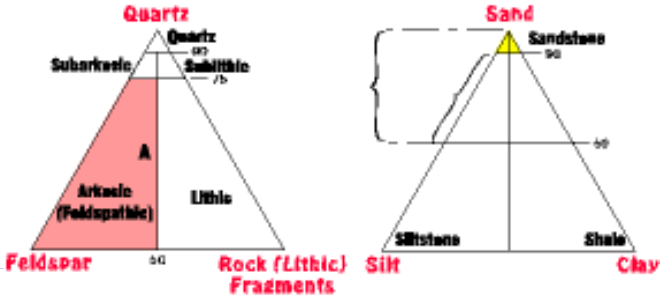
- siltstone, mudstone from 65 (?) million years ago found offshore
- marine sandstone from the Pliocene Epoch- 5 to 1.8 million years ago

Rock Basement Layer Along Carmel River State Beach (50-60 MYA)

Arkosic (feldspathic) arenite

Robinson Canyon Redbeds (12-16 MYA)

QFL Composition



Sandstone with a mixture of quartz and orthoclase feldspar (pink). The sand grains stand out in high relief in this specimen (i.e. there is little matrix) placing this in a sand category.
The sand grains here are very large, some even drifting over into the granule size range (2-4 mm) which would technically make this a gravel (conglomerate). We put it here since most of the grains fall into the sand category.

Tectonic Association

Arkoses with abundant feldspar such as this come from the weathering of a sourceland rich in alkali granite. The absence of virtually any other grains other than quartz and feldspar indicate the immediate source of this rock was not a mixed sourceland.

Red Rock Pool
July 1976

River Terrace Gravels (2-3 MYA) over Monterey Shale (20 MYA) Carmel Valley Road east of mid-Valley

MAJOR FAULTS

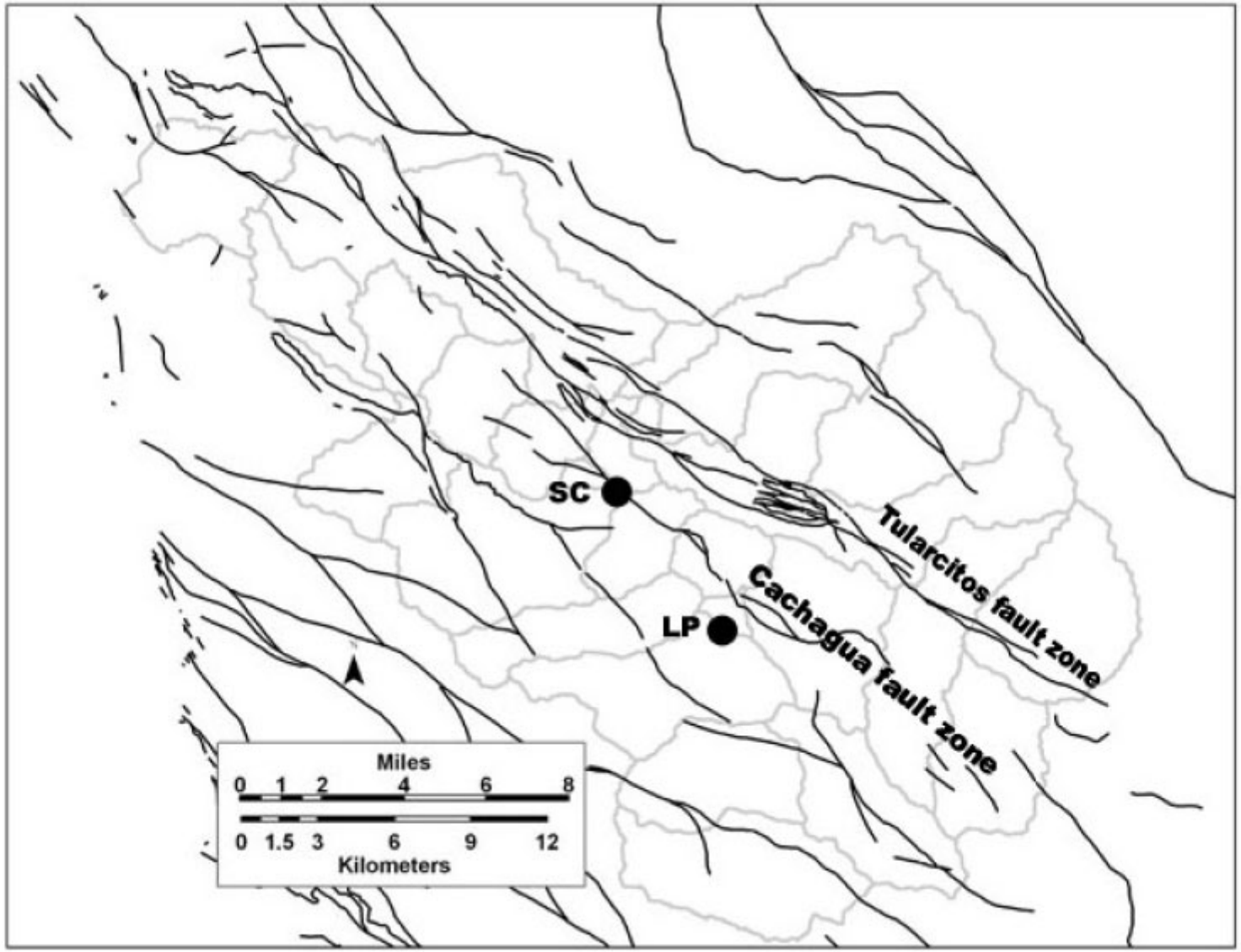


Figure 3: Major faults of the Carmel Watershed. SC is San Clemente Dam. LP is Los Padres Dam.

Uplift and erosion – primary forces shaping the river

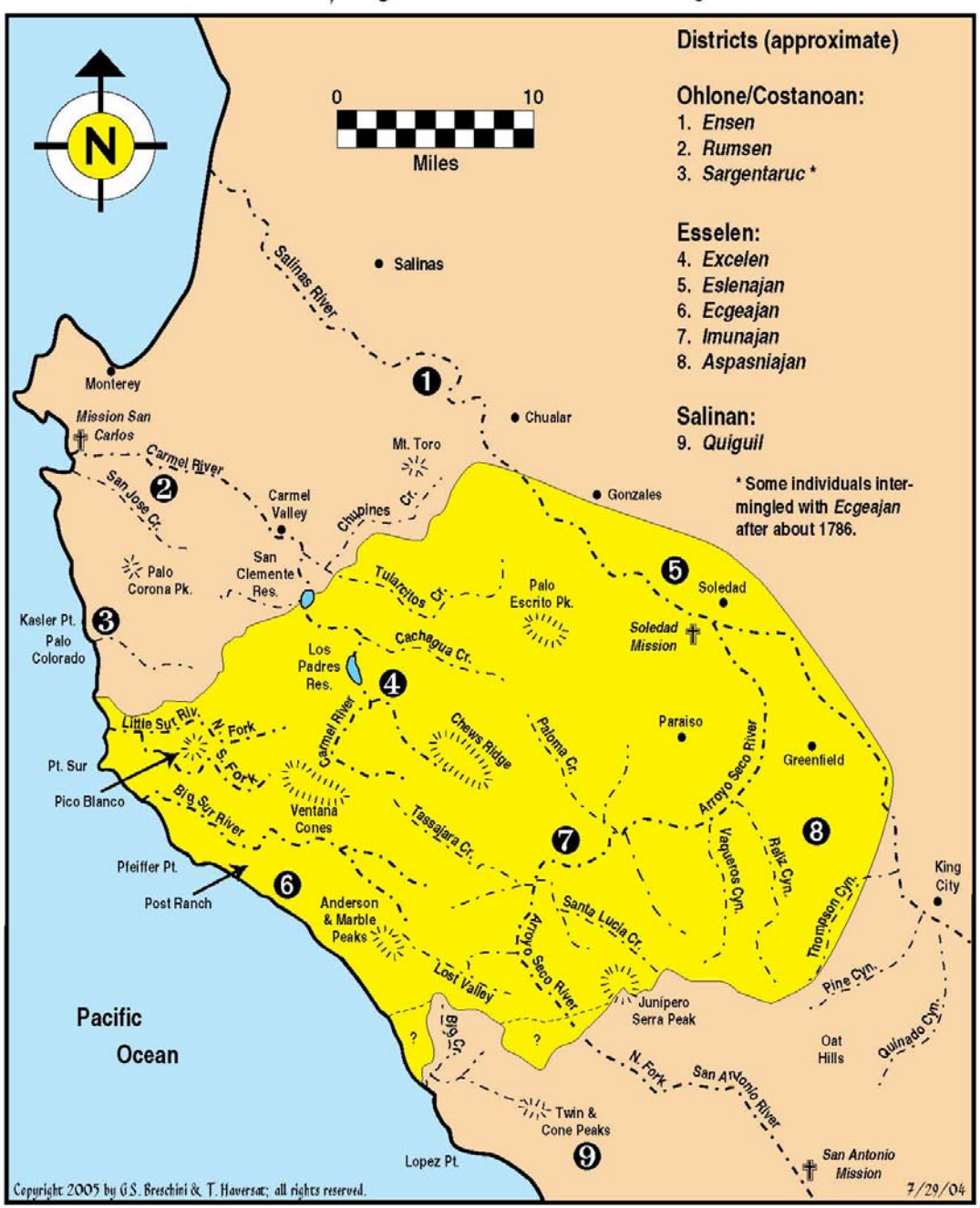
Tularcitos Creek

From Los Tulares – July 2, 2008

Fire Hastens Mass Wasting

Below - Danish Creek watershed – July 12, 2008

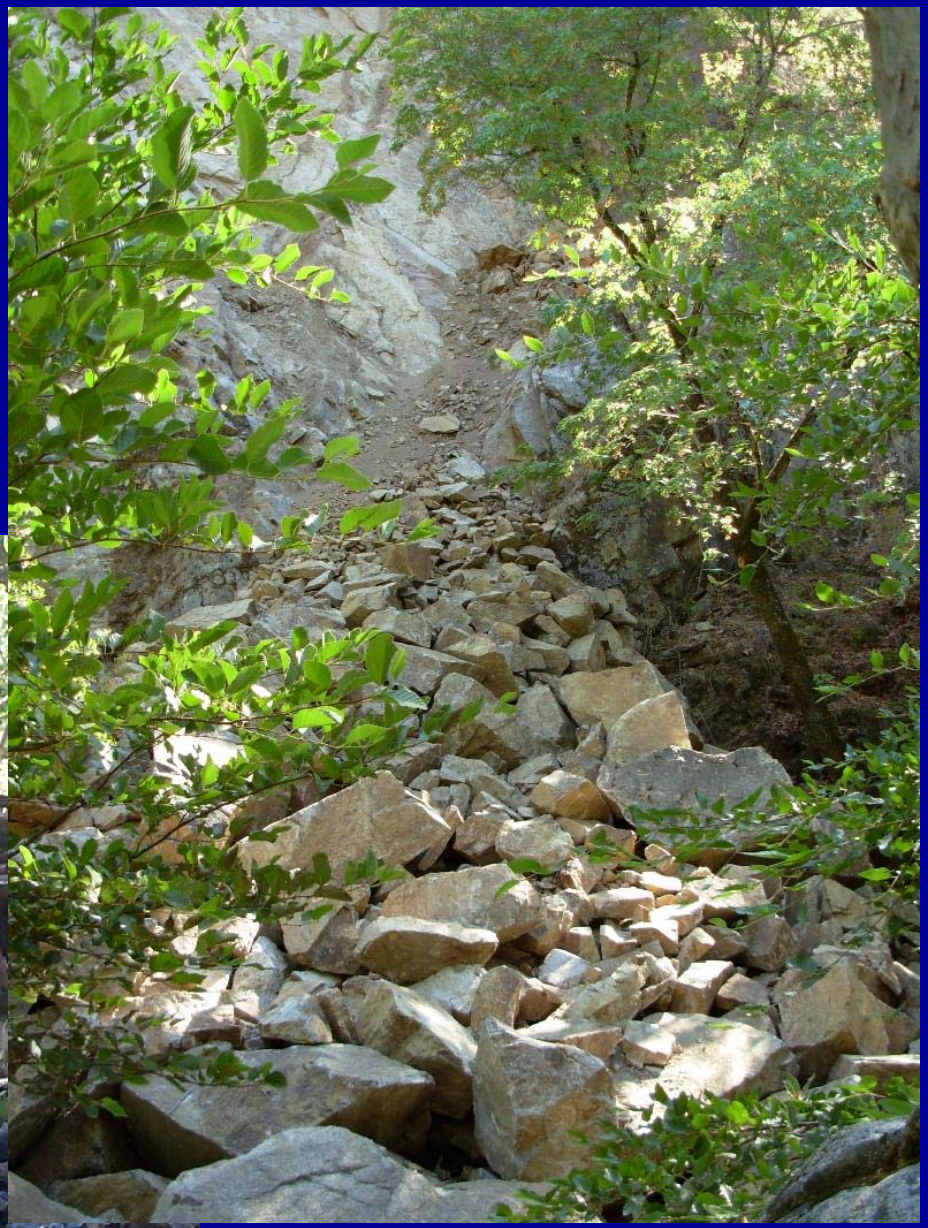
Terrain and Native American Territory



Tribal Areas

Use of map courtesy of Gary S. Breschini

Esselen Territory



Native American Groups

- Esselen Group
  - occupation began about 3,300 years ago
  - one of least populous groups in State (estimates range from 500 to >1,400)
  - largest village was at Princes Camp
  - subsisted on hunting, fishing (including some ocean fishing), and gathering
  - occupied upper Carmel River drainage in six tribelets near the Church Creek area in Miller Canyon-Tassajara Creek
  - controlled about 750 sq. mi. in Santa Lucia Mountains

Esselen Group

- entire length of Carmel River was used as a traditional plant gathering area for medicinal and ceremonial purposes
- Carmel River is the path spirits of the dead travel to the Western Gate or Door to the Island of the Dead at the headwaters of the river

Coastal Indians

Native American Groups

- Rumsen Group
  - Ohlone tribelet of about 500
  - five villages along the Carmel River, including one at the Santa Lucia Preserve
  - tradition places Costanoan Rumsen in California for at least 20,000 years
  - CSUMB Master Plan suggests settlement by at least 5,000 B.C. and possibly earlier

Acorn Diet

Above – mortar from mid-Valley

Left - acorn woodpecker granary

A healthy way of life?

"Old Gabriel"

San Carlos Mission records show he was 119 in 1890, so he was born the year Fr. Serra moved the mission to Carmel Valley

Vizcaíno discovers Monterey Bay and the Carmel River in 1603

1603 January 3rd Sebastian Vizcaíno discovers a stream and names it El Rio del Carmelo, probably because three friars of the Carmelite order were members of his expedition, this in honor of their patroness, Our Lady of Mount Carmel. (Wagner, p. 379)

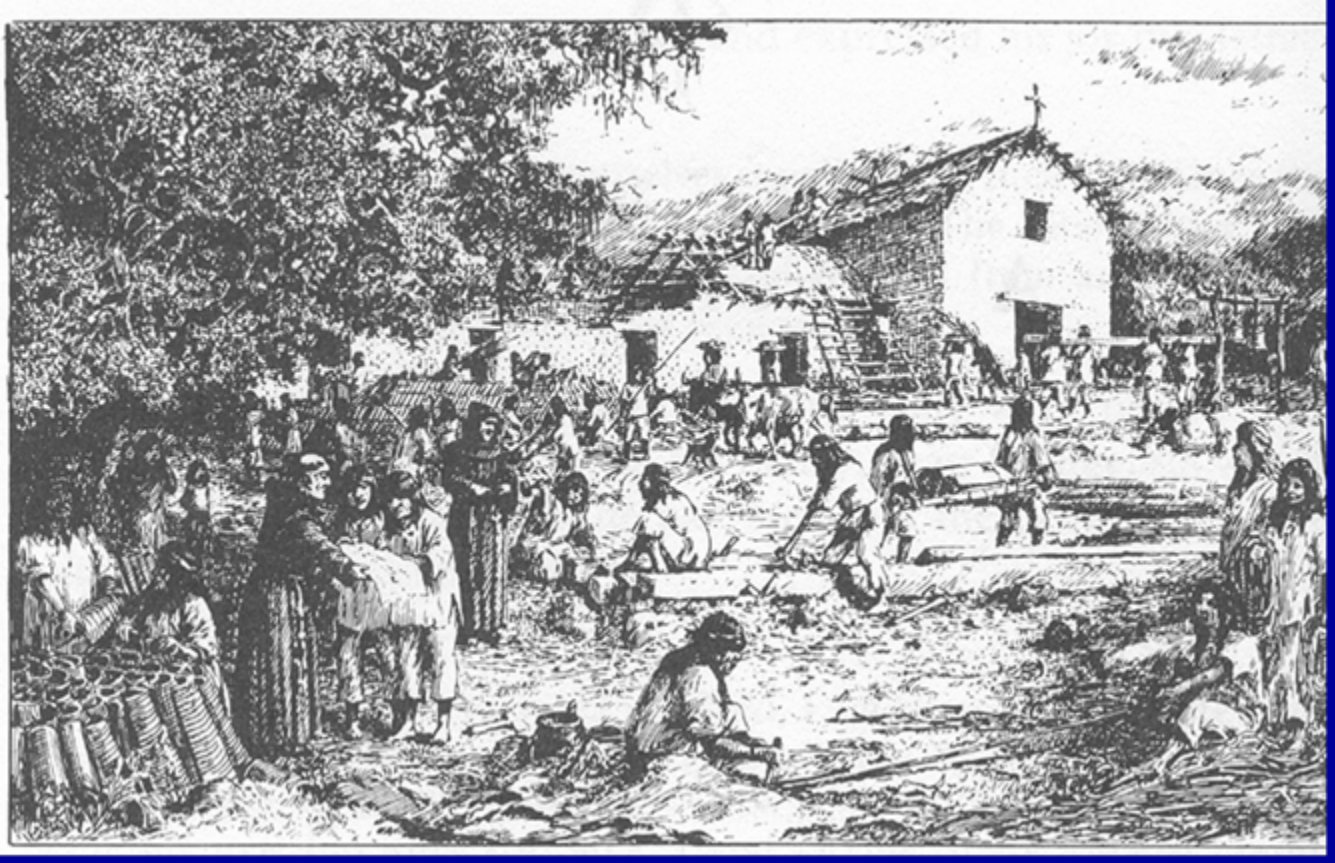
Mission Era

1770 - Father Serra arrives at Monterey

- He writes to Father Juan Andres: “Or it may be necessary to leave the presidio here and move the mission with a few soldiers to the banks of the Carmel, two short leagues to the South. It is a truly delightful spot, which, thanks to its plentiful supply of both land and water, gives promise of abundant harvests.” 6/12/1770 (Vandevere)

Filling the lagoon with water and salmon (steelhead)

- **1783** In his annual report Serra writes: “To the 7 months’ worth required to take water from the river for irrigation, as mentioned above, we must add the labor of bringing it to the lagoon near the mission residence. In some years, this lagoon used to be dry. Now it is always full, making it a great convenience and a delight to the mission. Some salmon (pescado) have been placed in the pool so we have it handy.”



Salty Soil Around the Lagoon

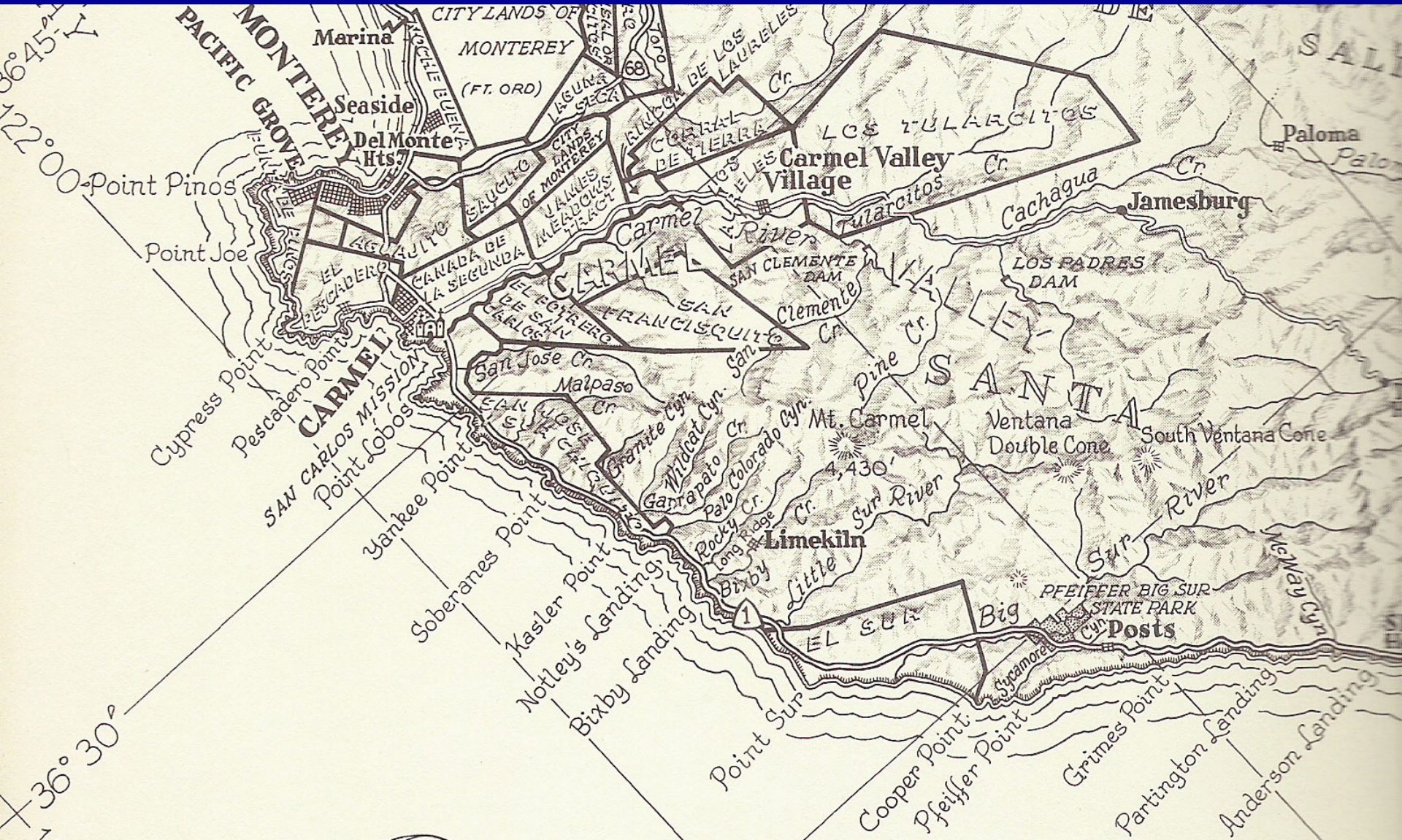
1771: Serra writes to Father Francisco Palou:

"What we did here, we of the mission, in the way of raising crops came to nothing. We made a little garden nearby and enclosed it; the Indians doing the digging. The whole of it became one seeding bed, as Father Fray Juan had all kinds of seeds. Everything came out fine, but nothing grew to maturity. We were all greatly puzzled. Later we found out that the ground, while showing no signs of it, at times is washed over by the salt water of the bay and so is fit for nothing but nettles and reeds." 6/21/1771 (Vandervere)

End of the Mission Era

- Mexican citizens in California felt that all California lands should be opened up to settlement
- Governor Echeandia issued decrees in 1826, 1830, and 1831 to secularize mission property
- Stated purpose was to free Native Americans from bondage and give them property
- Immediate effects of secularization throughout California were to deprive a large percentage of the remaining mission Indians of their rightful property and disperse mission property to a few well placed individuals
- By early 1800's, Carmel Valley natives had left their villages for missions or fled into the mountains

Ranchos (granted 1820's-1840's)



Joining of Carmel Valley to the Monterey Peninsula

Hotel Del Monte opened June 10, 1880 by Charles Crocker (Pacific Improvement Company)

Old Carmel Dam built to serve Hotel Del Monte

- constructed ca 1880
- 700 Chinese laborers
- 25 miles of 12-inch iron pipe
- crossed river in five places
- first Monterey Peninsula water supply
- included five-foot trestle at Robinson Canyon

Solid Construction

Granite block abutments (above)

Mortar and cobble center support (right)

Above - looking downstream at door in dam - made for sediment passage?

San Clemente Dam • March 29, 1932

Pat Hathaway Collection

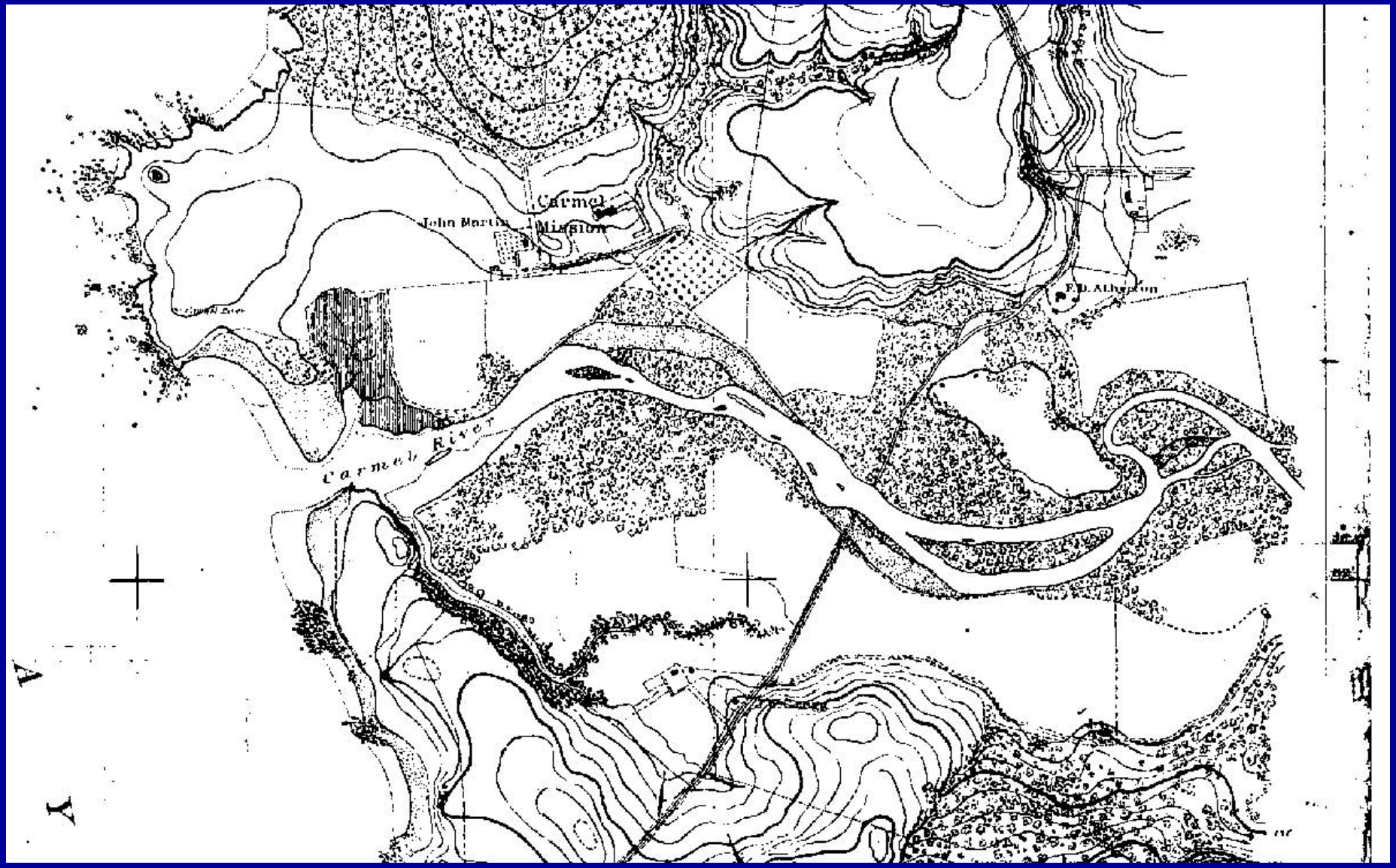
1921 cost to build
$1-2 million

Finding no water in Pebble Beach, SFB Morse buys most of Carmel Valley from Crocker family to obtain water rights and builds San Clemente Dam

2007 cost to remove
> $80 million

San Clemente Reservoir

U.S. Coast 1876 Survey

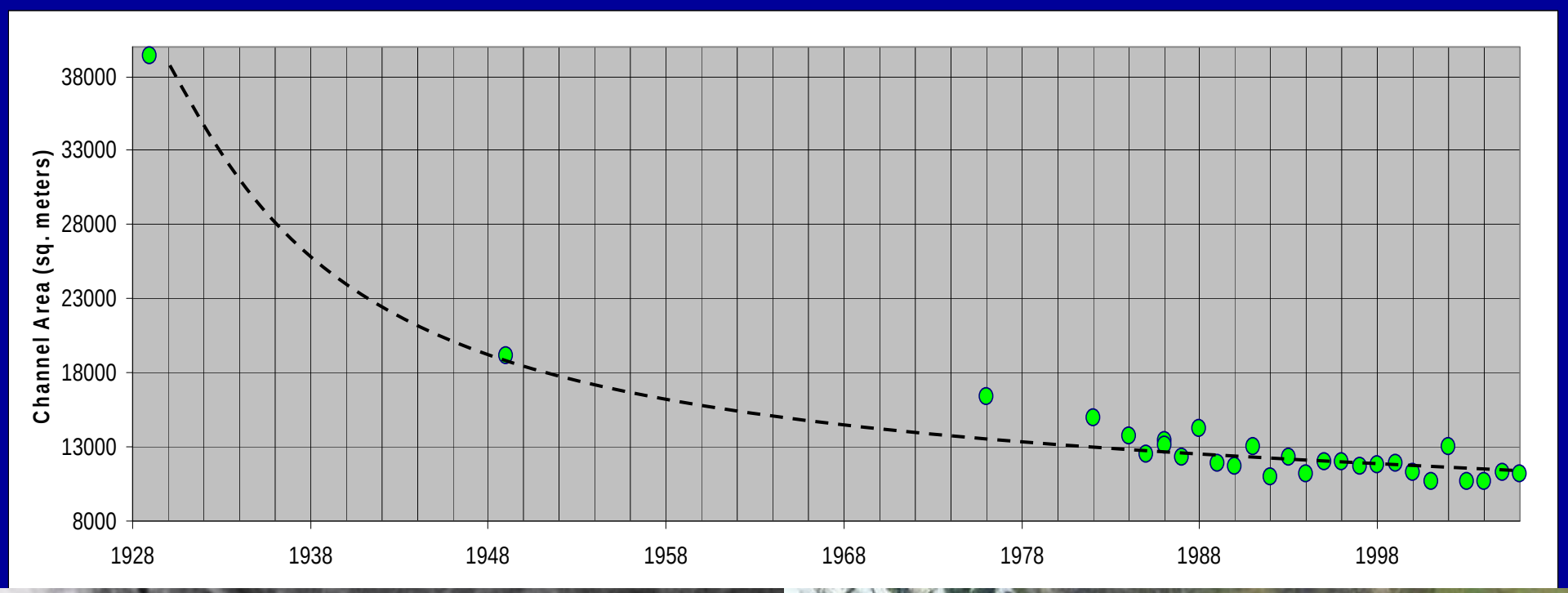


Breaching the the Carmel River State Beach – an old tradition

Sand Mining at the Carmel River Lagoon - 1937


1929


2006

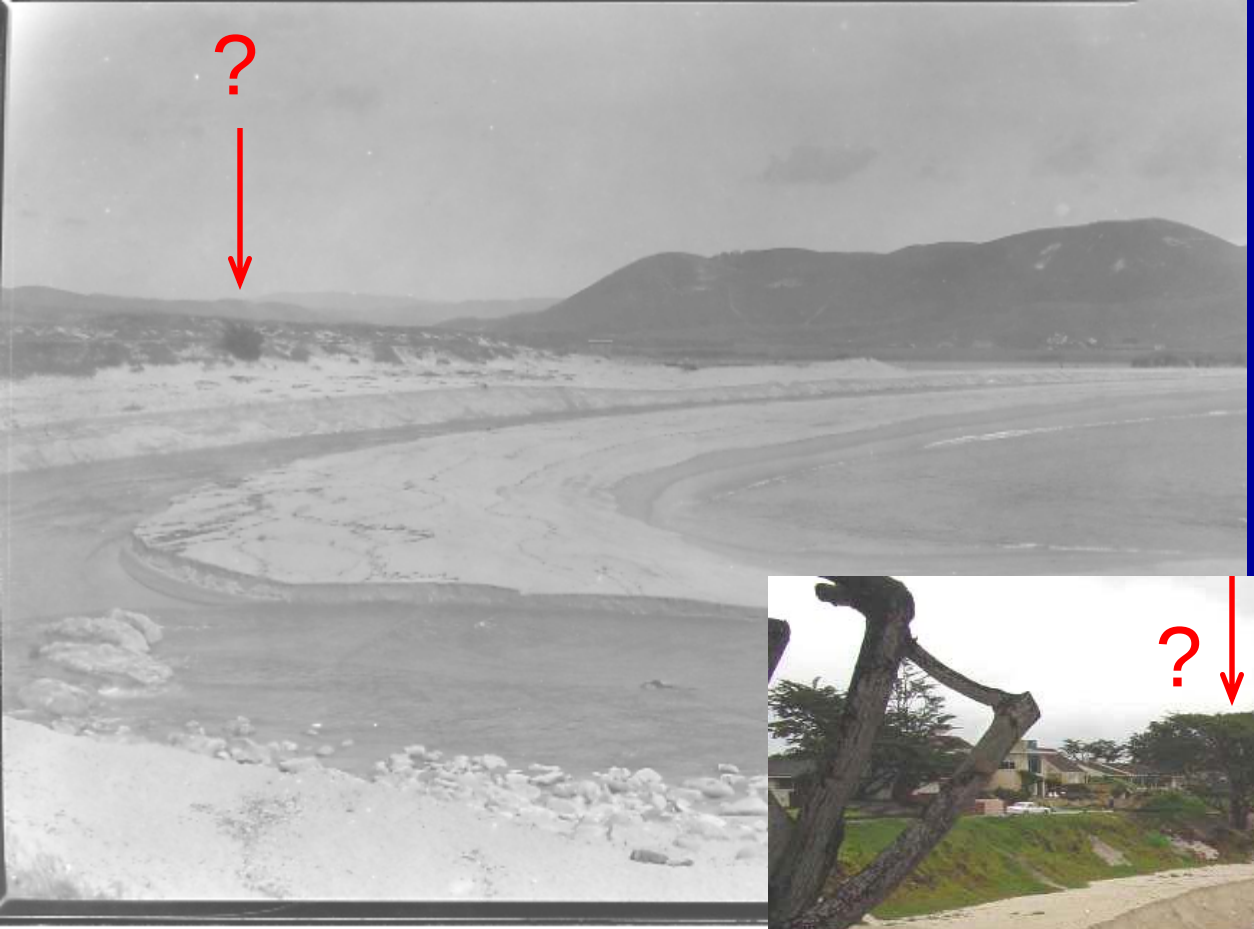

Channel Area (sq. meters)
38000
33000
28000
23000
18000
13000
8000
1928
1938
1948
1958
1968
1978
1988
1998

So has the beach changed?

1935
Courtesy of
Bruno O'Dello

Carmel River Lagoon 1937-2007

Stewart's Cove



Pat Hathaway Photo Collection (831) 373-3811 www.caviews.c

above – ca spring 1937

left - March 4, 2005

The surge

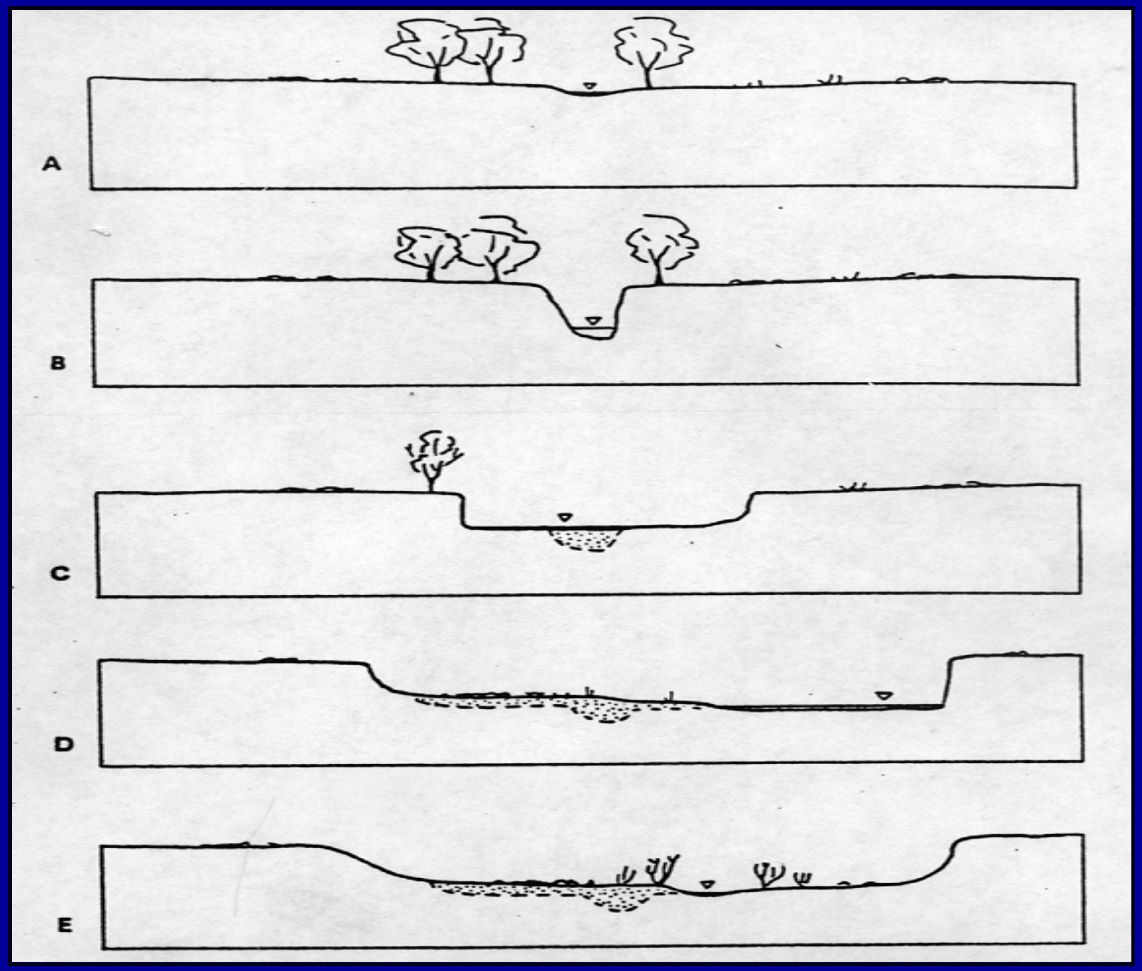
35-FOOT WAVES HIT THE BEACH

JANUARY 5, 2008

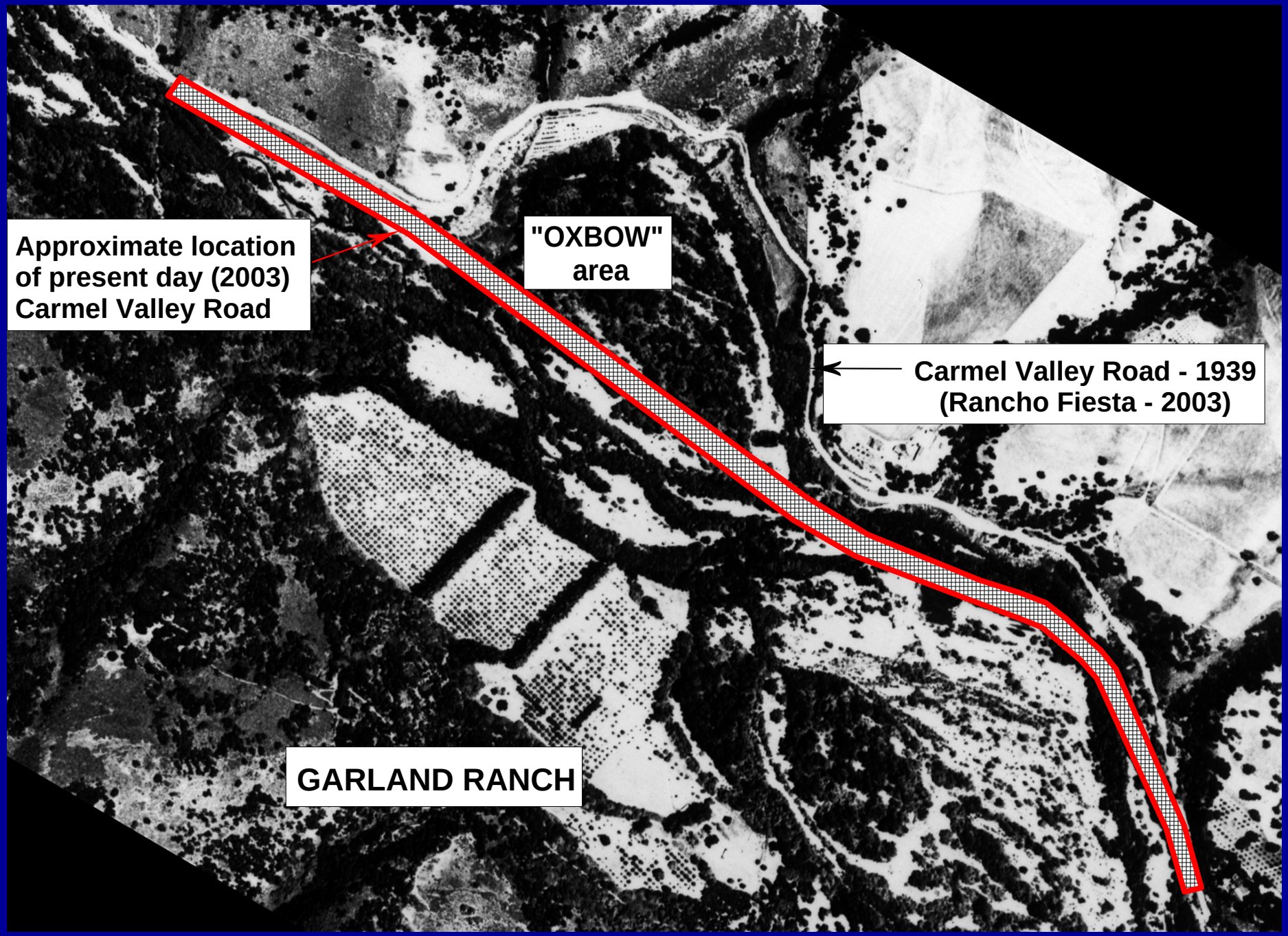
LAGOON CLOSURE

Evolution of an Incised Channel

(Schumm, et al., 1984)



Oxbow Area Across from Garland Park


Approximate location
of present day (2003)
Carmel Valley Road
"OXBOW"
area
Carmel Valley Road - 1939
(Rancho Fiesta - 2003)
GARLAND RANCH


View upstream of Carmel River at
present-day Garland Park,1918
(Pat Hathaway collection)


View upstream of Carmel River at
Garland Park, 2004 (MPWMD)

View downstream of Carmel River at present-day Garland Park,1918 (Pat Hathaway collection)

View downstream of Carmel River at Garland Park, 2004 (MPWMD)

Channel Maintenance at Farm Center ca 1940s

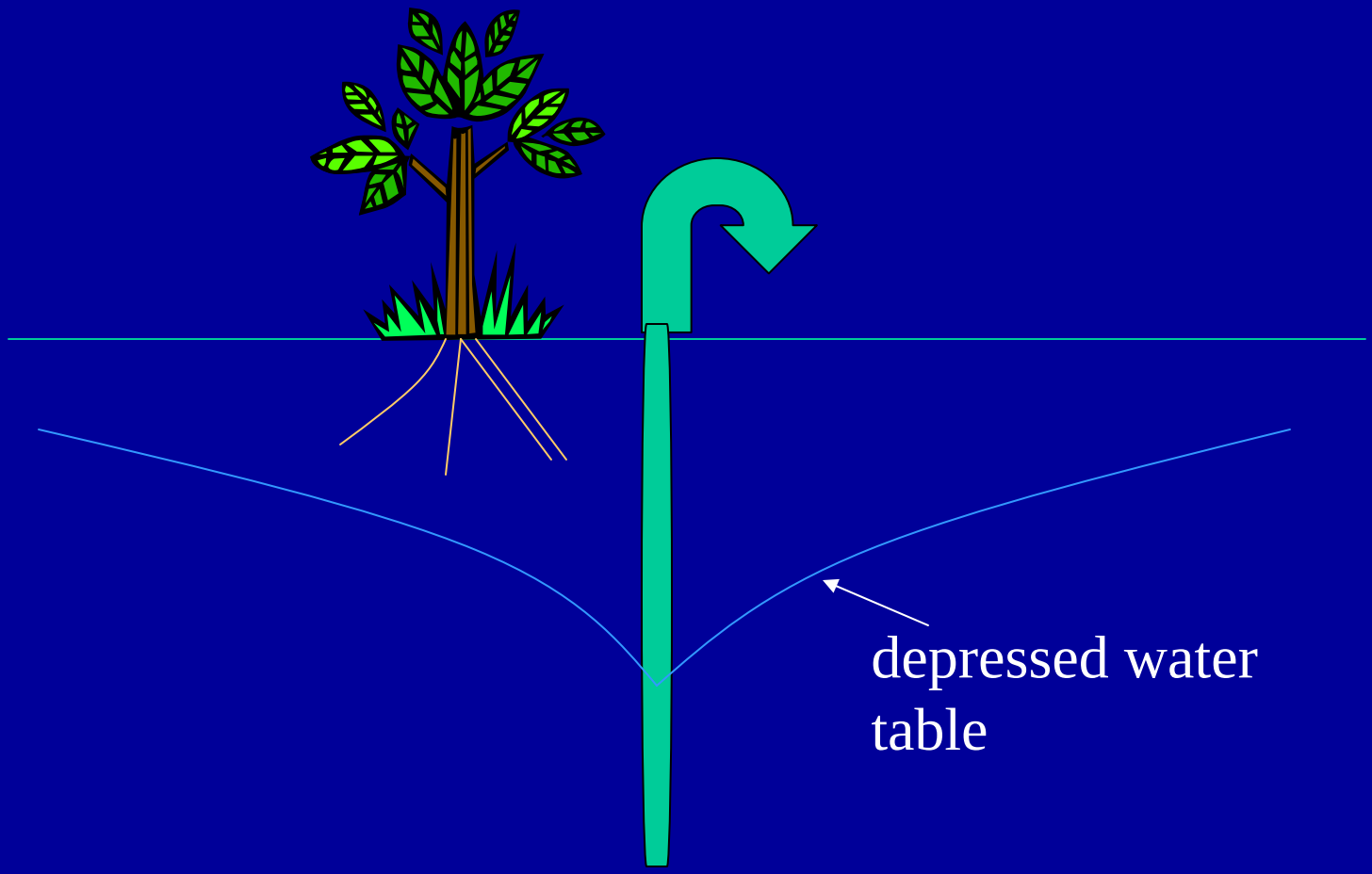
"Sand bars can build up in the river channel, divide the flow and divert it on new courses unless a clearance project is maintained from year to year."

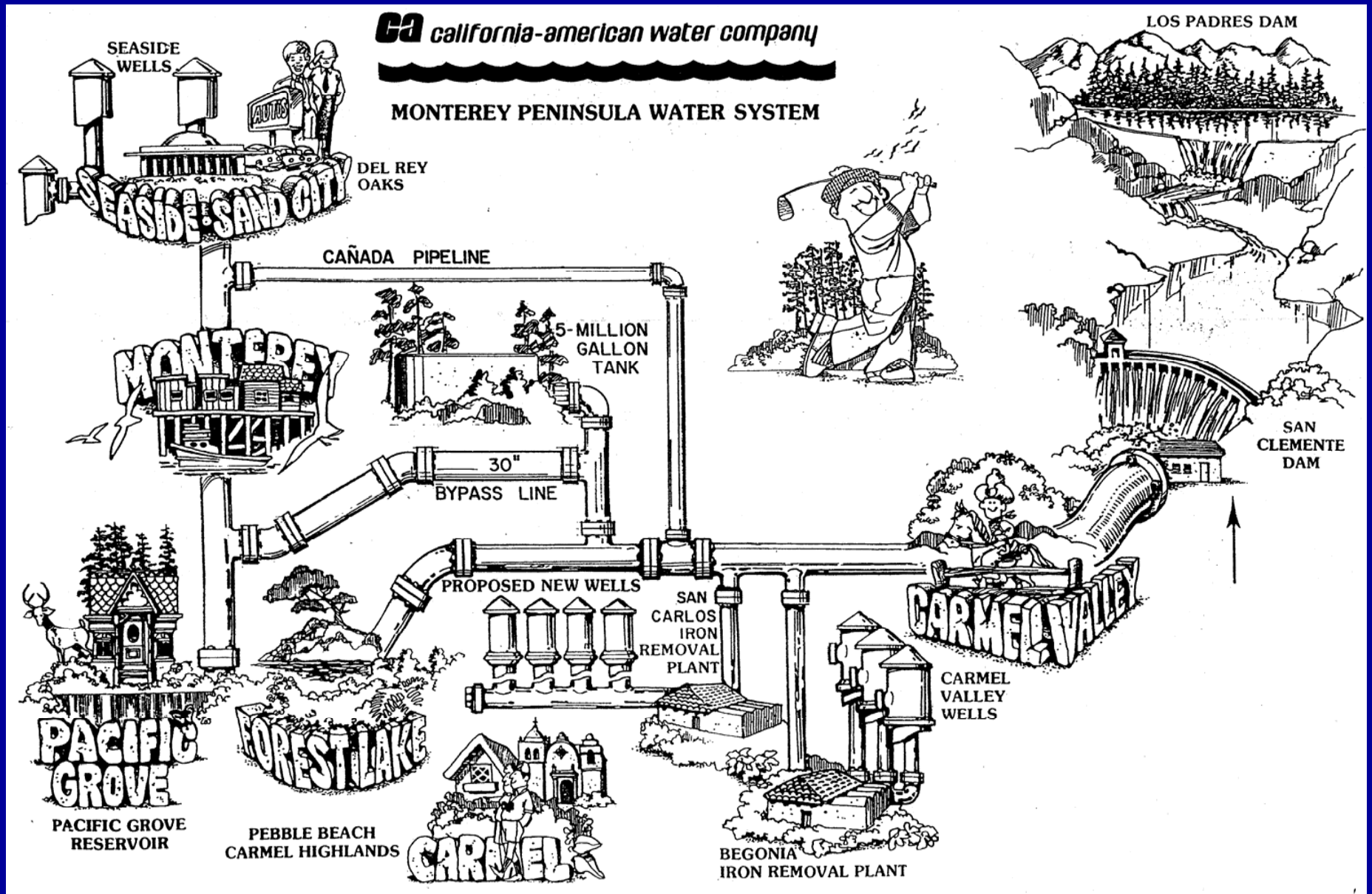
SCHULTE ROAD - 1958

A Region Known to Have Difficulties Getting Unstuck

Looking downstream to a 1958 (?) Volkswagon at the end of Schulte Road, April 2, 1958. Photograph by Charles R. Walker

1960's - Groundwater Pumping Increased

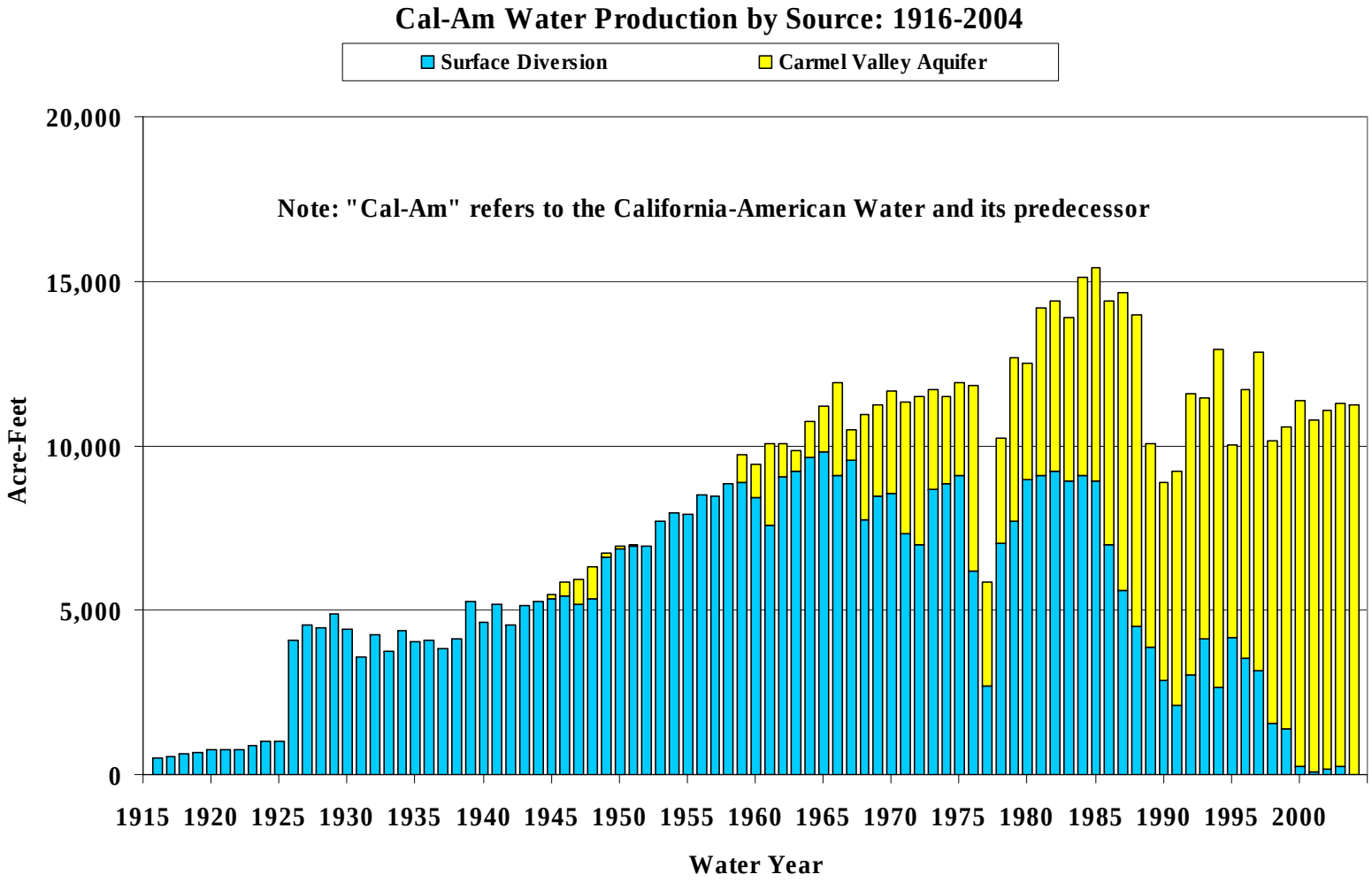



california-american water company
MONTEREY PENINSULA WATER SYSTEM
SEASIDE WELLS
SEASIDE
SAND CITY
DEL REY OAKS
CAÑADA PIPELINE
MONTEREY
5-MILLION GALLON TANK
30" BYPASS LINE
PROPOSED NEW WELLS
SAN CARLOS IRON REMOVAL PLANT
LOS PADRES DAM
SAN CLEMENTE DAM
CARMEL VALLEY
CARMEL VALLEY WELLS
PACIFIC GROVE
PACIFIC GROVE RESERVOIR
FOREST LAKE
PEBBLE BEACH
CARMEL HIGHLANDS
CARMEL
BEGONIA IRON REMOVAL PLANT

SUMMER PUMPING in the CARMEL VALLEY ALLUVIAL AQUIFER

Above Robinson Canyon Bridge (1980)

Carmel Valley Water Production 1915-2004



Production values for the 1916-1978 period from Cal-Am Exhibit 90 at the 1992 State Water Resources Control Board hearings regarding Cal-Am's diversions from the Carmel River system. Production for the 1978-2004 period were compiled by the Monterey Peninsula Water Management District from monthly production reports submitted by the Cal-Am's Monterey Division.

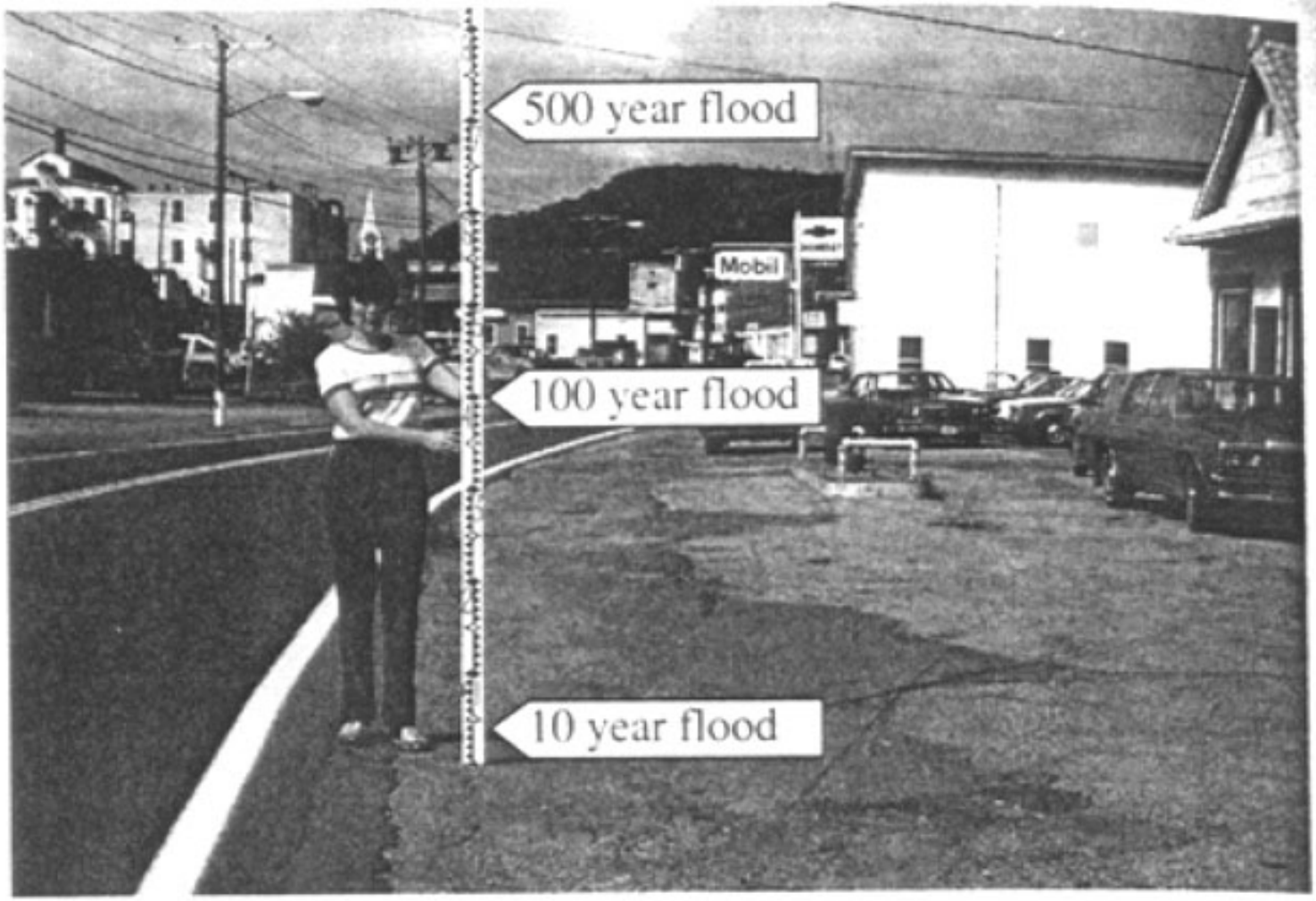
January 10, 1982

Upstream of Schulte Bridge

Schulte Road Bridge – May 1982

Steelhead Outmigration Impacted

Flood Return Interval = Average Spacing of Events



Early Carmel Valley Residents evacuate during a flood (late Cretaceous – 65 MYA)

Floods of the 1990's

CARMEL RIVER FLOW

MARCH 10, 1995
BORONDA BRIDGE
(left)

MAY 2002
BORONDA BRIDGE
(right)

Highway 1 Bridge over the Carmel River
Above - March 10, 1995
Below - March 12, 1995

Highway 1 Bridge Hit by 120-foot tree – likely a cottonwood from near the Crossroads Center

Rancho Cañada Bridge No. 5

1994 (left)

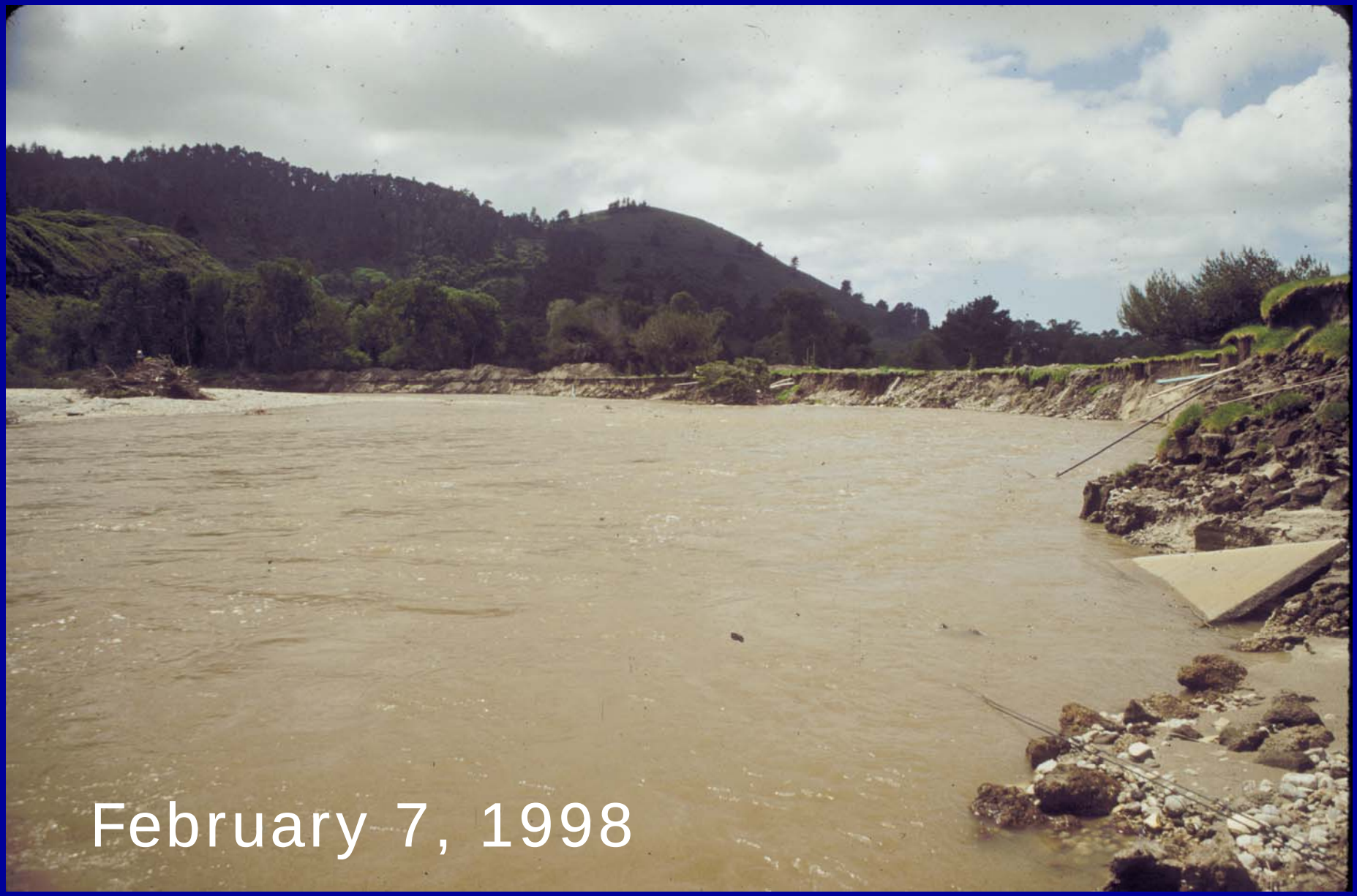
1995 (below)

Rusty Bridge Pilings as a Failure Mechanism

Rosie's Bridge – replaced in 1994 – left abutment sustains damage in 1995

Hacienda Carmel Levee Fails in 1998

Rancho Cañada Loses Two Fairways



Court Battles, Citizen Efforts, Better Management Halts Degradation of River

- 1974 - suit over groundwater extraction in mid-Valley
- 1976-77 drought - Carmel River Watch (CREW) established
- 1983 - 84% of riverfront property owners vote for restoration plan for the river
- 1984 – MPWMD orders Cal-Am to shift pumping downstream
- 1987 – four complaints filed against Cal-Am with SWRCB resulting in Order 95-10
- 1990 – EIR on water allocation results in expanded Mitigation Program for river
- 1996-97 – listing of steelhead and California red-legged frogs spurs tighter federal controls of activities along the river
- 2007-08 - SWRCB revisits Order 95-10

Threatened Species Protected in 1996 and 1997

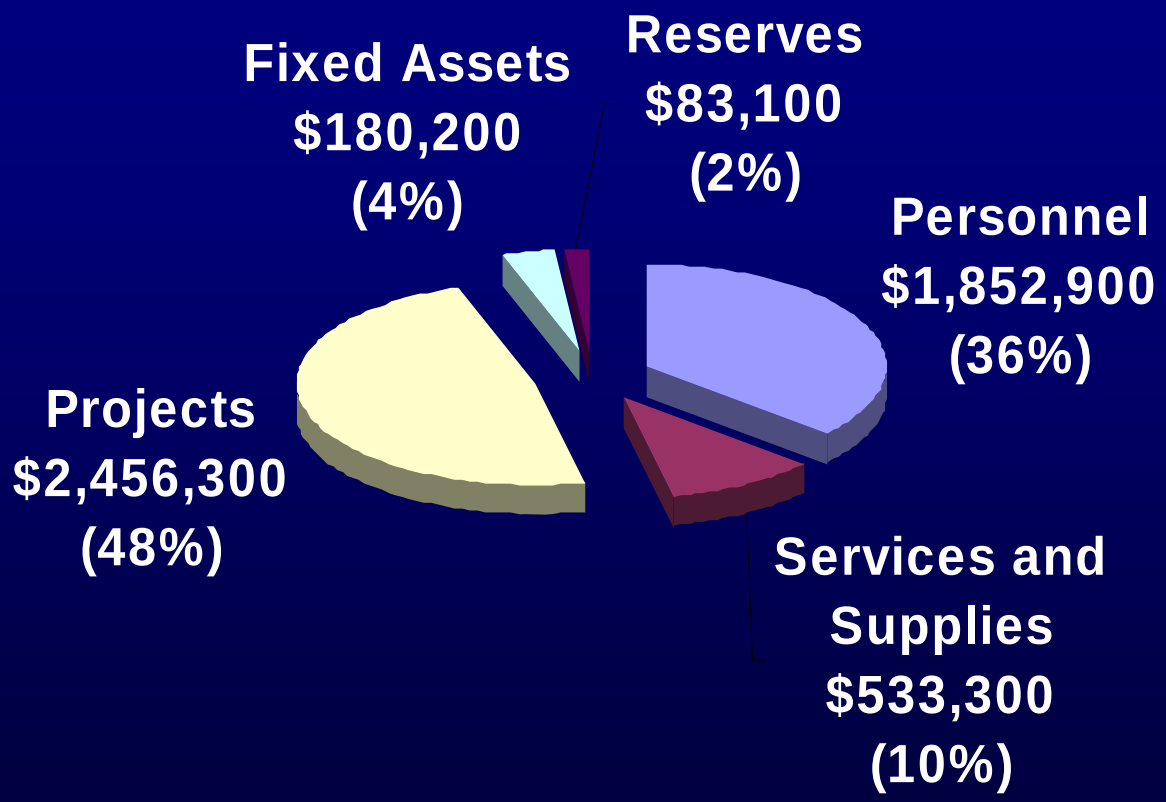
Carmel River Begins Recovery

Above – May 1982

Right – May 2002

2008-09 MPWMD Mitigation Program Expenditures

Total = $5,105,800



Direct Measures

- Seaside basin injection/recovery
- Fish rescue, rearing, habitat improvement
- Irrigation of Carmel River riparian corridor
- Vegetation management/modification and augmentation
- Streambank and channel restoration

Indirect Measures

- Conservation - e.g. property inspection/retrofits, studies for Pebble Beach reclamation project
- Enforcement of Ordinances/Rules and Regulations for water use and activities along the Carmel River
- Management of limited water supplies
- Monitoring programs (fishery, wildlife, vegetation, water quality and quantity)

July 2002

October 1999

All Saints Day School Project

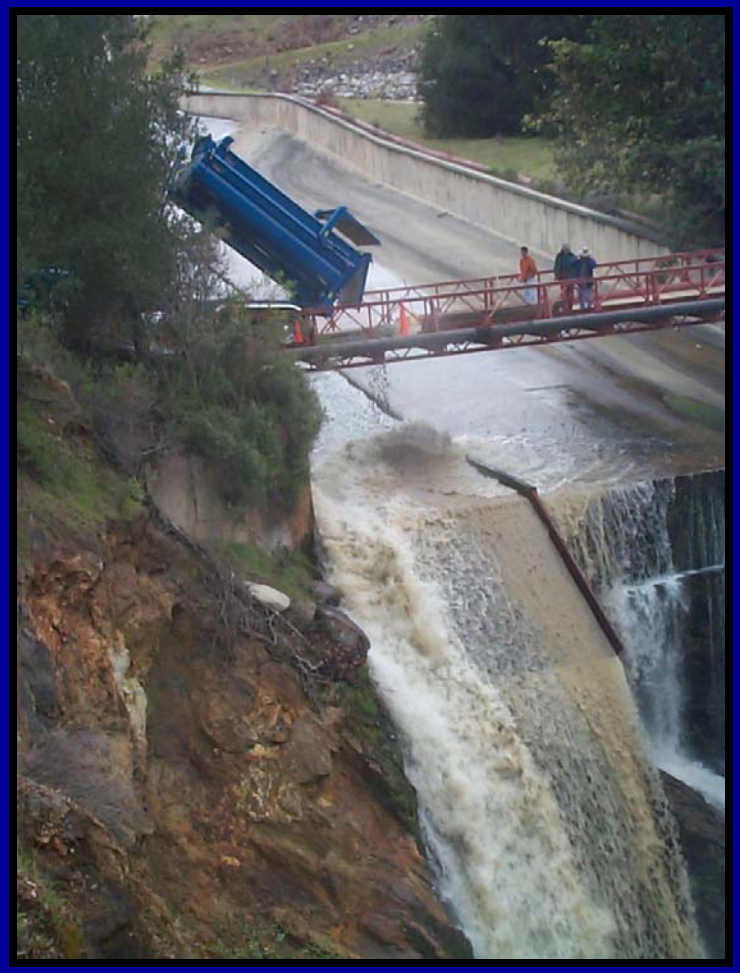
MPWMD Annual Rescues

- **Community demand** dries up eight miles of river
- **39,500** juvenile fish rescued in 2003
- **100,000** juvenile fish rescued in 2008
- **Over 300,000** fish rescued in the past 14 years

A backpack electrofisher and dip nets used to catch fish before the river dries up.

MPWMD Fish Rescue Team

Gravel Injection Program



Placing spawning gravel through the bridge at the Los Padres Dam spillway.

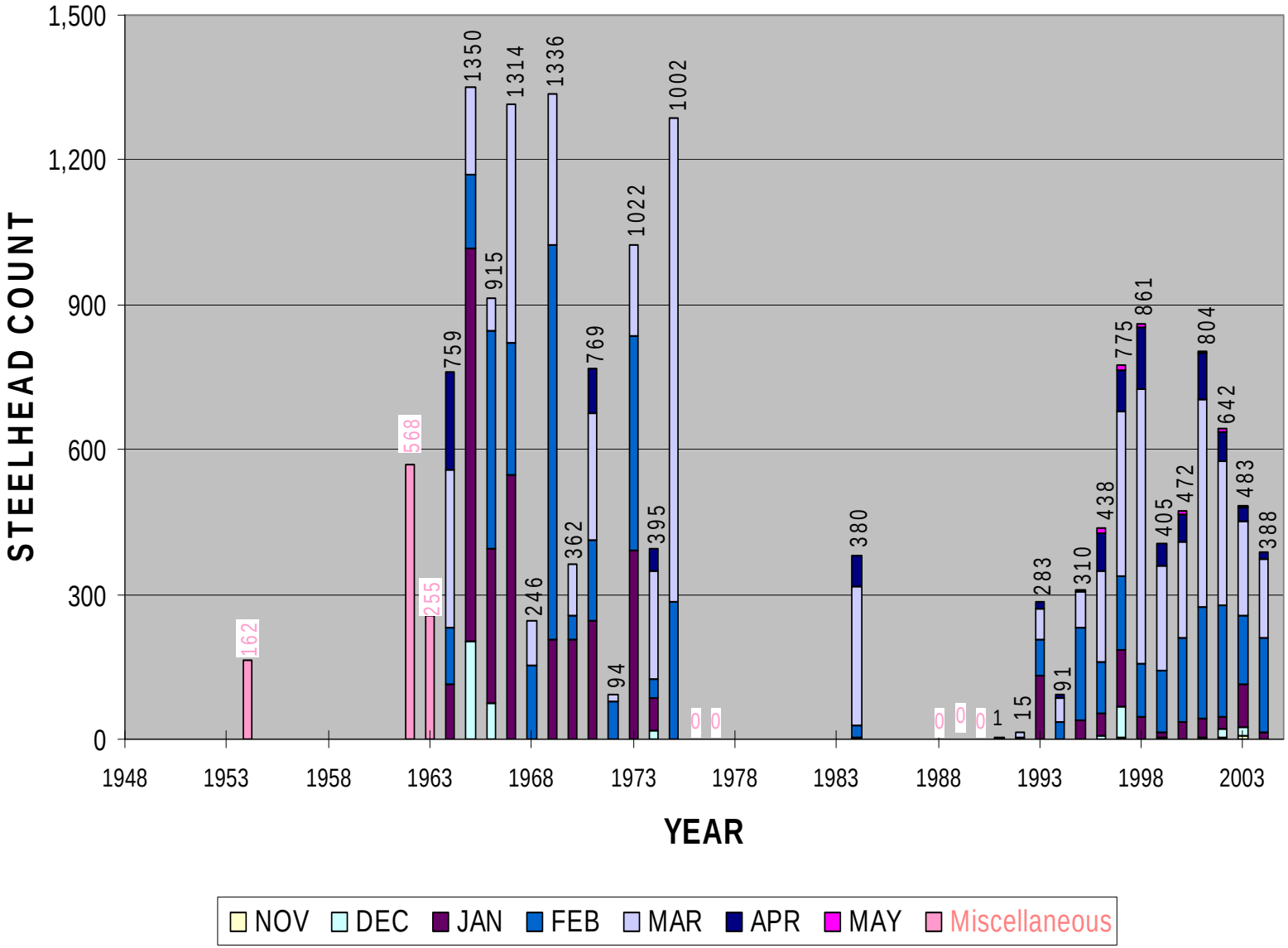
Mitigation for Habitat Loss

- Injection program replaces gravel retained by main stem reservoirs
- 4,000 tons of material placed since 1993

A backhoe pushes spawning gravel into pool near fish ladder.

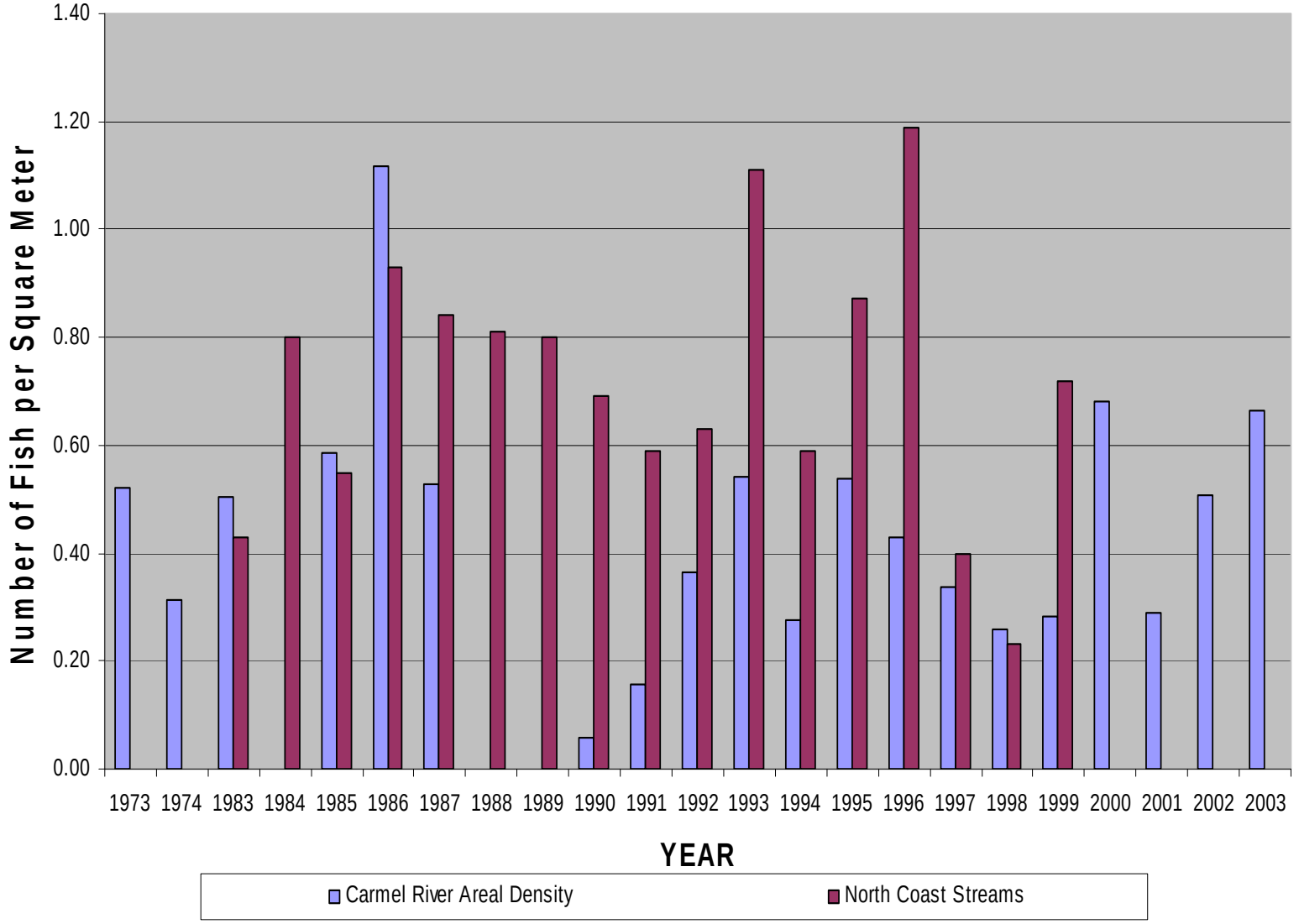
Historical Counts of Adult Steelhead at San Clemente Dam

1954-2004



Juvenile Steelhead Population Density, Carmel River and North Coast Streams

Selected Years, 1973-2003



Source:North Coast Streams 1983-1994,Cramer, et al. 1995 and 1995-1999, CDFG 2003; Carmel River, MPWMD files

Planting Streamside Vegetation

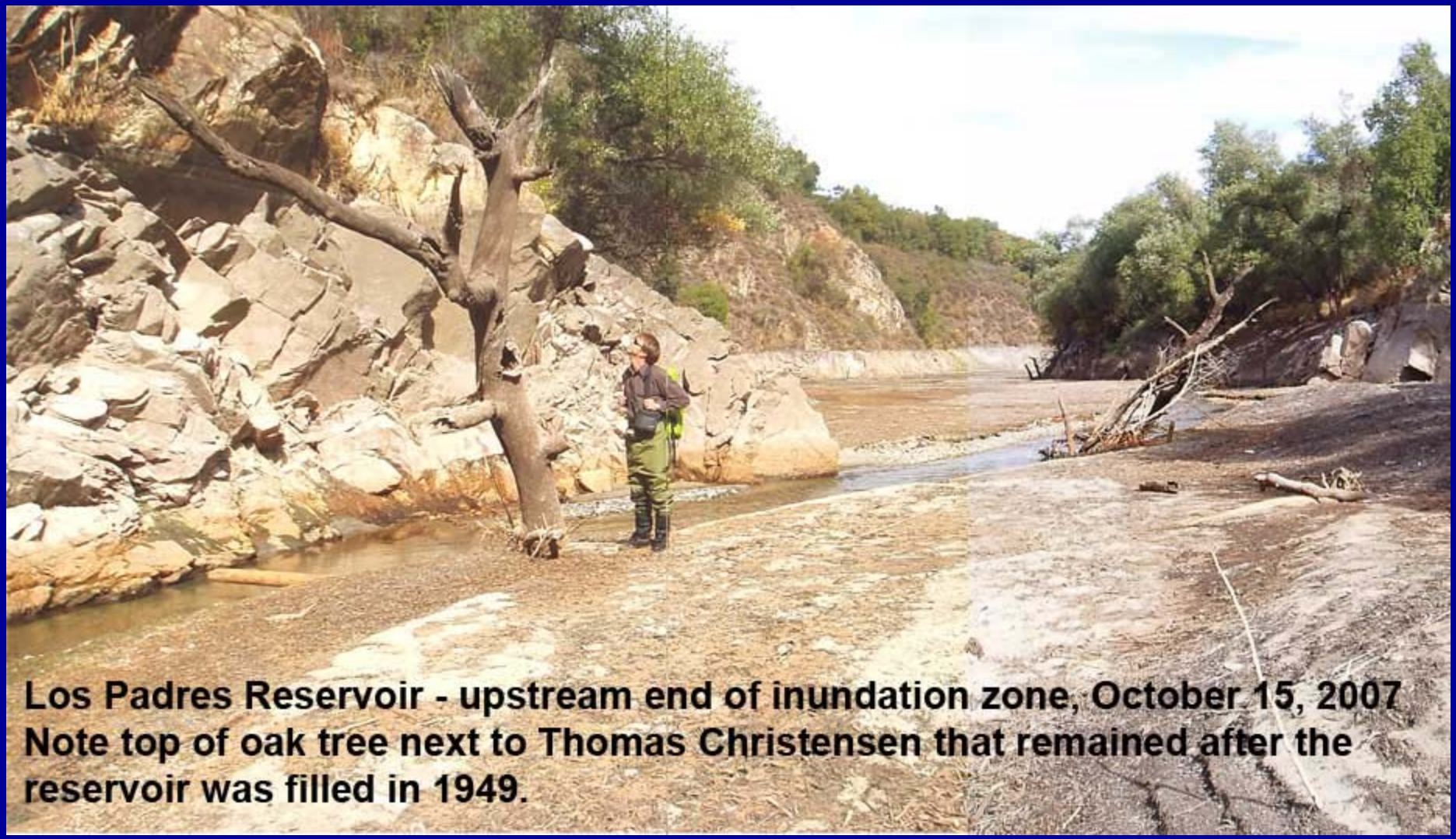
2001 estimate of riparian area = 438 acres

That's up from 299 acres in 1986

What Are the Threats to Resources of the Carmel River?

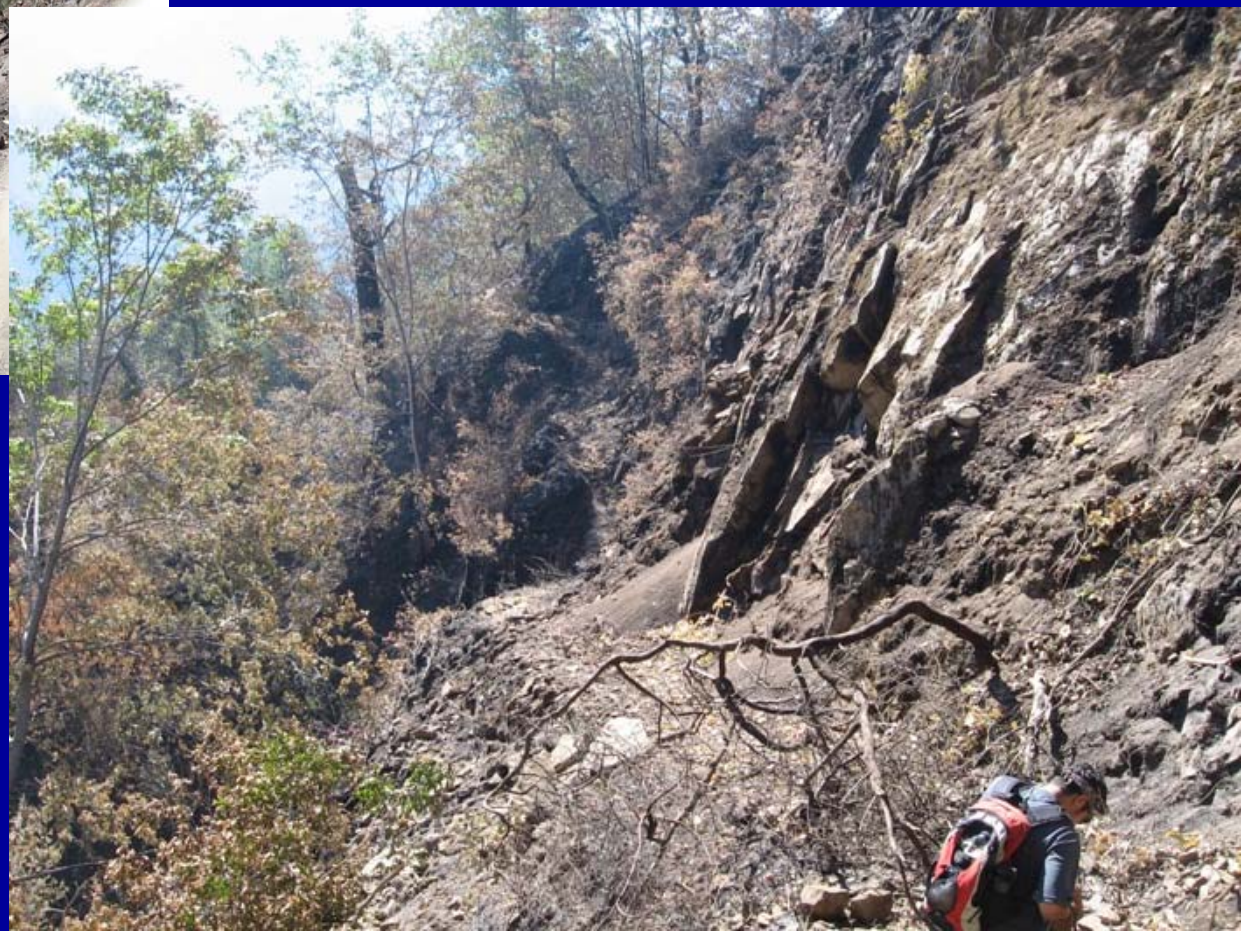
- Los Padres Reservoir may continue to impound sediment from the upper watershed
  - Loss of surface storage may result in less flow downstream in the summer
  - Lack of sediment may destabilize streambanks
- Armoring of streambanks is likely to continue after large floods
- Diversions in lower river continue to affect vegetation and aquatic habitat
- Global warming may cause larger swings in temperature and rainfall

Los Padres Reservoir Sedimentation



Los Padres Reservoir - upstream end of inundation zone, October 15, 2007
Note top of oak tree next to Thomas Christensen that remained after the reservoir was filled in 1949.

Basin Complex Fire Will Increase Sediment Load



Incision at Rancho Cañada

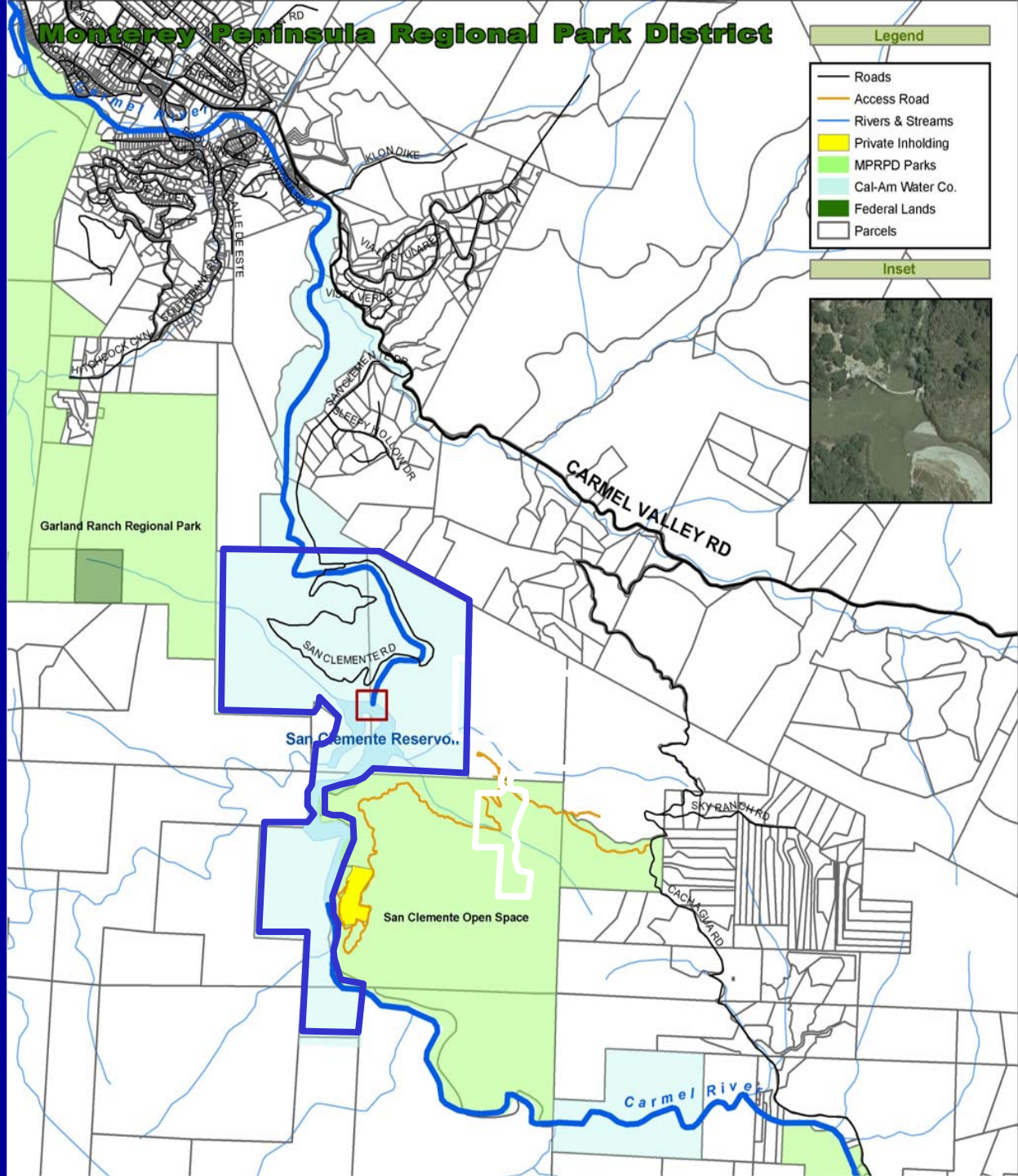
Degradation Starts

Moving Forward

- Significant bond act funding may be available to continue restoration and mitigation efforts
- Private and non-profit groups such as the Big Sur Land Trust and the Planning and Conservation League are interested in restoring and maintaining the watershed
- San Clemente Dam to be removed by State Coastal Conservancy
- Cease and Desist order against Cal-Am may require reduction in diversions from Carmel Valley
- New water supplies for the Monterey Peninsula are projected to be completed within eight years

River Reroute and Dam Removal

Maximize the Public Benefits



References

Smith, D.P., Newman, W.B., Watson, F.G.R., and Hameister, J., 2004, Physical and Hydrologic Assessment of the Carmel River Watershed, California. The Watershed Institute, California State University Monterey Bay, Publication No. WI-2004-05/2, 88 pp.

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