SURFING I MANUAL

TIDES

LA has two high and two low tides every day. There is a low/low, high/low, high/high, low/high. Knowing the tides can help you decide where and when to surf.

- HIGH TIDE: Beach breaks generally work better at a high tide. Sand bars found at the beach breaks will break in nice peaky waves if the water is deep enough around them. As the tide gets lower, the peak of the wave will expand into a wall and close out the section of wave.
- LOW TIDE: Reef breaks generally work better at low tides; they sit offshore, surround by deep water and as the tide goes down the reef gets closer to the surface and a swell that would have passing during a high tide hits the reef and breaks. The lower the water goes the more powerful the break will become.

WIND

The sun's energy heats the ocean unevenly creating wind. When wind becomes powerful and prolonged a storm occurs. The longer a storm is at sea, the more energy will be created on the surface of the ocean. As the wind continues ripples are created on the surface over time these ripples become open ocean swells. When these swells hit land they are formed into waves where their shape is dictated by the topography of the ocean floor.

SURF AND RIP CURRENTS

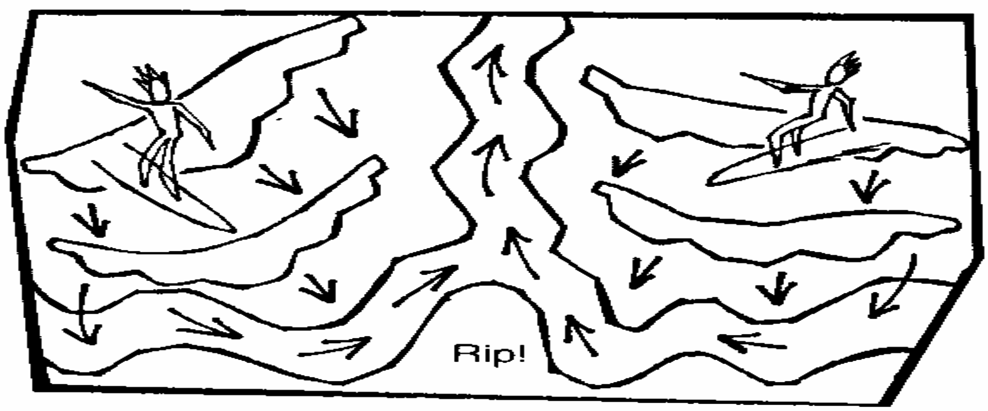
Porpoises can ride the wake of a ship indefinitely. Boaters too can enjoy a free ride by positioning a small boat on the forward face of the first large wave in a ships wake. Ina similar way, surfboards are propelled down the surface of a wave by taking energy from the wave. The following diagram shows the forces involved in surfing. In effect, the surfer slips down the moving front of the wave under the influence of gravity. Correctly position and moving with the direction of the wave, the surfer travels at the speed of the wave crest. By traversing the face of the wav, the surer may move even faster than the wave. The trick is to catch the wave as it passes to that the gravitation force on the board is greater than the resistance of the water. Ideally after a few strong strokes the super is propelled by the wave's energy.

When a surfer passes through a wave, the curricular motion of the water particles produces a brief downward pull. This is only of short and is not dangerous in itself, but surfers close to shore may be thrown and deposited (not always lightly) on the beach.

Visitors to the beach are sometimes puzzled by the variation of breakers on the beach, even over a short time. On any given day a dozen or so moderate to small size waves will break followed by a group of larger waves, followed by a period of relative calm. The irregular sequence is caused primarily by the simultaneous arrival of several swells from separate storms at sea. Larger waves form when waves of separate group merge and reinforce one another. Smaller waves form when incoming waves are out of phase and interfere with one another. The resulting patterns produce a beat frequency called surf beat, which is much longer than the period of individual wave. Surf beat of two or three minutes may occur when wave periods are between 10-14 seconds. When surf beat occurs, longer waves strike the beach and the water level is raised.

Waves at the edge of the sea re often associated by what is called "undertow". Actually there is not real undertow that draws or sucks swimmers under. There are however, rip currents, these are dangerous currents in the surf zone with water moving away from shore that occur whenever currents funnel through a narrow opening formed by the erosion of a channel or gap across the lowest part of an offshore sandbar.

Rip currents may move up to 2 m.p.h. They are localized and their position changes according to the sometimes dynamic wave conditions. The higher the waves the stronger the rip current. If you are ever caught in a rip current you should swim parallel to the beach till out of the current as opposed to swimming against it. A rip current is narrow and you will soon be out of it. If you tire, look for a sand bar where you can rest. Foaming light colored water is usually a sign of a sandbar.



BREAKING WAVES

Waves breaking on the coast of California and Oregon may have formed near Antarctica and traveled for two weeks across the Pacific, about half way around the globe, before finally spending themselves on the coast. Waves hitting the Californian coast may also have formed north of Hawaii or any place in the north or south pacific along a great circle route. In the winter waves tend to come from the North Pacific. During summer they are likely to have come from the South Pacific. Waves travel long distances encountering little friction; decay of swell energy is minimal.

Because depth decreases toward the beach, waves travel from deep water to shallow water waves as they approach the shore. As the leading waves interact with the shallow bottom, the incoming waves crowd more closely together because their speed is proportional to depth. If the crests are 100m apart, the waves "feel bottom" at 50m (1/2 their wavelength). The speed of the waves then decreases causing their wavelength to decrease. Succeeding waves tend to pile up as the orbiting water particles are squeezed together. The orbital velocity of the molecules at the trough, but not at the crest is reduced. The wave becomes more and more unstable, and the ratio of height to wave length becomes greater than one to seven. At this point the crest of the wave moves faster than the trough, and it curls over at the top. Just before breaking, the orbital velocity at the crest may be twice the speed of the wave. At last the wave topples, and the water breaks into foam and surf.

Another way to explain the growth of shallow water waves involves the transfer of energy from one form to another. As the wave speed decreases, the wave's kinetic energy decreases. In accordance with the law of conversation of energy, that energy appears as potential energy, which is proportional to height.

There is no clear cut transition from a deep water wave to a shallow water wave. The transformation is gradual, growing more pronounced closer and closer to shore. A shallow water wave begins to break at a depth equal to about $1/20^{th}$ of its wavelength, or when the depth is 1 1/3 times its height. For instance, a wave 3m high will break at a depth of 4m; a 6m wave will break at a depth of 8m.

If you know the approximate slope and depth of a beach at various distances from shore, you can estimate the height of a wave at each distance. Walk toward the water's edge until the crest of the breakers is aligned with the horizon. The height of the next wave will equal the vertical distance from your eye level to the lowest level of the retreating water from the last wave.

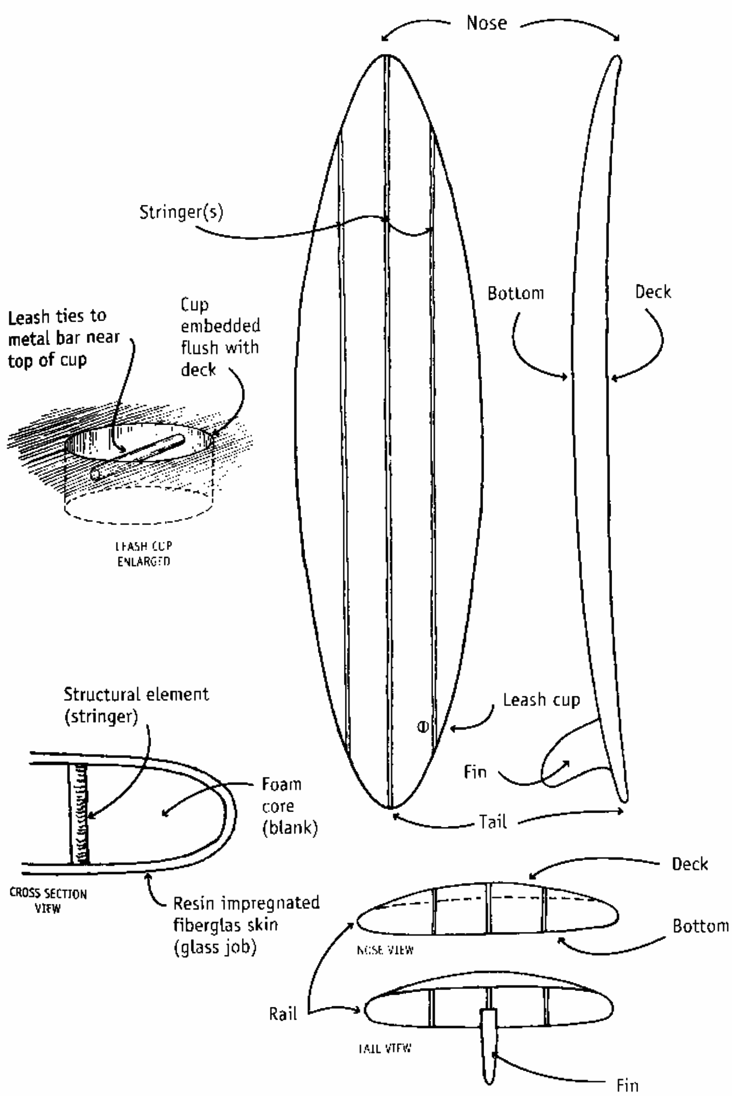
Breaking waves are of two types: spillers and plungers. Spillers roll in evenly and slow (slow and mushy). Plungers break over a short distance, pounding the beach with a great roar and splash of flying water and foam (fast and hollow). Spillers give surfers the longest rides.

Although winds are currents have an effects on whether a swell becomes a spiller or a plunger, (onshore winds produce spillers, offshore winds produce plungers) the main influence is the bottom topography. The stepper the bottom slope, the more quickly the wave will slow down and break. The composition or roughness of the bottom is also a factor, although its effects are not as pronounced as that of the slope. A smooth, step slope tends to produce slow mushy waves. The slope and the texture of a beach are affected by the endless bombardment of the waves and the release of large amounts of energy. There breakers hitting the shore produce the highest energy environment on earth. Moreover, since weather conditions vary daily, the type of breakers found at any given beach is not constant.

Before the Allies undertook amphibious landings during WWII, the beach slopes were carefully studied. How close could landing craft come to the beach to dispatch thousands of men and their supplies? Aerial photography of the beaches and the offshore waters provided the answers. On the basis of the decreasing wavelength as waves approached the shore, specialists determined the depths and drew up slope profiles of the beaches.

REFRACTION, DIFFRACTION and REFLECTION

When waves approach the shore, they undergo refraction, diffraction, and reflection.
Deep water waves entering shallow regions at an angle to the bottom contours are bent as they touch bottom. This refraction is caused by the reduction of wavelength as depth decreases. The part of the crest entering shallow water first moves more slowly the part of the waves still in deep water, and the wave front bends to fit the shore. As a result, the wave is almost parallel to the shore when it breaks numerous refraction patterns are possible, depending on the angle at which the wave approaches and on the bottom topography and tide height. Diffraction accounts for the presence of waves in sheltered regions, such as harbors. Like light waves, water waves may be bent into shadow zones behind steep sided obstacles. Diffracted waves in a harbor or inside a breakwater are smaller and choppy. Diffraction patterns observed from the air leeward of Pacific atolls often extend for several kilometers. Early Polynesian mariners interpreted these choppy waters as a sign that they were approaching an atoll. Since an atoll lies so low in the water, it cannot be seen from a canoe or outrigger more than 10km away. A vertical or nearly vertical sea wall or cliff situated in deep water may reflect a wave train (swell) with little energy loss. The reflected waves exert very little force on the wall under certain conditions. This phenomenon appears as a standing wave which occurs in the waves strike the wall perpendicularly. If they strike at an n angle other than 90 degrees, waves of equal and opposite angles are formed. The original waves are the reflected waves may interfere with each other, in which case their crest and troughs will cancel out, or they may reinforce each other. It is often difficult to tell which waves are coming and which are going.


Nose
Stringer(s)
Bottom
Deck
Leash ties to metal bar near top of cup
Cup embedded flush with deck
LEASH CUP ENLARGED
Structural element (stringer)
Leash cup
Fin
Foam core (blank)
Tail
CROSS SECTION VIEW
Resin impregnated fiberglas skin (glass job)
Deck
NOSE VIEW
Bottom
Rail
TAIL VIEW
Fin

GLOSSARY

BEACH BREAK	Sand bar just off shore of a beach.
BLACK BALL FLAG	A non-surfing area.
BLOWN OUT	Caused by too much wind. Often occurs mid-day.
CLOSE OUT or WALLED UP	Waves that break all at once.
DAWN PATROL	Surfing in the early morning.
DING	Damaged area of the surfboard
FOAM BOARDS/ BZs/ DORIES	All beginner soft boards
GOOFY FOOT	Right foot forward on the board
KOOK	An inexperienced surfer.
LEFT	From the water looking at the beach wave breaks to a surfers left.
MUSHY	Weaker waves that break or crumble slowly
OFF SHORE	Wind blowing from the land out to sea (good)
ON SHORE	Winds that is blowing off the ocean toward land (bad)
POINT BREAK	A protruding section of shore that causes waves to break.
REEF BREAK	Shallow reef off shore.
REGULAR FOOT	Left foot forward on the board
RIGHT	From the water looking at the beach wave breaks to a surfer's right.
SECTION	A specific area of a breaking wave
SWELLS	Open ocean waves originating from storm.
WAVES	What happens to a swell as it encounters shallower water and breaks.