Surf Tsunami

In Search of the Perfect Wave in the Perfect Place

Learn Through Experience

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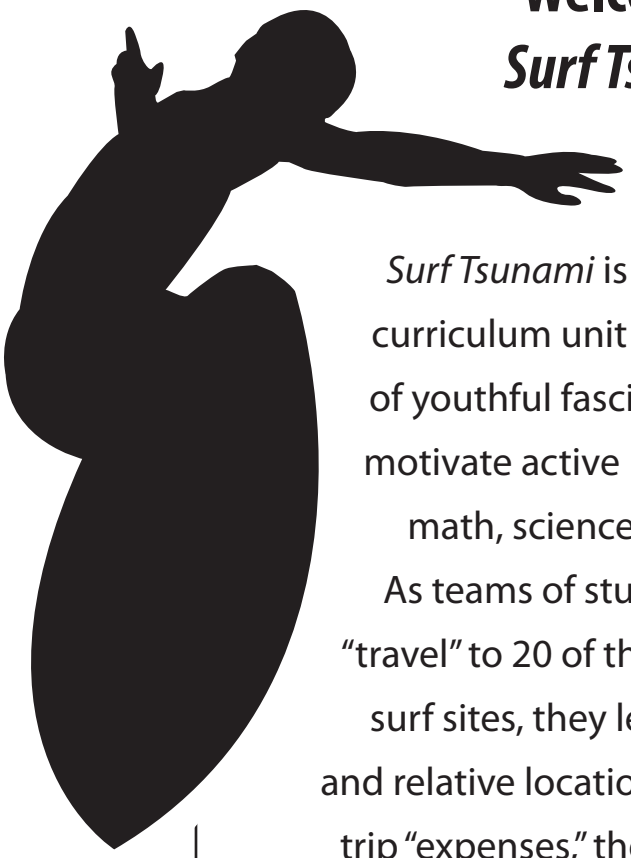
Welcome to *Surf Tsunami*!



Surf Tsunami is an interdisciplinary curriculum unit that takes advantage of youthful fascination with surfing to motivate active learning in geography, math, science, and language arts. As teams of student "surfers" plan to "travel" to 20 of the world's most famous surf sites, they learn about absolute and relative locations, they budget their trip "expenses," they study the science of waves, and in the end, they write "magazine articles" using a rich vocabulary of scientific terminology and surfer slang in order to analyze the factors that make their chosen surf site great and to persuade readers that they have located "the perfect wave in the perfect place."

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Purpose and Overview

The purpose of the *Surf Tsunami* curriculum is to harness the connection young people feel to the sport—and the culture—of surfing, and to use that natural connection to inspire interest in world geography (by investigating at least 20 of the world's most famous surf sites) and in the science of waves. How do waves form? Where do they come from? How does the ocean floor below the waves help form the waves' shape and power? In a series of Surf Science Learning Centers, students acquire some basic understanding of the science of waves.

Playing the role of journalists assigned to visit at least three of the world's most outstanding surf sites, students plan simulated itineraries (practicing geography skills) and budget their trips (practicing math skills).

After a mini-lesson that strengthens sentence- and essay-writing skills, students draw upon both scientific vocabulary and the colorful lingo of surfer culture to write zesty "magazine articles" that integrate their newly acquired scientific and geographic knowledge.

Authentic assessment based on performance of cooperative group work combines with more traditional assessments of the knowledge and concepts mastered.

Summary Description

Surf Tsunami is an interdisciplinary simulation. Working in groups, students search for the best surf spot in the world. To evaluate which place they think is best, students research famous surf spots and gather pertinent information, including geographic information and scientific data derived from research and experiments. To report which place they believe best, they first present their findings orally to the "editorial board" of a surfing magazine, and then—using colorful surfer lingo—write an article for that same fictional surfer magazine. Along the way, students plan simulated trips to the leading surf spots, using geography skills to find and research the locations and math skills to budget their "travel expenses"; participate in Surf Science Learning Centers where they study waves, buoyancy, air pressure, tides, and tsunamis; and work cooperatively, setting and accomplishing goals, practicing problem solving, and exercising communication skills.

In other words, your brahs and bettys scope the beaches and the sets to sort the slammin from the shommy, the blown out from the bodacious; they plan a vaycay for high

rollers or for surf gypsies on a hot dog budget; they scope the science that explains what makes waves juicy and rides rad; and they explain what they've learned without sounding like a bunch of random standers or lame shoobies.

The goal, in short, is to do all that can be done on dry land to equip students to understand—and to explain their understanding of—the art and science of surfing.

Detailed Overview

In the *Surf Tsunami* simulation, students play the role of journalists who have been commissioned by a surfer magazine, *Surfer's Gazette,* to travel to some of the world's most famous surfing sites. They must research the sites, choose which ones to visit, and budget their trips to make sure their travel and living expenses don't exceed the advance the magazine is paying. Their assignment is to decide which site has the perfect waves in the perfect place, and at the end of the simulation, to write an article, complete with pictures, persuading readers that the site they have selected really is the best surf spot in the world. Since they are writing for a surfer magazine, their articles need to be full of surfer lingo—but they'd better sound like mega-rippers, not lame wannabes, or the editors will reject their articles.

To prepare for their writing assignments, students will read a surfer "magazine" called *Surfer's Gazette* (included in this curriculum packet). This magazine lists some of the strengths and drawbacks of 20 world-class surfing beaches. At the same time they read the magazine, students use globes, maps, atlases, and the Internet to learn where these beaches are, and they may use books and magazines for further research. Throughout the simulation, they maintain a balance sheet to keep track of travel and living expenses, and throughout the simulation they learn and practice surfer vocabulary. Fate cards may deliver setbacks or unexpected benefits.

Students also participate in Surf Science Learning Centers to learn about waves, buoyancy, air pressure, tides, and tsunamis. The Learning Centers involve research, demonstrations, and experiments designed to familiarize students with basic scientific facts and principles related to waves. Along with surfer lingo, students are expected to master a certain amount of scientific terminology.

As the simulation comes to a close, students pitch their articles verbally to the magazine's "editorial board," which provides helpful feedback before the writers buckle down to polish final drafts. As final products of the simulation, students turn in posters that combine final drafts of their articles with photographs and other illustrations. As an alternative culminating project, students might be encouraged to produce Web pages instead of posters.

The full simulation requires two weeks of roughly one-hour sessions, but flexibility to shorten this timeframe is designed into the curriculum and extension activities can considerably lengthen the timeframe if that is desired. Formal and authentic assessments are suggested or supplied.

What Do Students Learn?

Students participating in *Surf Tsunami* will:

Gain knowledge

- Learn about the various locations, including other countries and states, as a means to help them make their decision about the best place to go
- Gain information (geographical, meteorological, tidal, etc.) about top surf spots around the world
- Explore wave formation, air pressure, longitude and latitude, and buoyancy
- Integrate ocean-floor mapping, tide charts, and weather patterns to follow the perfect wave
- Understand tides

Develop skills

- Discuss and develop a research plan
- Research famous surf spots and gather pertinent information
- Plan trip to sites around the world
- Develop geographical and measurement skills using mathematical and scientific tools and formulas, maps, charts, atlases, globes and the Internet
- Utilize a budget/balance sheet to finance their odysseys
- Speak at the surf magazine "board" meeting to present findings
- Write an article using surfer lingo backed up by research to persuade readers that the perfect surf spot has been located

Develop the affective domain

- Work cooperatively, processing higher-level thinking skills
- Use practical mathematical measurements and scientific concepts in realistic applications
- Learn difficult concepts within an enticing subject: surfing

- Understand how to solve problems through meeting client needs
- Conduct a commissioned project
- Apply communication skills and techniques
- Demonstrate the ability to communicate orally and in writing
- Work on teams to achieve project objectives

Interdisciplinary Content

Students develop knowledge and skills in the following curriculum areas:

Geography

- Use atlases and other reference materials to locate continents, hemispheres, countries, and cities
- Research and analyze information about countries visited
- Determine latitude and longitude

Science

- Physics of wave motion
- Air pressure
- Weather and climate
- Ocean currents
- Tides
- Ocean-floor mapping
- Buoyancy

Math

- Calculate travel costs
- Write checks
- Balance checking account
- Read tables and charts
- Draw to scale
- Convert from U.S. customary to metric
- Use coordinate grids

Language Arts

- Read
- Enrich vocabulary
- Research and analyze data
- Take notes
- Analyze a literary form
- Make an oral presentation
- Practice peer editing
- Write a persuasive magazine article

Technology

- Access Internet sites for information
- Create a Web site
- Use Google Earth and Google Ocean

Cooperative learning

- Communicate effectively
- Set and accomplish goals
- Organize and accomplish tasks
- Solve problems
- Work cooperatively

Components

The *Surf Tsunami* curriculum materials are organized into three parts:

Teacher's packet — **Teacher's packet** with unit overview, set-up directions, a schedule of activities, directions for learning centers, and reproducible handouts.

Individual student packets — **Individual student packets** with an introduction to the unit and descriptions of team roles (photocopy one per student).

Team packets — **Team packets** with the materials each travel team will need during the simulation, a Surfer's Dictionary, and the *Surfer's Gazette,* a simulated surf magazine that each team uses as their initial source of information on 20 of the world's most famous surf sites, and that also serves as a model for their writing assignments (photocopy one per travel team).

CD-ROM — All these materials are provided both in print format and as printable pdfs on a **CD-ROM**.

Getting Started

Teacher Preparation

1. Collect Materials

In your school library and public libraries, find books on surfing, waves, air pressure, storms, ocean currents, tides, latitude and longitude, and the ocean floor. Also collect information on the various places teams will be "visiting": Australia, Brazil, California, Fiji, France, Hawaii, Ireland, Mexico, New Zealand, North Carolina, South Africa, Spain, and Tahiti. Since part of the simulation involves planning—and pricing—"travel" to these places, travel guides will be useful, especially travel guides that include price ranges for hotels and restaurants. In addition to libraries, you might also check used bookstores, flea markets, and yard sales for slightly out-of-date travel guides for your permanent collection. Also, if possible, find a copy of the children's book *How Much Is a Million?* for the learning center on tsunamis.

If possible, ask several parents to go to several libraries to check out materials or to donate outdated travel books. As the materials come in, be sure to mark them in some way so you know which books should be returned to which parent or library. For instance, you might put post-it notes of different colors representing different libraries on the inside covers of the books. It's very important to have a varied and large collection of books at differing reading levels for students to access during this simulation.

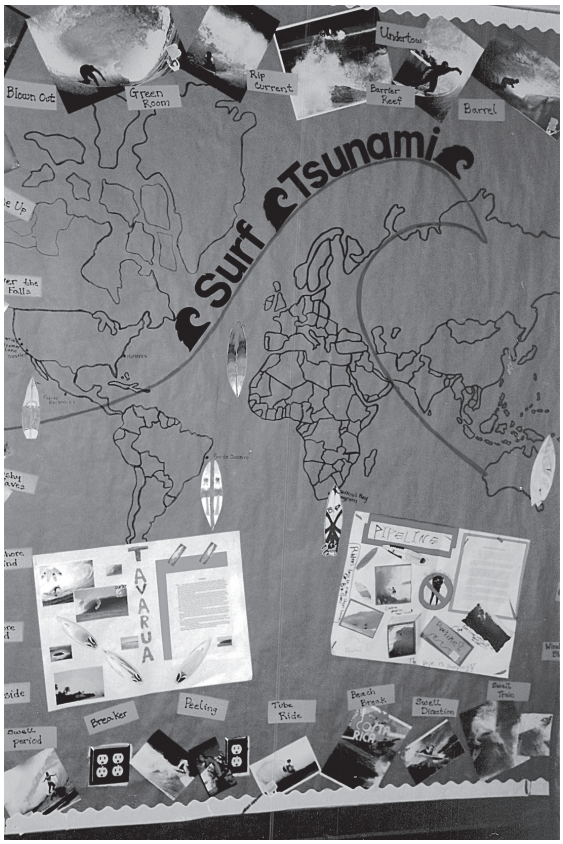
Find as many surf magazines as you can. Ask students. Ask surf shops for old copies. Ask friends and neighbors. Call or write to surf magazines, explaining the project and asking for copies. Google "surf magazine" to find a wide variety of possibilities. Surf magazines have amazing pictures of surfers and surfing breaks. They have articles on surf spots, famous surfers, competitions, surfboards, wet suits, and other interesting topics related to surfing. A cautionary word about the surf magazines: They occasionally print inappropriate language. You should preview all magazines that you use, and you may want to lift out sections that are appropriate or inappropriate.

Also consider surfing the Web for student-friendly surf sites. The free online surfing magazine called *Free Surf Magazine* (freesurfmagazine.com) is "family friendly" and includes features such as "Surf Art," "Fit for Surf" (about being physically fit), "She Rips" (about women surfers), and "Triple Crown" (about surf competitions). These are only a few examples of the variety of offerings found at this site. The Web site *Rippin H2O* (http://rippinh2o.com), the main source of the surf lingo glossary, also aims to be "family friendly," but their glossary is a judgment call. SiteDude, the Webmaster at *Rippin H2O,* writes about his glossary: "I do screen entries before adding them to our list, the criteria is A: Try and keep it clean for our younger viewers (I have changed the rating to PG), and B: It must be Surf Related." Despite SurfDude's efforts

on behalf of verbal hygiene, some "salty" lingo will be found on his Web site: PG is not G, so use with caution or stick to the Surfer's Dictionary provided in the curriculum unit. Note that the surf stories on the *Rippin H2O* site definitely cannot be considered safe for school use. We can recommend the *Rippin H2O* photo gallery, however. For another great photo resource, try the search engine *Every Stock Photo* (http://www.everystockphoto.com). For a starter kit of other vetted sites, see the relevant appendixes at the end of the teacher's packet.

2. Bulletin Board

Consider creating a ***Surf Tsunami*** bulletin board that includes a large world map.



1. Using a projection system such as document camera or an overhead projector with a world map transparency, trace a simple outline of the world onto a piece of butcher paper on a large section of one wall. Save space at the bottom and edges of the wall.
2. Pin or tape up the surfboards the students design to the sites that each group visits.
3. Move the surfboards daily as the groups move to different sites around the world. Be sure to have the students, rather than you, point out where the surfboards should be placed.
4. Cut out or print out photographs of the breaks.
5. Write surf lingo and scientific terminology on index cards or sentence strips to place around the edge of the map.
6. Place the completed student projects ("board presentations") across the bottom of the bulletin board.
7. Optional: draw latitude and longitude lines on the map.

Alternatively, use Google Earth to map the surf sites.

3. Provide globes, atlases, and maps.

4. Put students into teams, about five students per team.

Use your best judgment in putting teams together—but forming teams randomly is always fair, and the results can be pleasantly surprising.

5. Use the method of your choice to assign three (or more) surf breaks to each team.

Aim to challenge each group with geographic diversity. The ***Surfer's Gazette*** magazine provides articles on 20 surf breaks, but students should be encouraged to nominate any additional great surf breaks not included in the ***Surfer's Gazette*** that they know about or discover in the course of their research. Be as open as possible to student interest and enthusiasm.

6. Prepare student and team packets, photocopying handouts as needed.

Also make photocopies for the Surf Science Learning Centers you intend to include.

7. Create team folders.

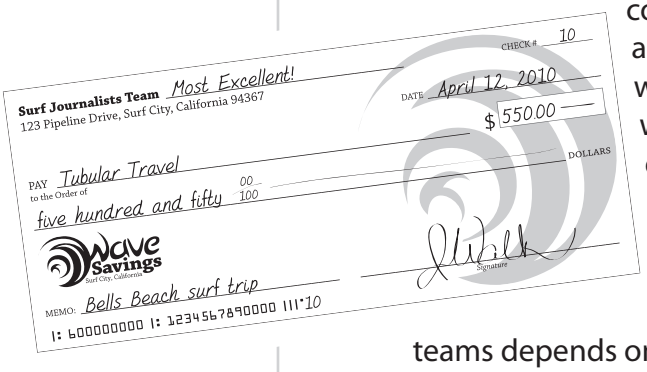
Folders can be made out of construction paper. Choose a different color for each team to make it easier to keep track of each group's work. Each team will need four folders. (Ex: Team #1 will have four blue folders, Team #2 will have four yellow folders.) The following forms go into each folder:

- Team Accountant: a page of reproducible checks and one reproducible **Bank Balance Sheet**
- Team Cartographer: a **Cartographer Data Sheet** and a world map
- Team Research: photocopy masters for a **Surf Break Analysis Sheet**, an explanation of the categories in the **Surf Break Analysis Sheet**, a **Metric Conversion Sheet**, and an **Ocean Currents Map**
- Team Resources: **Surfer's Dictionary**, and whatever else turns up in student research

8. Decide how much "money" to give each surf team.

This is a crucial issue. Note that scaling up or scaling down the role of the Accountant provides teachers with an opportunity to scale the simulation's timeframe up or down.

Teams will "travel" to surf sites around the world, so they must keep track of travel expenses. Sent as journalists from *Shaka Surf Review,* each team receives a lump sum of "advance money" to get them started, and then they deduct the estimated costs of visiting each site. The handling of these travel expenses can be complex and time-consuming, or simple and quick. Teachers who want to maximize this math component of the simulation can demand that student teams research the costs of airfare, lodging (How expensive are hotels? Are there campgrounds near the beach?), meals, ground transportation, entertainment, and surfing equipment (Would it be cheaper to ship surfboards and wetsuits or rent them at the surf site?). Teachers who want to minimize the math component and its attendant research can limit



cost calculations to only airfare, allowing students to assume they will be met by a local surf club which will host their visit, generously providing the team with ground transportation, lodging, food, and equipment. By choosing which factors to consider and which to omit, other teachers may strike a balance between these two extremes.

How much "advance money" to give student teams depends on several factors. First and foremost, will teams pay for all their expenses or get a free ride from local surf clubs? Second, how many surf sites will they visit? Third, will you make each expedition a separate round-trip (maximizing expenses but minimizing research time and math work) or demand an itinerary that combines several legs (minimizing expenses but maximizing math work as well as research and planning time)? Finally, how challenging do you want the trip planning to be? Providing plenty of money will speed the simulation along. Keeping budgets tight will intensify math, research, planning, and group decision-making—and will add significantly to the time required.

How should teachers arrive at a number? First, take account of the four factors just mentioned. Second, simplify the problem by thinking in per-student terms, then multiplying your ballpark per-student figure to arrive at the team budget.

To estimate airfare, start with the cost of a ticket for a flight halfway around the world. That's a little under $2000 round-trip as this unit goes to press, while a one-way ticket is $2500—crazy, right? If teams will travel to three destinations, figure one long trip, one medium trip ($1500), and one short trip ($500). For four or more destinations, keep adding medium trips.

Surf Team Responsibilities

Each team member will have a specific assignment to complete every day. Assignments rotate daily so all members participate in all aspects of the project. Upon completing individual tasks, all members should help with the overall project.

The Accountant will:

- research costs
- purchase plane tickets (one per team member)
- write checks for other purchases as needed
- complete the **Bank Balance Sheet**

The Cartographer will:

- locate and mark each surf spot on the team map
- complete the **Cartographer Data Sheet**
- move the team surfboard to the team's current location on the classroom map

The Researcher(s) will:

- read the ***Surfer's Gazette*** article to the group
- search surf magazines, books, Web sites, Google Earth, Google Ocean, and any other approved information sources for information and photographs

The Recorder will:

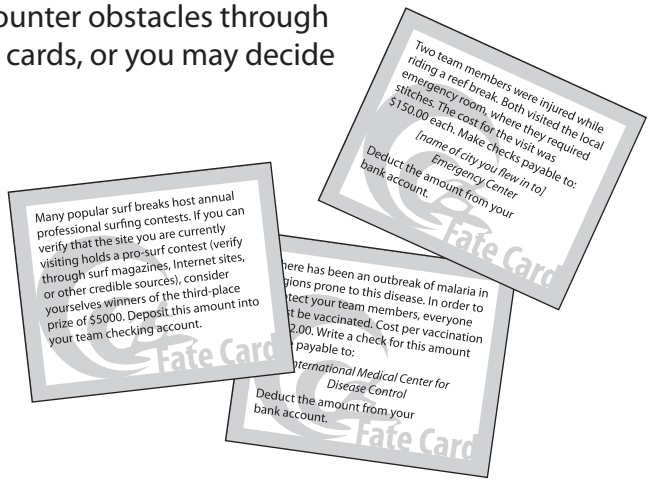
- work closely with the group to complete the **Surf Break Analysis Sheet**
- work closely with the group to complete the **Information About Surf Location Sheet**

The Manager will:

- coordinate the group's tasks and responsibilities
- facilitate discussion
- keep team members on task

Fate Cards

A "fate card" is read to the entire class. If the fate card applies to a group, they must do what it says. A realization that scientific study does not occur within a vacuum and that outside interference can and does occur frequently will become apparent to the students as they encounter obstacles through fate cards. You may decide to create more fate cards, or you may decide not to use any.



Learning Centers

Teaching Notes

Of the eight Learning Centers, four are central. **Learning Center One: Where's the Best Surfing?** is the main component of the geography curriculum. Learning Centers Two and Three, **It's All About the Waves!** and **Give Me a Break!**, both address the curriculum's core science mission, to teach about the fundamental concept of waves. The eighth, **Planning to Write an Article**, leads students step-by-step through the curriculum's culminating activity. After analyzing the form and content of the surf site reports modeled in ***Surfer's Gazette***, students write their own surf site reports, preserving the form of the model articles but improving the content and replacing the conservative style and tone of the model articles with a more youthful and zesty style full of accurate technical terms and colorful surfer slang.

The other four Learning Centers can be considered peripheral. While air pressure, buoyancy, tides, and tsunamis are interesting aspects of the science related to surfing, teachers who want shortcuts through this curriculum should look at these Learning Centers first when seeking ways to save time.

Most of the outside resources suggested in this curriculum are found on the Internet. Teachers with limited Internet access are encouraged to print relevant Web pages as handouts. Teachers with no Internet access at all must build classroom libraries rich enough to support the activities spelled out in the curriculum. For Web-connected teachers, a site associated with this curriculum will serve teachers as a one-stop source for the relevant URLs, and the publisher validity periodically checks and updates those links. The URL is:

http://www.teachinteract.com/tsunami

Peer-to-peer teaching is the key instructional method at the heart of this curriculum. At every phase of instruction, members of student teams should be researching and learning, then explaining to each other what they have learned. The teacher's main job is to encourage and facilitate peer-to-peer instruction.

Learning Center One: Where's the Best Surfing?

Directions in the handout, combined with directions for Day 3 in the Daily Directions, should make Learning Center One self-explanatory. If your students are well versed in using latitude and longitude to describe a site's absolute location, and in using words to describe a place's relative location, suggestions are provided to shorten the time needed for this core geographical activity.

Learning Center Two: It's All About the Waves!

For Learning Center Two, students must research waves. The selected Web sites provide a variety of readings at a variety of levels of difficulty. It is strongly recommended that students have access to these readings. If all students cannot access the Web pages directly, teachers should consider printing the Web pages (one copy per team) so they can be handed out to students. If neither of these options is possible, teachers must take care to find and provide readings of their own.

Learning Center Three: Give Me a Break!

The same readings that are so important to Learning Center Two are also important for Learning Center Three. If all students cannot access the Web pages directly, teachers should consider printing the Web pages (one copy per team) so they can be handed out to students. If neither of these options is possible, teachers must take care to find and provide readings of their own.

The cloze assessment included in this Learning Center could be administered right away or reserved for the end of the simulation to check retention of key information.

The wave-tank demonstration of swells and breaks offered as an extension activity should be performed by you, not by students, because the danger posed by bringing a hair dryer or fan into close proximity with water must be carefully controlled.

To perform this demonstration, the teacher should first construct an environment and make swells using various items that simulate differing degrees of wind. Materials needed: an oblong plastic tub, water, several straws, a ruler, a hair dryer or small fan (preferably with variable speed settings), clean sand, green or blue food coloring, an oblong rock, and a "pusher"—a flat rectangle that lets you push water from one end of the tub to the other. In addition, students will need pencils and pads of unlined paper in order to sketch a series of wave-tank set-ups and resulting wave patterns. If available, a digital camera should replace pencil and paper as students snap pictures of the wave patterns.

First, set up the tub and color the water to increase wave visibility. Have one student blow on the water through a straw while other students record the resulting point-source wave pattern. Next, have two students blow on the water through straws placed side by side

and record the resulting wave patterns; take note of any constructive or destructive interference as combining waves reinforce each other or cancel each other out.

Next, use the hair dryer or fan to set up a more sustained and widespread blow, simulating wave generation on the open ocean. It's best to begin with the fan on low and aimed to minimize its push on the water, noting the low energy wave patterns, before increasing the wind strength by stages and noting and discussing resulting changes in wave patterns.

Pile sand at one end of the tub to create a slanting "beach." Use your fan and your pusher to create waves of various strengths. Push some waves directly at the beach, others obliquely, and record and discuss resulting patterns. Prompt discussion of the difference between wave energy reflected off the wall of the tub and wave energy dampened by the slanting beach. You might also digress into conversation about wave-powered sand transport.

Place the oblong rock in the water to simulate a point break. For best results, place the rock with one end buried in the sand at the downwind end of the tub and angle the rock so it has windward and lee exposures. The rock should be deeper than the water so it resembles a peninsula. Direct waves of various strengths into the situation and record and discuss resulting patterns.

Increase the water depth enough to cover the oblong rock, place the rock offshore from and parallel to the beach, and observe the patterns created by various strengths of waves.

Throughout this demonstration, winds should blow the long way down the oblong tub. When students note and record each demonstration, they should name them ("open water model," "reef break model," etc.), note wind strength, and jot down thoughts and observations. Consider having them use the ruler to measure wave heights. Note-taking and discussion time between demos allows time for waves from the last demo to dissipate before beginning the next demo.

Teaching tip
For best results, try the demo at home before you try it with an audience.

At every stage, however, encourage students to be the scientists by asking questions rather than supplying answers.

The student directions ask students to follow the demonstrations by diagramming and writing about each experiment. Most teachers will not want to invest that much time, so consider having each student diagram and write-up just one or two of the experiments.

Learning Center Four: Storm Chasers (Air Pressure)

The diagrams of a low-pressure storm cell over the ocean, showing patterns of airflow and including the wind's effect on waves, will vary. Students should not be expected to get their diagrams right on the first try. Instead, after they have drawn their diagrams, ask them to research the topic and then, as a follow-up after their research, ask each team to work together to create a diagram that reflects the whole team's best understanding.

If a large storm centered on 150 degrees west and ten degrees north blows for one week, the surf site most likely to benefit is Isla Todos Santos. Tahiti's Teahupoo is another good candidate: the storm is in just the right quadrant to blow surf straight into its break, while Todos Santos benefits most from storms farther north than this one, but wave sizes in Tahiti just cannot match wave sizes at Todos Santos, not even with the advantage of the straight line from storm to break.

Hawaii is close to the storm, but Hawaii's breaks face north or west and won't benefit much from a storm to the southeast. Other West Pacific breaks are far away across seas broken up by island arcs that will diminish the waves, so they are not good candidates. California's breaks will be good, but they are farther away than Todos Santos and just won't be quite as good.

Regarding the balloon and bottle experiment: Be sure to use a plastic bottle, not a glass bottle, to avoid the danger of the glass shattering due to the quick change in temperature. Also, it is helpful to stretch the rubber of the balloon before the experiment to make it blow up more easily. It's best to have several balloons on hand in case one breaks. Also have a stopwatch or a watch with a second hand.

The balloon will inflate as the air in the bottle heats up. The air molecules begin to move faster and need more room to move, causing the balloon to expand.

Some students will say the balloon expands because warm air is lighter and rises, but you can (and should) show that the warm-air-rising effect is negligible compared to the increased air pressure inside the bottle and balloon. You can show this by turning the bottle upside down (bottle on top and balloon beneath). If rising warm air explained the expansion of the balloon, you would expect the balloon to empty out as the hot air rises into the bottle. Of course, the cooling air will shrink the balloon, so you need to compare the time it takes for the balloon to shrink while *over* the bottle to the time it takes to shrink while *under* the bottle, timing both to see if there is a difference. Time the balloon-under configuration before the balloon-over

configuration to weight the experiment slightly in favor of the point you want to make.

With the application of cold water, the air inside the bottle cools, and the molecules slow down, requiring less space. This causes the balloon to begin to deflate. It may even be sucked into the bottle and "blow up," which is neat to see, so try to use a transparent bottle.

Of course this balloon "barometer" does not really measure air pressure, it merely shows the power of temperature to make air expand and contract. The shape of the container changes to maintain a constant balance between pressure inside and outside the container. Many fairly simple recipes for building true barometers are available on the Web and in science books for youngsters, so you may want to extend this activity by building a true classroom barometer. You might want to end your demonstration by asking, "Is this a real barometer? Why or why not?"

Learning Center Five: Tide Readers

The first handout in this learning center, the pretest asking about the connection between tides and the moon and about the connection between tides and waves, is intended to help you decide whether or not to make time to include this learning center in the curriculum. It can also be administered as a posttest.

If students do not have access to the Web site, recommended in the reproducible student reading, teachers should print that Web page out so it can become a supplemental reading, and they should use a blackboard, smartboard, or some other visual display to re-create the diagram that explains the monthly tidal cycle.

One of the Web resources recommended for this learning center is a YouTube video clip. If access to YouTube is blocked at your school, consider using one of the many free programs that allows users to download (kids say "rip") these clips to your hard drive. Then you can put the clip on a disc, bring the disc to school, and show the clip without trouble.

Learning Center Six: Wave Riders (Why Do Things Float?)

The flaw in the thought experiment is the barrel. The water in the barrel weighs exactly the same as the surfer and surfboard, but nothing on the surfer-and-surfboard side of the seesaw counterbalances the weight of the barrel itself.

To redesign the experiment, you need to start with the barrel submerged in the tank of water. Make your grease mark, remove the barrel (the water level

will drop below the mark), place the barrel on the seesaw, add the surfboard and surfer to the tank, do all the rest the same, and everything will work out fine: the seesaw will balance.

The main scientific principle at work is displacement, and the fact that the surfer-and-surfboard floats brings in the principle of buoyancy. Buoyancy relates to density. You may want to refresh your own understanding of these concepts.

Learning Center Seven: Tsunamis

This handout-driven activity asks students to (1) reframe bad questions into better questions, (2) research tsunamis, and (3) appreciate the concept of scale.

Learning Center Eight: Planning to Write an Article

In the Daily Directions, see the description for Day Seven.

You will want to assess how well student articles conform to the formulaic order for presenting information that is modeled in the ***Surfer's Gazette*** articles. Here is a précis of the formula:

- Top reasons why this site is great
- The conditions that create the site's excellence
- Details about the break or breaks
- Additional factors like seasonal info, dangers, and equipment needs
- History and local color
- Getting there
- A "clincher" that restates why the site is great

Note that paragraph breaks do not necessarily need to match bullet points on a one-to-one basis (for instance, sometimes two bullet points might be covered in one paragraph or one bullet point might be broken out across two paragraphs), but the order of the information should always be respected unless there are strong reasons for departing from the formula. Also note (and point out to students!) that the ***Surfer's Gazette***'s clinchers tend to be pretty lame. Challenge students to pay special attention to devising strong beginnings and strong endings for their articles.

Daily Directions

The following "days" are suggested. Activities may take more or less time, depending primarily on how completely you pursue the full curriculum, but also depending on factors like student preparedness and the length of class periods are (one hour has been assumed). Teacher creativity knows no limits, so please regard these suggestions as merely a starter kit.

Day 1

Whole Class

Briefly introduce the unit. You may set the mood with "surf music," a clip from a surfing movie on DVD, or a surfing clip from SchoolTube.

Spend a few minutes asking questions. What do you know about surfing? Has anyone here ever tried it? Have you seen any movies about surfing? Do you know any surfer slang? Do you know of any famous places to surf? What makes one surfing spot better than another surfing spot? What factors make good waves? Could anyone surf a tsunami?

Tell students about the unit. Play up the aspects most likely to appeal to your particular group of students. You may want to refer to the unit's introduction, summary description, and detailed overview. You might say something like:

Read or say

> Over the next [insert timeframe] we're going to make imaginary trips to some of the world's best surfing sites, and we're going to study those sites to learn what makes them special. What makes them so good for surfing? What makes the waves there so good? We're going to learn some geography, and we're going to learn some science. You're going to do research, and maybe a few experiments. In the end you're going to write a magazine article to show what you've learned, and we're going to publish all your articles in a magazine for surfers called *Shaka Surf Review*. Now, the thing you need to know about *Shaka Surf Review* is that this magazine is for the coolest-of-the-cool surfers, so your knowledge has to be solid, but you have to have to explain what you know in surfer slang, because that's the language surfers understand and respect. You all need to learn that language, so your homework tonight is to study surfer slang, and starting tomorrow, while we study surfing we'll all speak surfer slang as much as we can.


Individual

To assess students' background knowledge about surfing and related topics, distribute the handout **What Do You Know About…?** Assure your students that this is not a test, just a chance for you the teacher to find out what they already know and what they still need to learn. If you like, this pretest can be re-administered at the end of the unit as a formal assessment.

While you hand out the preliminary assessment, also hand out the **Surfer's Dictionary** and ask students who finish early to begin studying its surfer slang. Give students about 15 minutes to respond to their handouts, and then go over the **What Do You Know About…?** handout as a whole class. This activity will help you see which students are most interested in the material; you may decide to set up each of your student groups around those students who show the strongest motivation. Also try to elicit what students most want to learn more about, and use this information later to adjust your lessons.

At the end of the period, remind students to put their names on their handouts, collect the handouts, and remind students that tomorrow you want to hear them talking like surfers. You may decide to reinforce this preview of the ultimate goal of the simulation by distributing the **On Assignment for *Shaka Surf Review*** handout for Learning Center Eight.

Day 2

Remember to encourage students to use surfer slang and to model the use of surfer slang yourself.


Whole class

Hand out **Student Packets**. As a whole class, inventory the materials in the student packets, introducing the materials briefly and superficially. Preview for students what they will be asked to do during this unit. As a summary of points to preview, teachers might refer to the "Detailed Overview" in the first pages of this teacher's guide. Teachers should also go over the **Surf Break Analysis Sheet**, which deserves point-by-point review and discussion. Since this handout will be completed for each surf break and used as the basis for analyzing surf breaks, it is important that students understand the categories on the forms and what they mean.


Small group

Once the class is familiar with the **Surf Break Analysis Sheets**, break into teams. Inform the teams that they have two tasks: (1) using their ***Surfer's Gazettes*** and their **Surf Site Preference Sheets** to rank the 20 surf sites in order of preference (from the sites they'd most like to "visit" to the sites they'd least like to study) and (2) agreeing on a team name. The names should be based on surfer slang, the vocabulary of waves and beaches, or some other thematically relevant word-realm. In these activities, speed counts. The team that is ready first—with every team member raising a hand to show the whole team is ready—gets first pick of the surf sites.

Because budgetary constraints may affect their preferences, before selection begins, let students know what how much money they have been "advanced" by the editorial board of the magazine *Shaka Surf Review*.

When all teams are ready, they select their preferred surf sites, choosing in the order that they became ready. In other words, the first group that was ready goes first, choosing their preferred site out of the whole list of 20. The second group that was ready goes next, choosing their preferred site out of the remaining list of 19. The third group chooses out of the remaining 18, and so on, rotating back to the first group once all groups have made one choice, and continuing until every group has three surf sites (or whatever number you have chosen).

As a timesaving alternative, teachers may choose to assign the surf sites themselves, but the longer process outlined here is intended to build student buy-in and intensify student motivation by arousing a spirit of competition.

The second day could end here, but if all this has been done with dispatch—and the competition between groups is designed to encourage speediness—you should still have some time left in the class period. If so, use the rest of today's class period to allow students to familiarize themselves with the student packets, the descriptions of their chosen sites in the ***Surfer's Gazette***, and the classroom library of reference materials.

Allow a short time for teams to survey the packets and work out their roles. If any group is having difficulty setting roles, remind them that roles will change from day to day, so setting roles today should be no big deal. At this juncture, you might clarify the roles. The cartographer should start working on the site's location, and the accountants should start working with the cartographers to figure out how much it will cost to get there and the prices to expect for lodging and meals. The researchers should first comb the ***Surfer's Gazette*** for the information needed to fill out the **Surf Break Analysis Sheet**, and then find other sources to fill in any gaps in the required information. The recorders should help the researchers and accountants focus on getting the right information. Managers should oversee the whole process, keeping people on task and lending a hand in any task that bogs down progress.

To summarize, what students researching their surf sites need to do is:

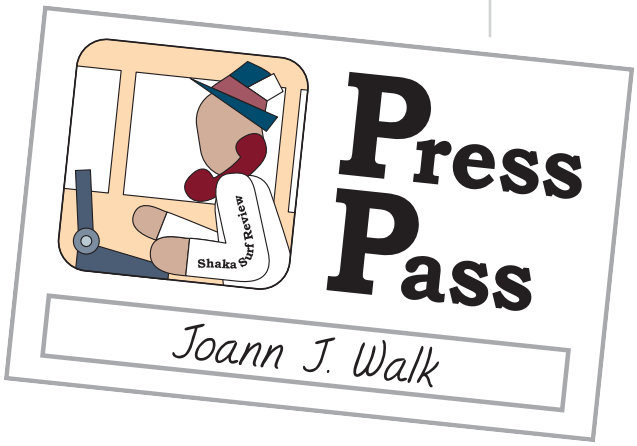
- take on the roles of accountant, cartographer, researcher, and recorder
- sift through research data included in the surf magazine
- do additional research for more detailed information about the spot
- use information gathered during research to complete the surf and location data sheets
- understand the factors that influence how the breaks "work"
- find photographs or video of the breaks
- keep a balance sheet of trip finances and expenditures
- respond to **Fate Cards** as received

Set students to the task of researching their first surf site. Research begins with the entire group actively listening as one member reads the site's description aloud from the ***Surfer's Gazette***. Then team members plunge into the work demanded by their roles.

Another way to speed the simulation's research time up is to hand out the **Tourism, Surfing, Visas, and Currency in Countries With Surf Sites** "cheat sheet" that can be found among the teacher's additional handouts.

2 mintues before the end

Two minutes before the end of the class period, today and every day, team members should give their research to the recorders, who should gather all the data into their files and then hand the files over to the teacher for safe keeping or store them in some designated place.



Small group

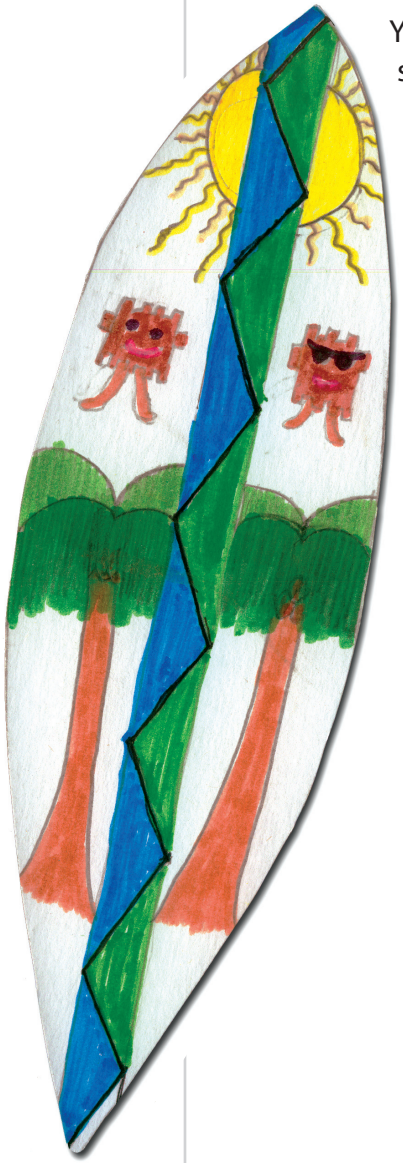
Teaching tip
You may entirely omit the first Learning Center if student skills in latitude and longitude are already strong. Proceed instead to the directions for day four.

Day 3

You may choose to open the class period by introducing one of the Learning Centers. Don't forget to use your surfer slang.

Learning Center One: Where's the Best Surfing?, teaches about absolute and relative location. If you want a strong geography component in the unit, distribute the handout to the whole class and have everyone in the class become, for this day, cartographers.

In the most complete fulfillment of Learning Center One, each student determines the absolute location of all 20 surf sites by three different methods, and also identifies the positions of the sites by writing, for each site, a single grammatical sentence describing its relative location. In this configuration, Learning Center One will take the entire class period.



You can cut the lesson time in half by assigning half the students to do the first ten of the 20 surf sites and the other half of the students to do the second ten of the 20 sites. Then use the remainder of the period for the student groups to continue (and possibly finish) research on their first surf site.

Cut the time to one quarter by having each student do just five surf sites, or by having each student do just the sites (usually three) assigned to their team. Again, use the rest of day three for the student groups to continue (and possibly finish) research on their first surf site.

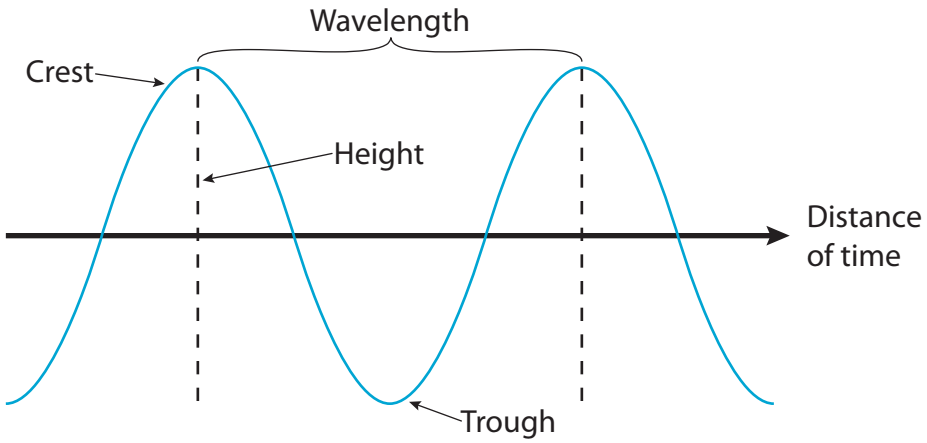
If you have decided to make a bulletin board display showing the surf sites on a map of the world, this is a good time to ask teams to create surfboard icons to pin to the board at the locations of the surf sites.

Day 4

Small group

Work in one or two learning centers, giving preference to Learning Centers Two and Three, **It's All About the Waves!** and **Give Me a Break!**, which both address the fundamental concept of waves. As you introduce scientific terminology, encourage students to translate scientific terms into surfer slang.

In any remaining time, teams finish research on the first surf site and start research on the second site. Remind students to rotate team roles. **Fate Cards** could come into play.



Day 5

Small group

Work in one or two learning centers. Remind students to rotate team roles. Teams finish research on the second surf site and start research on the third site. **Fate Cards** could come into play. Keep talking surfer!

Day 6

Small group

Work in one or two learning centers. Remind students to rotate team roles. Teams finish research on the third surf site. **Fate Cards** could come into play.

Before the end of the day, each team should reach consensus on which of their three surf sites really is the best candidate for "perfect wave." They should also brainstorm how they will illustrate their surf site reviews.

Dude! Don't tell me you forgot to talk like a surfer!

Day 7

Whole Class

Work through Learning Center Eight, **Planning to Write an Article**.

Learning Center Eight begins as a whole-class exercise. The teacher makes sure students recognize that ***Surfer's Gazette*** contains writings in the literary form of magazine articles and, more particularly, in the literary genre of reviews. Next, the teacher shows—or better, uses the Socratic method to lead students to discover—that the articles are formulaic. In almost every article, the same sorts of information are presented in the same order. For a breakdown of this formula, see the teaching notes for Learning Center Eight.

Small group

The class breaks into teams for ten minutes to analyze the articles. Using the **Surf Break Analysis Sheet** as a checklist, students should quickly grasp the structure that is common to all the reviews.

Whole Class

The class meets as a whole again to compare insights on what the teams have discerned about the structure of the surf reviews. Team recorders should compile notes on this discussion and share the notes with team members.

30 minutes

Then tell students you are going to teach them to **Write Like Tarzan**. The oddness of the idea should catch their attention. When they edit a piece of writing from first draft to finished piece, how do they know if they are making it better or just changing it to fit their personal taste? Promise that in the next 30 minutes, Tarzan will teach every person in the class to be a better writer.

This **Write Like Tarzan** mini-lesson suggests an easy-to-learn technique for writing strong sentences. It should be a Socratic lesson. You'll stand at the blackboard (or whatever display technology you've got) with a paragraph ready for editing—the first paragraph of Scott Carlton's review of Tavarua (a handout you'll find in Learning Center Eight). As you prompt students with questions, the whole class will collaborate with each other and with you, advising you how to change the paragraph based on five basic rules for better writing. At the end of the lesson, after the class has collaborated in improving the paragraph, you're going to want to put the unimproved old paragraph next to the improved one, so take steps to make that possible.

Begin the lesson by praising the article's first sentence. It's great: "Sapphire blue barrels curl around the serene coral reef that surrounds Tavarua." The sentence starts strong, with "sapphire blue barrels"—that's as pretty as a *National Geographic* photograph. The next word "curls" those blue barrels, putting the photograph in motion, turning the photograph into a movie. More strong words lead the reader along to "Tavarua," and by the time you get to that word, it is no meaningless geographical name for a place you've never been and don't know—Tavarua is a place you can see. Eliciting as much of this as possible from

your students, guide them this far through close analysis of the first sentence.

Now distribute the **Write Like Tarzan** handout from Learning Center Eight. Ask a student to read it out loud. The four main rules are: (1) identify the strong words, (2) put your strongest words first to grab the reader's interest, (3) put a strong word at the end so the sentence goes somewhere good, and (4) get rid of all the weak words you can.

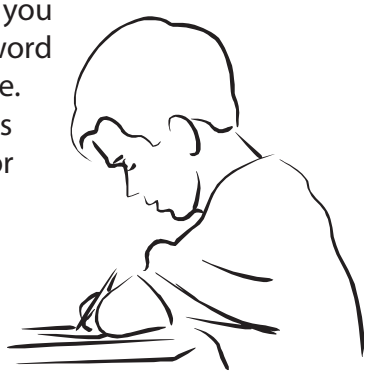
For two main reasons, the **Write Like Tarzan** mini-lesson does not go into detail about what makes words strong or weak. First, to allow students a sense of *discovery*—to let them own the language as something intuitively understood and naturally theirs instead of handing down rules from those higher grammarians imagined to be the language's elite masters. Second, the strength of the lesson is its simplicity—a system almost anybody can use. To add details is to lose students—and to lose exactly those students who most need help.

Okay, apply rule one to the article's first sentence. Circle (or mark) the strong words. Ask the students to guide you. As it turns out, of the 12 words in the first sentence, only two are weak: "the" and "that." Maybe some student will suggest the preposition "around" is weak; if no one does, ask why not. Prepositions are generally weak, why not this one? That'll give you an excuse to talk about the poetry in the sentence. "Around" rhymes with "surround," "curl" almost rhymes with "coral," "surround" and "serene" almost rhyme—this writing's intense!

But the next sentence comes as a letdown. It starts weak. "The minute"—it's abstract. Ask the kids which words to mark as strong. Toes, warm water, duck, perfect barrel, stoked—these are the strong words, and "stoked" is strongest of all. In fact, you can see that each noun is a little stronger than the one before it, so you can see that the strategy of this sentence is to build up to a climax, the climax of being stoked for life. "Stoked for life" is supposed to be stronger than just plain "stoked," but "life" comes across as an abstract time-period like "minute." "Stoked" is the strong word, "for life" is an anti-climax.

Rule number two: put your strongest word first to grab the reader's interest.

In the sentence ,"The minute your toes hit the warm water, the minute you duck into the perfect barrel, you're stoked for life," the most powerful word is "stoked." Let's move the strong word to the beginning of the sentence. Let's use its power to grab readers right away. Rewrite the sentence this way: "Stoked the minute your toes hit the warm water, you're stoked for life the minute you duck into the perfect barrel."



Now the sentence starts with a strong feeling and ends with a strong reason for the feeling. We didn't do much to change the sentence, but we applied rules one, two, and three, and the sentence got

better. Even the "for life" seems stronger now that it is not dangling at the end of the sentence. You could apply rule four. You could argue that allowing "the minute" to show up a second time in the sentence is weak repetition, but you could also argue that the repetition lends the sentence a pleasing symmetry—it's a judgment call.

The strongest words in sentence number three, the kids will tell you, are "epic" and "gnarly." Following rule number three would change the sentence from "Epic is the only word to describe these gnarly waves" to "Epic is the only word to describe waves this gnarly." Invoke rule number four and you'll excise that long string of weak little words to arrive at "'Epic describes waves this gnarly." That's more forceful.

But the next sentence is almost all weak words. What is strong in "They can reach to 18 feet on special days, but mostly the size is ideal for many people"? I'd argue that only "18 feet" has any impact; even "special days," which should be strong because it is "special," is actually an evasive phrase since it avoids specifying what actually makes the days special.

And the last two sentences aren't much better: "The fast moving, powerful wave is first class, and totally necessary for hardcore surfers. It provides a long and legendary ride for those willing to surf it."

So, letting the kids and the rules guide you, steer the class toward seeing that the rest of the paragraph contains so little strength that the best solution will be to combine the three sentences. Though the process of finding the best solution will be complex, keep prompting and questioning until you arrive at something like this end state: "Reaching 18 feet some days, easily surfable other days, this fast-moving, powerful wave provides a ride that's long and legendary."

Note that the transition from the eight words of "mostly the size is ideal for many people" to the four words of "easily surfable other days" came partly from following rule number five: Replace weak words with stronger words.

A lesson along these lines sells the idea that writers should take the time to edit their first drafts, and it models how to use simple editing guidelines that do not merely make aimless changes, but purposefully improve the prose.

Individual

In any time left, students begin writing their articles. Each student on the team writes his or her own formulaic review of the site the team has nominated as the "perfect wave." These individual reviews will be finished for homework.

Remind students to make their reviews rich in technical terminology and surfer slang.

Day 8


Small group

After rotating team roles, students present their individual surf-site reviews to their teammates orally, also using any photos they have found or diagrams they have drawn as visual aids. In terms of the simulation, they are "pitching" their articles to the "editorial review board." What's really happening is a peer review process in which teammates offer constructive criticism about form, content, and style. In the remainder of the period, students collaborate on writing a single review of their surf site, a killer review that combines all the best features of their individual reviews and uses plenty of surfer lingo.

Day 9


Small group

Putting the final touches on their presentations, students assemble their work—the review and any illustrations—in whatever format the teacher (or the class as a whole) decided on at the beginning of the unit—perhaps as posters to hang on the wall, or pages to bind in a magazine, or Web pages linked to the class Web site.

On day nine or the evening of day nine, you should assess each team's article. Articles will either be "accepted for publication" or "returned for revisions." If any articles are returned for revisions, teachers should be clear about the improvements needed and those student teams should be allowed time to re-submit their articles after making the required corrections.

Each article "accepted for publication" should earn the team responsible a "check" for $15,000 from *Shaka Surf Review*.

Day 10

Beach party, dude!

There's a classic surfer movie playing on the TV screen. Students are wearing leis and drinking Hawaiian Punch. They're dancing the twist to surf music playing on a boom box. Heck, if the weather is warm and the principal is cool, the kids might even be wearing bathing suits!

Each team explains their choice of the perfect wave in the perfect place to the rest of the class. Try to make this as relaxed and informal as possible. Encourage surfer slang. Encourage a spirit of fun.


Small group

After the students' oral presentations, encourage talk about what people most enjoyed learning; what they liked best about the simulation; what else they'd like to learn about oceans, waves, and surfing. Great conversational topic: "If you could really go to just one surf site, where would you go? And why there, why that spot?"

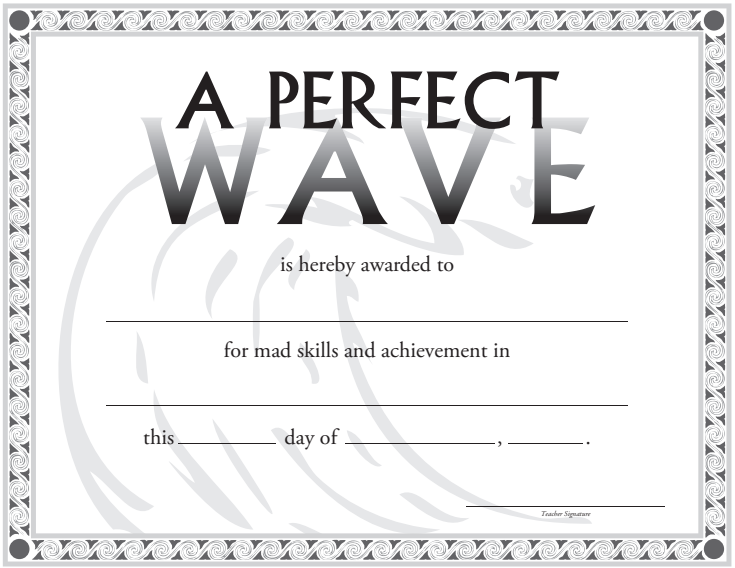

Whole class

Another great topic for conversation: "What does it mean to be perfect?" Isn't "perfect" a matter of opinion, a matter of taste, with no real right answer? Isn't it true that ideal conditions without a great experience won't equal a perfect wave? Doesn't "perfect" sound like a changeless, eternal ideal, while a wave is constantly changing? Can a constantly changing thing be perfect?

Give out **Perfect Wave Awards** for any "bests" that were accomplished during the simulation. Let your imagination go wild on this. Don't just give Perfect Wave Awards for the obvious stuff—the best cartography, the best accounting, the best team management, the best teamwork, the best work on each Learning Center, the fastest, the most thorough. Give unlikely, unexpected awards, too—say, best team name or best surfer dialect. Give a "best photographer" award to whichever student or team came up with the most outstanding surf picture. Give a "best oceanographer" award to the student strongest in wave science. Give a "most stoked" award to the student with the greatest enthusiasm, an "aloha spirit" award to the most helpful teammate, and even a "best do" award to the student with the best surfer hair. Give an award to the team that goes home with the most money in its bank account. Give an award to the team with the most awards.

Record the awards and make them part of your student assessments.

Of course the big kahuna of **Perfect Wave Awards**, saved for the party's finale, comes when you announce which team's review was most persuasive—the team that convinced you they really had found "the perfect wave in the perfect place."



Extension Activity Ideas

- Have students apply for passports so they can travel abroad. Applying for a U.S. passport can be done online: http://travel.state.gov/passport/passport_1738.html
- Have students find out what visas are—who needs them and how do you get them? Will they need visas to travel to the country they will be visiting?
- Have the students find out if they will need any shots for their trip. Where can they find this information?
- Find out if there are entry fees to get into the countries they are visiting. What about exit fees?
- What currencies are used in the countries students will visit, and what are the exchange rates?
- Take the unit to greater depth by investigating the cultures of the different countries where these surf spots are found.
- Assign each student to investigate an area of interest related to surfing. For example, different kinds of wetsuits, what kinds of boards are used in different surfing conditions, or how to perform various maneuvers.
- Students who want to learn to surf can research the basics and write an article for their classmates. A great book for this is Doug Werner's *Surfer's Start-Up: A Beginner's Guide to Surfing.*
- Play the Beach Boys or other surfing music while students are working.
- Show movies or excerpts from movies related to surfing. Examples (many are unrated, please preview all movies before showing) of surfing documentaries include *The Endless Summer* (1966), *Tubular Swells* (1975), *Endless Summer II* (1994, rated PG), *The Endless Summer Revisited* (2000), *Step Into Liquid* (2003, rated PG), *Blue Horizon* (2003), *Billabong Odyssey* (2005, rated PG), *Going With the Flow: Classic California Soul Surfing* (2005), *Free as a Dog* (2006), *Sipping Jetstreams* (2007), *One California Day* (2007), *Bustin' Down the Door* (2008), and *Waveriders* (2008). Examples of campy "beach party" movies (not much surfing, but good for a chuckles at surf culture stereotypes) include *Beach Party* (1963), *Muscle Beach Party* (1964), *Bikini Beach* (1964), *Beach Blanket Bingo* (1965), and of course one of the all-time great movie titles, *How to Stuff a Wild Bikini* (1965).
- Read about famous surfers. Most of the books are about male surfers, however, the book *Girl in the Curl* (Andrea Gabbard, Seal Press ©2000) is an excellent history of great female surfers.
- Play music with ocean sounds.
- Visit a surfing museum.
- Interview surfers. In preparation, write out interview questions.

Answer Key

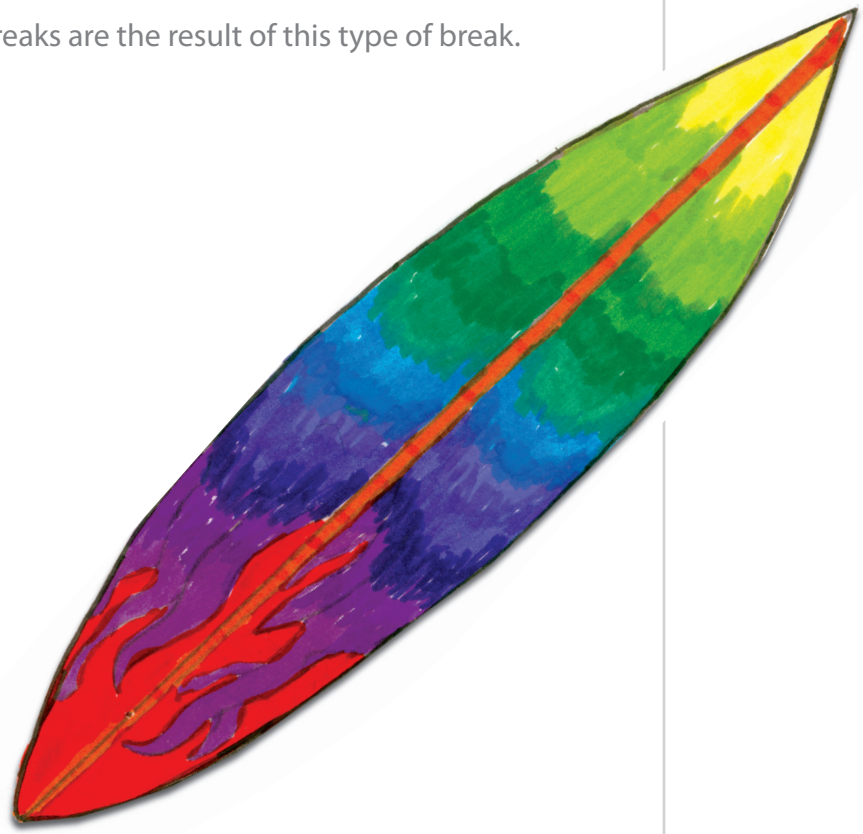
Learning Center One: Where's the Best Surfing?

Surf Break	City	Latitude/Longitude Using Computer
Banzai Pipeline	Honolulu, Oahu	21°19' N, 157°51 W
Bells Beach	Bells Beach, Victoria	37°49' S, 144°58' E
Cape Hatteras	Cape Hatteras (no city)	35°30' N, 75°30' W
Dingle Peninsula	Brandon Bay, Inch Beach	52°08' N, 9°59' W
Dungeons	Hout Bay, Cape Town	33°55' S, 18°22' E
Hossegor	Hossegor	43°40' N, 1°27' W
Isla Todos Santos	Ensenada	18°01' N, 95°30' W
Jeffreys Bay	Jeffreys Bay, Port Elizabeth	33°58' S, 25°40' E
Kirra	Kirra, Gold Coast	28° S, 153°25' W
Mavericks	Princeton-by-the-Sea, Half Moon Bay	37°29' N, 122°26' W
Mundaka	Munda, Bilbao	40°24' N, 3°41' W
Puerto Escondido	Puerto Escondido	15°50' N, 97°10' W
Raglan	Raglan	33°26' S, 149°36' E
Rincon	Rincon Point, Santa Barbara	34°25' N, 119°42' W
Rio de Janeiro	Rio de Janeiro	22°57' S, 43°12' W
Steamer Lane	Santa Cruz	36°58' N, 122°02' W
Sunset Beach	Honolulu, Oahu	21°19' N, 157°51' W
Tavarua	Nadi	17°48' S, 177°25' W
Teahupoo	Teahupoo Tahiti	17°37' S, 149°27' W
Trestles	San Clemente	33°26' N, 117°37' W

Learning Center Three: How Do Waves Break?

The __wind__ plays a major role in forming the waves surfers ride. As the waves approach land, they encounter the ____ocean floor____. When this happens, the bottom of the wave begins to ___drag___, slowing the base of the wave down. This makes the following part of the wave pile up over the slowed base, increasing the wave's height (waves can reach heights of 80 feet). In the ___top___ part of the wave, the wave's ___momentum____ continues forward. As the top of the wave continues towards the shore, the base of the wave can no longer support it. The top of the wave ___collapses___ and falls over on itself—the wave breaks.

There are different kinds of breaks, depending on the type of ground underneath the waves as they approach the shore. A ___beach break___ is a surf zone that takes shape over a sandy bottom. A ___point break___ is a surf zone that breaks around a point of land and allows the incoming groundswells to wrap and peel around it. A ___reef break___ is a permanent, elevated, shallow area under the surface of the water that is almost always formed by rock and coral. Almost all international big-wave surf breaks are the result of this type of break.



Educational Standards

National Geography Standards

The goal of the National Geography Standards is to produce a geographically informed person who sees meaning in the arrangement of things in space and applies a spatial perspective to life situations. Standards applicable to this simulation:

The World in Spatial Terms

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective
2. How to use mental maps to organize information about people, places, and environments in a spatial context
3. How to analyze the spatial organization of people, places, and environments on earth's surface

Places and Regions

4. The physical and human characteristics of places

Physical Systems

7. The physical processes that shape the patterns of earth's surface

Human Systems

11. The patterns and networks of economic interdependence on earth's surface

Environment and Society

14. How human actions modify the physical environment
15. How physical systems affect human systems

The Uses of Geography

18. How to apply geography to interpret the present and plan for the future

National Science Education Standards

Through the process of inquiry, this simulation encourages scientific literacy—the knowledge and understanding of scientific concepts and processes required for personal decision-making. The simulation helps develop students who can ask, find, or determine answers to questions derived from curiosity about everyday experiences. These students describe, explain, and predict natural phenomena. They read with understanding articles about science in the popular press and engage in social conversation about the validity of the conclusions.

Relevant standards include:

Content Standards A: Abilities necessary to do scientific inquiry

- Design and construct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Develop descriptions, explanations, predictions, and models using evidence.
- Think critically and logically to make relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.

Content Standards B: Physical Science

Motions and Forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.

Content Standards D: Earth and Space Science

Structures of the Earth System

- Global patterns of atmospheric movement influences local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

Earth in the Solar System

- Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the phases of the moon.
- Gravity explains the phenomena of the tides.

Content Standards E: Science and Technology

Transfer of Energy

- Energy is transferred in many ways, including waves.
- The sun is a major source of energy for changes on the earth's surface, transferring energy from the sun to the earth.
- Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

Conservation of Energy

- All energy can be considered kinetic energy, which is the energy of motion; potential energy, which depends on relative position; or energy contained by a field, such as electromagnetic waves.
- Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion

California Applied Learning Standards

Standard 4. Students will understand how to solve problems through meeting client needs. Students will conduct a commissioned project.

Standard 6. Students will understand how to apply communication skills and techniques. Students will demonstrate ability to communicate orally and in writing.

Standard 8. Students will understand the importance of teamwork. Students will work on teams to achieve project objectives.

Name: _____ Date: _____

Where's the Best Surfing?

Learning Center One

Absolute and Relative Locations

A location, to a geographer, is a place. The geographer contrasts the word "location" with the word "region." A region is a wide area, and a location is a single place.

Geographers have two ways of talking about location. One way, more scientific, uses numbers to say exactly where a place is—to specify its "absolute location." The other way, more conversational, tells where a place is by explaining what other places are nearby. When we describe one location in terms of other locations, we are giving its "relative location."

For example, if someone asks you to tell where Surf City, USA, is located, you might answer—wait a minute, is this a trick question?

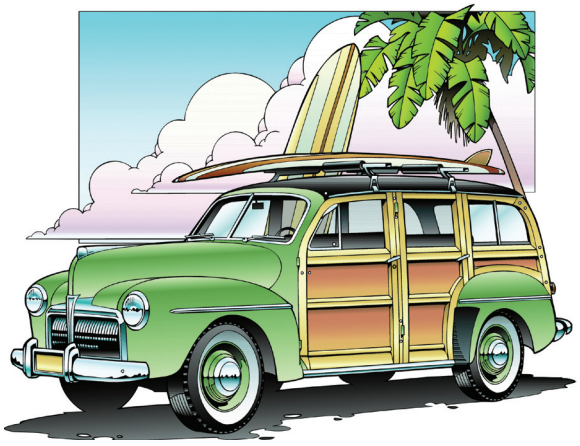
Yes, it is.

On a map, you can find Surf City, New Jersey. You can find Surf City, North Carolina. But which one is Surf City, USA?

Any surfer worth his or her salt should know that Surf City, USA, is both a mythical place and a real place. Way back in the 1960s, a musical duo called Jan and Dean came out with a hit song, "Surf City," with deathless lyrics such as:

I bought a '30 Ford wagon and we call it a woodie.
Surf City, here we come.
You know it's not very cherry, it's an oldie but a goodie.
Surf City, here we come.
Well, it ain't got a back seat or a rear window
But it still gets me where I wanna go.

And we're goin' to Surf City 'cause it's two to one.
You know we're goin' to Surf City, gonna have some fun.
You know we're goin' to Surf City 'cause it's two to one.
You know we're goin' to Surf City, gonna have some fun.
Two girls for every boy!



This song, along with other surf music from the same period—music from groups like the Beach Boys, the Ventures, and the Surfaris—made American teenagers fall in love with a vision of California sun, sea, and sand. Beach party movies quickly followed—movies like *Beach Blanket Bingo* and *How to Stuff a Wild Bikini.* A documentary called *The Endless Summer* followed two American surfers around the world in search for the perfect wave. On every American coast, surfing became the new craze.

Surf City, to Jan and Dean and every American teenager with ears and a heart, was a mythical place.

It was the good place you wanted to go to—not the place where you were now, but some other place, the right place, the place where you could be happy.

Surf City, to Jan and Dean, was also a real place in the real world. Surf City was Huntington Beach, California—and Huntington Beach's getting the nickname "Surf City" was no accident. The city's founder, H.E. Huntington, hired Hawaiian surfer George Freeth to demonstrate this ancient and exotic Polynesian art—and to generate publicity that would draw tourists to Huntington's little beach town. That's how, in 1910, Huntington Beach became the town that introduced surfing to the U.S. mainland. The city's promotion of surfing continues to this day, with its annual highpoint being the U.S. Open of Surfing and with "Surf City USA" being the town's legally trademarked nickname.

So our trick question, "Where is Surf City, USA?," should really ask, "Where is Huntington Beach, California?"

To answer with a relative location, Huntington Beach lies on California's coast between Los Angeles and San Diego. This answer is not very precise, but most people know where San Diego and Los Angeles are, so the relative location gives us a rough idea that we can quickly understand.

To answer with the absolute location, Huntington Beach lies precisely at 33°41'34" N, 118°0'1" W. But what the heck does that mean?

The Coordinate System of Location

When it comes to describing a location on the Earth's surface, numbers can be more precise than words.

The numbers used to specify a location on the Earth's surface are called coordinates. You might remember the word "coordinates" if you ever studied plane geometry. It was in plane geometry that you learned to draw two lines on a piece of paper and to label one line the x-axis and the other the y-axis. You probably drew the x-axis as a horizontal line and the y-axis as a vertical line. Then you could specify any point on the plane by measuring its distance from the x-axis and the y-axis. The two numbers, x and y, were the "coordinates" that specified the location of the point.

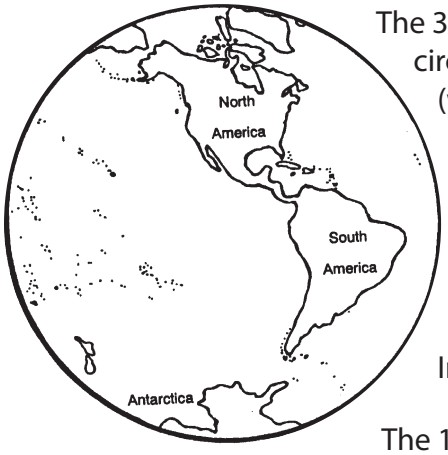
We use the same kind of coordinate system to specify the location of any point on the surface of the Earth. On the Earth, the x-axis is the equator, the imaginary line that runs east and west around the center of the globe, halfway between the North Pole and the South Pole. The y-axis is called the Prime Meridian, a line running north and south. The position of this north-south line was chosen through an accident of history. When the geographers of Great Britain were designing their country's coordinate system, they found it convenient to make the line of the y-axis run right through the backyard of their observatory in the little town of Greenwich. Other countries drew the y-axis in places that seemed convenient to them—through Brussels, Copenhagen, Kyoto, Lisbon, Madrid, Paris, St. Petersburg, Warsaw, and Washington, for instance. All these different numbering systems made using maps from foreign countries difficult, so in 1884, most of the world agreed to use the British line.

Using Latitude and Longitude

Lines of latitude and longitude create a grid system that we can use to come up with numerical coordinates that say precisely where something is.

Latitude lines run horizontally. These lines lie about 69 miles apart. Latitude lines can also be called "degrees of latitude," arranged by convention from 0 degrees at the equator to 90 degrees north at the North Pole and 90 degrees south at the South Pole.

Longitude lines are vertical lines. They run from pole to pole. Unlike lines of latitude, which are parallel (they never touch each other), lines of longitude converge (touch) at the North Pole and the South Pole. Unlike the distance between two lines of latitude, which we said stand about 69 miles apart from each other, the distance between two lines of longitude gets smaller the farther north or south you move from the equator. At the equator, for example, one line of longitude stands about 69 miles from the next line of longitude, but one third of the way to the North Pole (at about the latitude of New Orleans, Louisiana) two lines of longitude stand only 60 miles apart, and two thirds of the way to the North Pole (at about the latitude of Anchorage, Alaska) the lines of longitude are separated by only 34 miles. If you stand exactly on the North Pole, all 360 of the world's lines of longitude meet under your feet with the distance between them shrunk to zero.



The 360 degrees of longitude are true mathematical degrees—the circle of the globe divided into 360 equal angles. The Prime Meridian (which passes, you may recall, through the backyard of the Royal Observatory in England) is longitude 0. From there, the lines of longitude fan out 180 degrees east and 180 degrees west to meet at the International Date Line in the Pacific Ocean—just a little east of New Zealand. Everything from the Prime Meridian west to the International Date Line lies in the Western Hemisphere; everything east from the Prime Meridian to the International Date Line lies in the Eastern Hemisphere.

The 180 degrees of latitude (90 degrees north of the equator plus 90 degrees south of the equator) are not "degrees" in the mathematical sense: they aren't angles, they are only parallel lines. Because geographers thought it would be convenient to have the same way of talking about east-west lines as mathematics gave them for talking about north-south lines, they are called "degrees."

Mathematical degrees, you might possibly remember, can be further divided into smaller units. We divide one degree into 60 smaller units called "minutes" (but these minutes are not units of time, they are small angles) and we divide one minute into 60 smaller units called "seconds" (again, not units of time but even smaller angles). All of this also applies to degrees of latitude and longitude.

Using Latitude and Longitude

You now know everything you need to know in order to use latitude and longitude to identify a place on Earth—except one rule: When giving coordinates, name the latitude first, and then the longitude.

Both are expressed in degrees, minutes, and seconds.

To return to our original question, Surf City, U.S.A. (Huntington Beach, California) lies precisely at 33°41'34" N, 118°0'1" W. Translating the symbols, that means 33 degrees, 41 minutes, and 34 seconds of latitude north of the equator, and 118 degrees, zero minutes, and one second west of the Prime Meridian.

Practice makes perfect—so let's find our surf sites!

Learning Center One: Directions

Your teacher will direct you to do some or all of the following tasks.

Using the Internet or a copy of the magazine *Surfer's Gazette,* learn what towns or cities are closest to each of the world's 20 best surf spots listed in your handout.

Using a globe, find the latitude and longitude of the first 10 surf breaks—their absolute locations accurate to the nearest minute.

Using an atlas, find the latitude and longitude, accurate to the nearest minute, of the last 10 surf breaks.

Use the Internet to find the latitudes and longitudes of all the locations.

After you complete this work, answer the question: "How do the measurements compare?"

Describe each break's relative location in words, writing one good, grammatical sentence to describe the location of each break.

Learning Center One: Resources and Extension Activities

Use three different resources to find the absolute location of your school, and describe the school's relative position in one good, grammatical sentence.

If you started from your school, drilled through the center of the Earth, and came out the other side, what would your latitude and longitude be? Describe your relative position in one good, grammatical sentence.

Where's the Best Surfing?

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Banzai Pipeline		Hawaii
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Bells Beach		Australia
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Cape Hatteras		North Carolina
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Where's the Best Surfing?

Master

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Dingle Peninsula		Ireland
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Dungeons		South Africa
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Hossegor		France
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Where's the Best Surfing?

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Isla Todos Santos		Mexico
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Jeffreys Bay		South Africa
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Kirra		Australia
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Mavericks		California
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Mundaka		Spain
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Puerto Escondido		Mexico
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Where's the Best Surfing?

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Raglan		New Zealand
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Rincon		California
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Rio de Janeiro		Brazil
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Steamer Lane		California
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Sunset Beach		Hawaii
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Tavarua		Fiji
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Name: _____ Date: _____

Find the city locations of the surf breaks.

Surf Break	City	State or Country
Teahupoo		Tahiti
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Surf Break	City	State or Country
Trestles		California
Latitude/Longitude Using Globe	**Latitude/Longitude Using Atlas**	**Latitude/Longitude Using Computer**
Cited Globe	**Cited Atlas**	**Cited Web Site**
Relative Location		

Name: _____ Date: _____

It's All About the Waves!

Learning Center Two

How Waves Form

Researching Waves

Understanding how waves form, move, and break is important in helping surfers find and ride the perfect wave. Research the following questions:

- What are waves?
- What are the "parts" of a wave?
- What are the different types of waves?
- Can you describe the motion of one molecule of water as the molecule responds to a wave? Is that motion different in different types of waves?
- How do waves form?
- What makes some waves bigger than others?
- Do waves always move at the same speed? If they speed up and slow down, what makes their speed change?

Learning Center Two: Directions

After researching waves, and especially ocean waves, each team member, working individually should…

1. Answer the above questions in writing. Use complete sentences. As much as possible, use scientific terminology.
2. Draw a diagram of a wave and label its parts.
3. Without looking at your diagram or what you have written, talk to your teammates about the questions above, explaining your answers to your teammates. Listen carefully as they explain their answers to you. Do all your ideas match all their ideas? If any ideas don't match, do more research. The team manager should tell the teacher when the whole team is in agreement and ready to answer every question.

Learning Center Two: Web Resources

All of the following links can be found at: http://www.teachinteract.com/tsunami

- The *How Stuff Works* Web site includes a great article called "How Surfing Works" (Wilson, Tracy V., 11 June 2007. HowStuffWorks.com. http://adventure.howstuffworks.com/outdoor-activities/water-sports/surfing.htm, 10 March 2010.) Written in everyday language without much scientific jargon, the entire article is well worth reading, but section six, "The Physics of Waves," is especially useful, and it includes a very good diagram.

- For another very good, very short explanation of waves and wave motion (this one is especially good at explaining what a wave is), see the "General Wave Motion" page (http://www.school-for-champions.com/science/waves.htm by Ron Kurtus, revised June 24, 2006) on the School for Champions Web site.

- Technical but readable, the Web page "Ocean Waves Styles and Patterns" (http://earthsci.org/processes/weather/waves/Waves.htm on the Earth Science Australia Web site, last modified Sunday, January 10, 2010) supplies three really good pictures that show capillary waves, whitecap waves, and the formation of ocean swells in the open ocean.

- For a technical scientific explanation of waves, visit the following Web site: http://www.seafriends.org.nz/oceano/waves.htm ("Oceanography: Waves—theory and principles of waves, how they work and what causes them," by Dr. J. Floor Anthoni, 2000.) The most useful sections are "Waves in the Environment," "Wave Motion" (read the first five paragraphs and skip the boxed insert), "Waves and Wind" (the first three paragraphs and the last paragraph), and "Waves Entering Shallow Water" (the first two paragraphs). This resource is especially good on how wind causes wave size to increase.

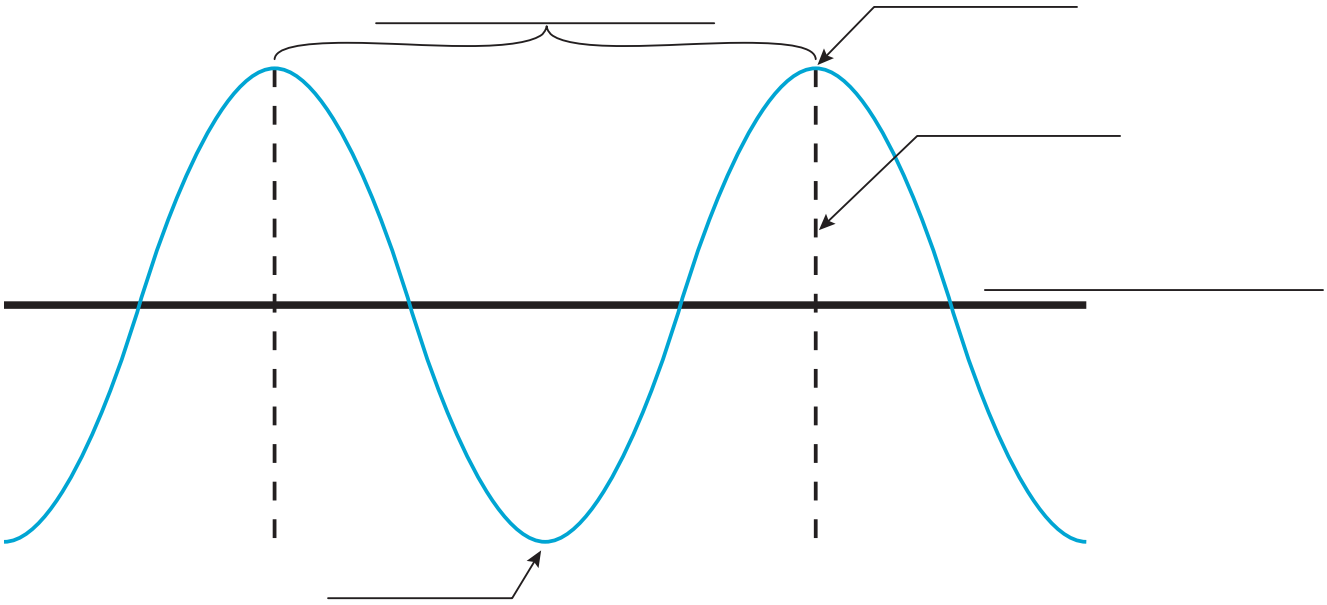
- The Water Encyclopedia Web site's "Waves" page provides excellent information about characteristics of waves, breaking waves, and the formation of waves at sea. See http://www.waterencyclopedia.com/Tw-Z/Waves.html by Ron Crouse, March 10, 2010.

- Fun for all ages, a whole-class group activity from the University of Southern California's Sea Grant Program:
http://www.usc.edu/org/seagrant/Education/IELessons/Docs/RideTheWaves.pdf

- For highly technical language accompanied by wonderfully revealing diagrams:
http://hyperphysics.phy-astr.gsu.edu/hbase/Waves/watwav2.html

- One more technical site for bodacious wave scientists:
http://www.antrimdesign.com/articles/waves.html

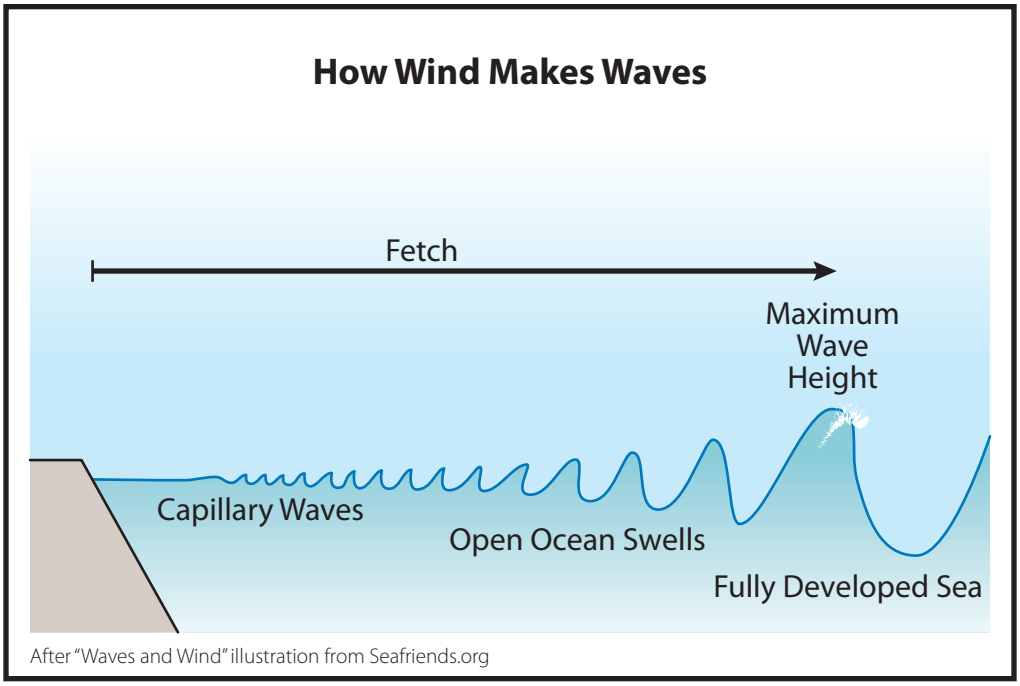
Learning Center Two: Diagram Activity 1



Label this generic wave diagram using the following terms:

- crest
- trough
- wave height
- wavelength
- period

Learning Center Two: Diagram Activity 2



After "Waves and Wind" illustration from Seafriends.org

The diagram above illustrates how wind blowing across water creates waves. Write a paragraph explaining that process. Be sure to use (and explain the meanings of) all the terms that you see in the diagram.

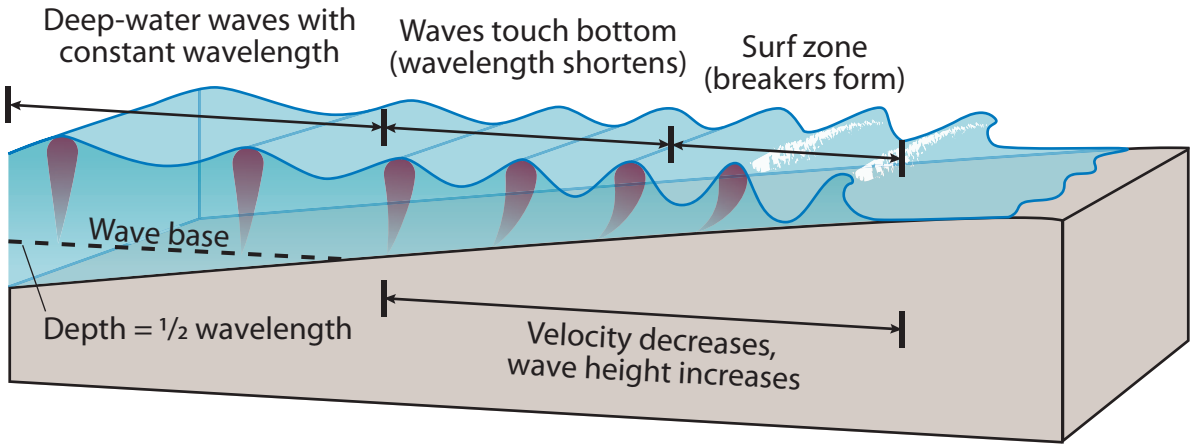
Name: _____ Date: _____

Give Me a Break!

Learning Center Three

How Waves Break

How Ocean-Bottom Topography Changes Waveforms



After an illustration in Ron Crouse's "Waves" article from the *Water Encyclopedia* Web site (http://www.waterencyclopedia.com).

Directions: Your short answers to the following questions do not need to be complete sentences.

1. What happens to wavelengths as waves approach shore?

2. What happens to wave heights as waves approach shore?

3. What happens to the speed of a wave as the wave approaches shore?

4. The base of a wave is the bottom of the zone of the wave's influence. In other words, above the base of the wave, the wave moves the water; below the base of the wave, the water is almost still. How deep is the base of a wave?

5. When the base of a wave moving shoreward begins to contact the seafloor, the bottom of the wave is obstructed and slows down, but the top of the wave continues at its original speed. What does this do to the shape of a wave?

Learning Center Three: Web Resources

All of the following links can be found at: http://www.teachinteract.com/tsunami

- The *How Stuff Works* Web site includes a great article called "How Surfing Works" (Wilson, Tracy V., 11 June 2007. HowStuffWorks.com. http://adventure.howstuffworks.com/outdoor-activities/water-sports/surfing.htm, 10 March 2010.) Written in everyday language without much scientific jargon, the entire article is well worth reading, but section six, "The Physics of Waves," is especially useful, and it includes a very good diagram.

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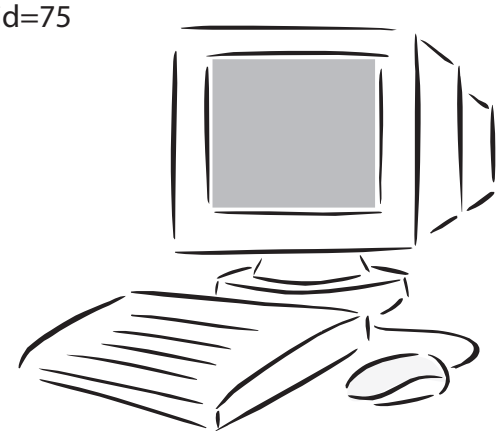
- The Water Encyclopedia Web site's "Waves" page provides excellent information about characteristics of waves, breaking waves, and the formation of waves at sea. See http://www.waterencyclopedia.com/Tw-Z/Waves.html by Ron Crouse, March 10, 2010.

- To learn more about the elements of surfboard design, consult this Web page: http://360guide.info/surfing/surfboard-design.html?Itemid=75



Learning Center Three: How Do Waves Break?

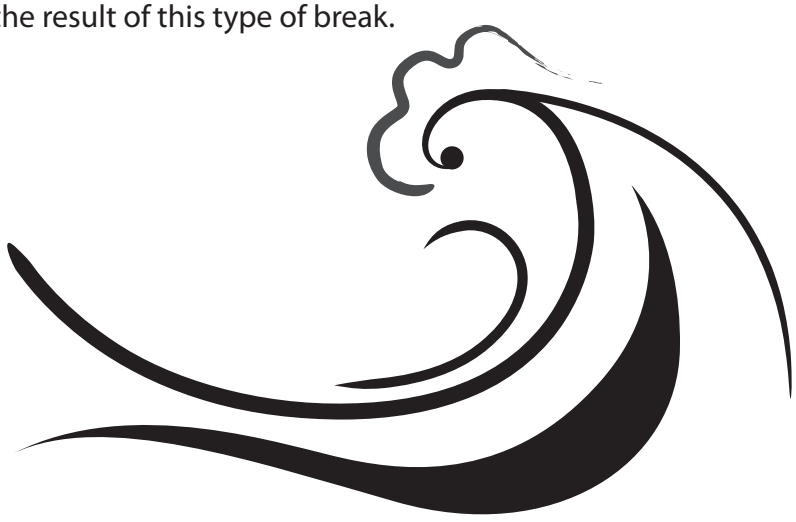
Understanding how waves form, move, and break is important in helping surfers find and ride the perfect wave. For answers, choose from these terms:

beach break collapses drag ocean floor point break momentum

reef break top wind

The _____ plays a major role in forming the waves surfers ride. As the waves approach land, they encounter the _____. When this happens, the bottom of the wave begins to _____, slowing the base of the wave down. This makes the following part of the wave pile up over the slowed base, increasing the wave's height (waves can reach heights of 80 feet). In the _____ part of the wave, the wave's _____ continues forward. As the top of the wave continues towards the shore, the base of the wave can no longer support it. The top of the wave _____ and falls over on itself—the wave breaks.

There are different kinds of breaks, depending on the type of ground underneath the waves as they approach the shore. A _____ is a surf zone that takes shape over a sandy bottom. A _____ is a surf zone that breaks around a point of land and allows the incoming groundswells to wrap and peel around it. A _____ is a permanent, elevated, shallow area under the surface of the water that is almost always formed by rock and coral. Almost all international big-wave surf breaks are the result of this type of break.



Learning Center Three: Extension Activity

Demonstration of Swells and Breaks

Your teacher is going to make waves. Your job is to observe and analyze wave patterns.

Your teacher has prepared a wave tank to model how winds make waves when the winds blow across open water and how waves behave when they encounter a beach break, a point break, or a reef break. If you have digital cameras, use these cameras to capture evidence of wave patterns. Also draw the patterns you see on unlined paper. Use a new sheet of paper for each new phase of the simulation. Draw a sketch of the set-up in the wave tank, give the demonstration a descriptive name (for example, "Open Water, Low-Force Winds"), draw the wave patterns you observe, and, if possible, measure wave heights and wavelengths.

As you work, discuss what you see with your fellow scientists, adding their observations to your own. If disagreement arises about facts or interpretations, you may ask the teacher to repeat the disputed phase of the demonstration.

For homework, redraw and relabel your diagrams to make them neater, and write a three-paragraph paper to accompany each diagram. The first paragraph should describe the set-up of the model as precisely as possible; the second paragraph should give a well-organized description of your observations; and the third paragraph should draw generalized conclusions about the behavior of waves.

The next time your team meets, show your diagrams to your teammates, talk to your teammates about what you observed about the behavior of waves, and explain your general conclusions. Listen carefully as they explain their observations and ideas. Compare notes until everybody is on the same "wavelength"!

Name: _____ Date: _____

Storm Chasers

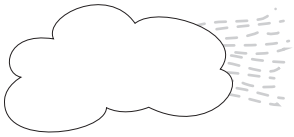
Learning Center Four

Air Pressure

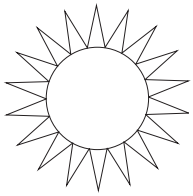
For surfers, it's all about the ocean's waves. For ocean waves, it's all about wind. For wind, it's all about air pressure.

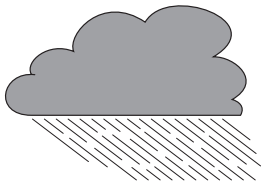
The better surfer you are, the larger you want the waves to be. Expert surfers are always looking for the big waves, and will even travel to find them. How do surfers know where the perfect wave will be? They become weather forecasters, searching for the conditions that create the big storms that generate the strong winds that form the huge groundswells that become the gnarly waves they seek. Surfing pros study air pressure systems that develop in the atmosphere over the oceans around the world, and then they actually *chase* the waves. They watch where the swells are headed and travel to meet them there.

If air pressure is the key to making waves, what is air pressure, exactly?

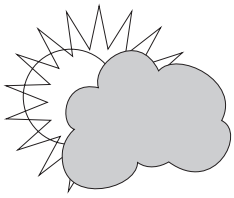


Air pressure is the weight of the atmosphere pressing down on the Earth. Earth's gravity pulls on everything, including the molecules that make up air. The closer the air is to the center of the Earth, the greater the pressure. If you've ever hiked high in the mountains, you've probably noticed how easily you get out of breath. That's because, as you climb higher in the atmosphere, there is less atmosphere above you pushing down on you. Mountain air is less compressed because less air is squashing down on the air you are breathing. A lungful of air in the mountains has fewer molecules of air in it than a full breath of air at sea level.





Air pressure is also affected by temperature. As the sun's energy reaches our planet, it heats the molecules in the air. When molecules in the air are warmed, they begin to move faster, to bang into each other and spread out, taking up more room. As this happens, there are fewer molecules in any given space. This makes the air less dense. Because it is less dense, it is lighter. Because it is lighter, it rises. Warm, rising air has low air pressure.

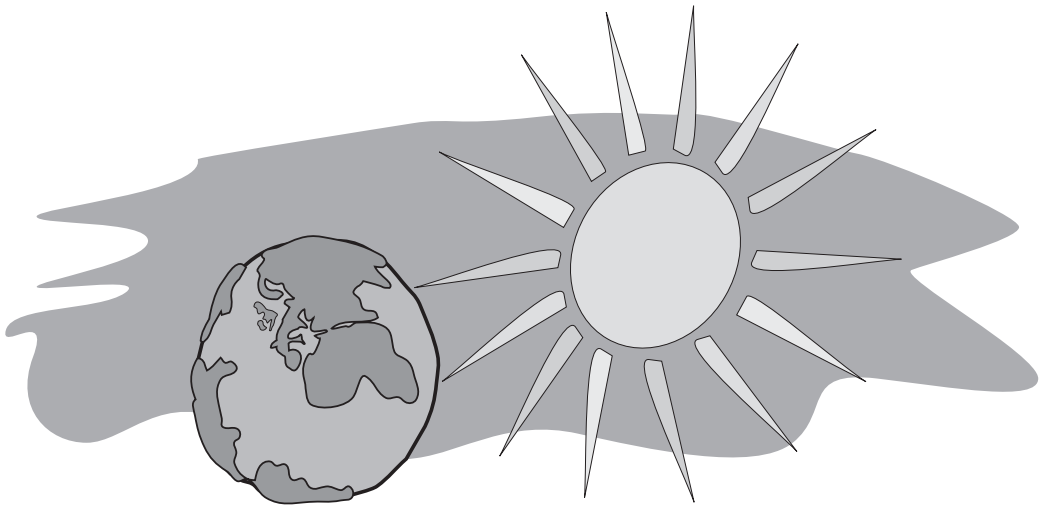


When molecules in the air cool down, they don't move around as much, so they are more tightly packed together, making the air denser. Denser air is heavier air. Heavier, cooler air sinks. Cold sinking air has high air pressure.

As air begins to cool (sink) or warm (rise), it begins to move. As a mass of cool air sinks, it pushes the thin, warm air underneath it out of the way, creating winds moving outward from the central high-pressure zone. As a mass of warm air rises, cooler air moves in from the sides to replace it, creating winds blowing into the central low-pressure zone. By these two mechanisms, air pressure causes winds.

When sunlight reaches Earth, it doesn't only warm the air, it also warms the land and sea. If sunlight lands on ground, it warms the ground only to a depth of a few inches or at most a few feet. When sunlight strikes water, the water is transparent, so the sunlight penetrates very deep, warming the water as it goes. This makes the oceans great storehouses of heat, and the warmth stored in the water warms the air over the water. Warm air, low pressure, remember? Earth's warm oceans are great generators of low pressure systems in the air.

When low-pressure systems occur in the air over oceans, they can be enormous, stretching more than a thousand miles across. Warm air rises, cools, condenses, and forms clouds. Cooler air from outside the system rushes in toward the center of the low-pressure zone to replace the air that has risen. Warming as it blows across the warm surface of the sea, this air, too, rises as it warms. As these in-rushing air currents move across the surface of the sea, the Earth rotates under the wind, and that spinning motion curves the wind flow. As more and more warm air rises and spins, a powerful storm is created. Imagine the winds a thousand-mile-wide storm can create. Winds can really get moving over the ocean, where the surface is relatively flat and smooth. These winds push against the water, and swells build up. In big storms, incredibly large swells form and get pushed by the strong winds across vast distances to breaks and beaches hundreds and even thousands of miles away. Hurricanes, typhoons, and cyclones are all names for the same kinds of massive pressure systems that originate over the warm waters of the ocean. Surfers watch the weather maps to find these systems and predict where and when they will deliver big waves to great breaks.



Learning Center Four: Directions

1. Draw a diagram of a low-pressure storm cell over the ocean, showing patterns of airflow and including the wind's effect on waves. Label your diagram.

2. Suppose a giant storm, centered on ten degrees north and 150 degrees west, blows up 50-foot waves. Which of the 20 surf sites in *Surfer's Gazette* is likely to have the best surfing? Explain your reasoning. Write on the back of the page if you need more space.

Learning Center Four: Demonstration

How do weather forecasters and meteorologists measure air pressure systems and hence make their predictions about weather? They use a barometer. If the barometer is rising, it means the air pressure is increasing and the weather will be clear. When the barometer falls, air pressure is getting lower and stormy weather is on the way.

Here is one way you can build your own barometer.

Materials needed:

- An empty plastic bottle with a narrow neck
- A balloon
- Two bowls or containers large enough for the bottle to stand in
- Hot water in one of the bowls
- Ice water in the other bowl

Step 1. Fit the neck of the balloon over the top of the empty bottle. Let the balloon just hang beside the bottle. Before placing the bottle in the hot water, write down what you think will happen.

Step 2. Stand the bottle in the bowl of hot water. Observe for several minutes and record your observations. Explain what you think is happening.

Step 3. Remove the bottle from the bowl of hot water. Write down what you think will happen when the bottle is put into a container of ice.

Step 4. Stand the bottle in the bowl of ice water. Observe for several minutes and record your observations. Explain what you think is happening.

Learning Center Four: Resources and Extension Activities

All of the following links can be found at: http://www.teachinteract.com/tsunami

- At *USA TODAY,* Jack Williams explains some basics about air pressure, including a fine little animated graphic that goes into action if you move your cursor over it. For a lot more science, follow his link near the end of the article.
  http://www.usatoday.com/weather/tg/whighlow/whighlow.htm

- SurfNetKids.com recommends five Web sites on air pressure:
  http://www.surfnetkids.com/air_pressure.htm

- NASA explains how kids can make a real barometer:
  http://kids.earth.nasa.gov/archive/air_pressure/barometer.html

- A more general introduction to air pressure on the same Web site is fun, especially the "Take a Balloon Ride" feature that demonstrates what happens to a hot air balloon as it rises from sea level to 10,000 meters.
  http://kids.earth.nasa.gov/archive/air_pressure

- NOAA offers a pretty good Web page with links to simple activities, even if they do write (at least as this lesson plan goes to press) "common dominator" when they mean "common denominator":
  http://www.srh.noaa.gov/srh/jetstream/atmos/pressure.htm

- PhysicalGeography.net sponsors a more sophisticated page with some nice graphics:
  http://www.physicalgeography.net/fundamentals/7d.html

- The KidsGeo.com Web site makes an interesting PowerPoint© presentation on the atmosphere available:
  www.kidsgeo.com/geography-for-kids/0081-atmospheric-pressure.php

- Directions for making more advanced barometers from simple materials:
  http://www.homelyscientist.com/2006/10/make-your-own-barometer/
  http://www.home-weather-stations-guide.com/how-to-make-a-barometer.html
  http://www.home-weather-stations-guide.com/make-a-barometer.html
  http://www.spartechsoftware.com/reeko/Experiments/ExpHomemadeBarometer.htm

Name: _____ Date: _____

Tide Readers

Learning Center Five

How Do Tides Affect Waves

Answer these questions the best you can with what you know or what you think might be true.

1. What is the connection between tides and the moon?

2. How do tides affect waves?

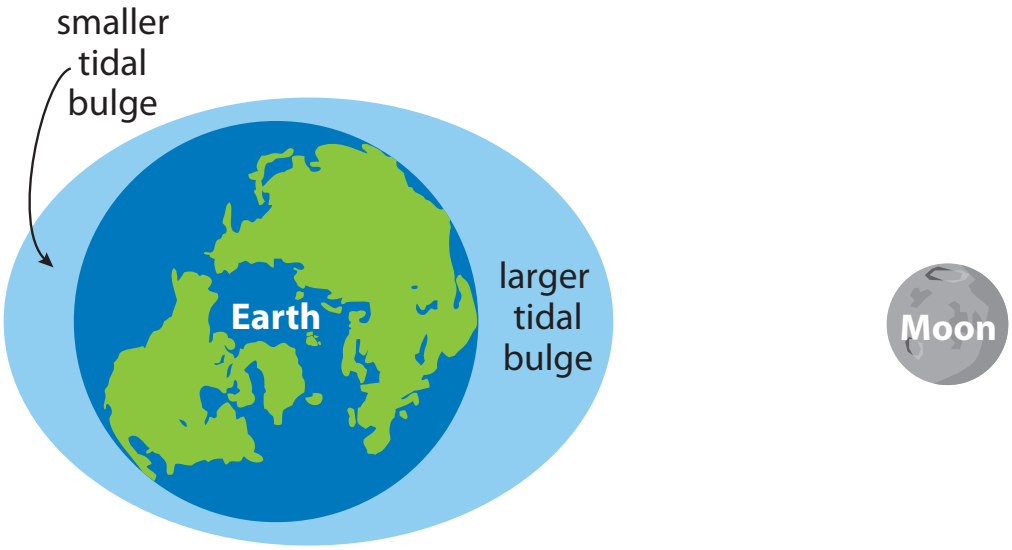
Read the Moon, Read the Tide

Do tides cause waves? No. Then is tidal information important to surfers? Yes. Surfers catch their ride where the wave breaks. The break happens where the wave crests. Changes to water depth change where the wave crests. Since tides change water depth, tides change where waves break and how waves are shaped. Tides affect rides.

Surfers want to paddle out when conditions are best for catching well-shaped waves at a specific surf location. Some surf spots are best at low tide and some at high tide. Knowing the best time (high or low tide) to surf a specific surf spot will help make your surf session awesome.

Two main patterns govern the tides: one a daily pattern, the other a monthly pattern.

Every day there are two high and two low tides. Why? Because the spinning of the Earth puts the moon overhead once a day and underfoot half a day later. When the moon is overhead, its gravity pulls up a bulge in the sea: high tide. When the moon is underfoot, in the sky over the opposite side of the planet, that also causes a high tide, though the reason is harder to grasp: The bulge the moon makes in the sea pulls water away from the "limbs" or sides of the globe, making the envelope of water thin there and the tides low, but the water on the side of the planet opposite the moon can't drain away so easily, so the tide there is high, but not as high as on the side closer to the moon.



Today's high tide (and all the rest of the daily tide pattern) occurs about one hour later than the day before, because the moon rises about one hour later each day.

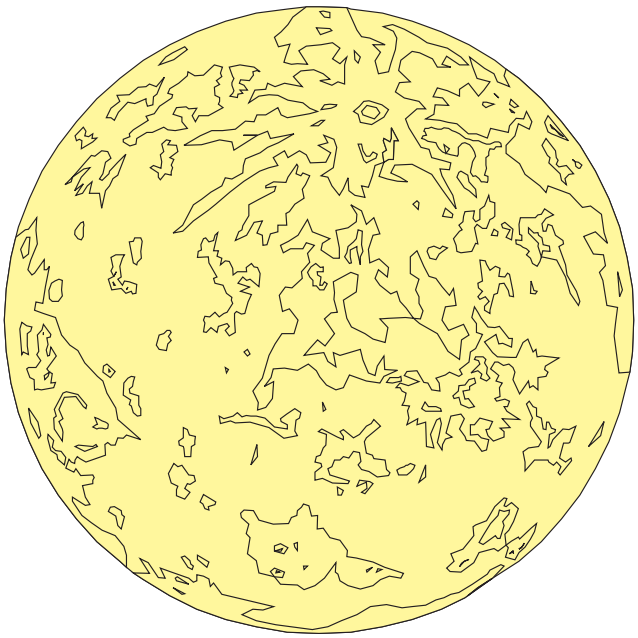
At any given moment, there are two high tides and two low tides sloshing their way around the planet as Earth's big ball turns beneath the moon. That's the main factor controlling the daily tide cycle. The monthly tide cycle is controlled by line-ups between the sun and the moon. The sun also exerts gravity, and the sun's gravity also pulls up a bulge in the ocean's water, though the great distance between Earth and sun makes this bulge small compared to the bulge pulled up by our closer neighbor, the moon.

When the sun and the moon are lined up, that's when high tides are highest and low tides are lowest, and you can tell when the sun and moon are lined up by looking in the sky. During the new moon, the face of the moon is dark because it is in shadow, and it's in shadow because the sun is shining on its far side. That's when the sun and moon are pulling in the same direction. But the full moon is also a high tide moon, because that's when the sun and moon are pulling in opposite directions, so the tides bulge out sunward and moonward, leaving very low tides on the limbs of the Earth.

For a good explanation and great animation, see:
http://home.hiwaay.net/~krcool/Astro/moon/moontides/

It is important to realize that the simplicity of the daily and monthly tidal cycles runs into countless complications when you watch how those cycles work out on all the complicated coastlines of the world. It's not unusual for low tide to come to the tip of a peninsula many minutes before low tide comes to the deep bay alongside the peninsula, for instance, and some large bodies of water—the Gulf of Mexico, for one—only have high tide once a day. That's why many seaside communities publish tide charts or daily announcements of the times of high and low tides in their local area.

And, oh, by the way, because you know how much you love to bug people with little-known facts: Tides *do* cause waves. Although we don't usually think of it that way, a tide *is* a wave, technically speaking. Tide makes the water bulge up and subside—that's a wave! Tides, like their smaller cousins, tsunamis, are defined as "shallow waves." A shallow wave is any wave with a wave height less than one twenty-fifth of its wavelength. A tide's wavelength stretches halfway around the globe, more than 12,000 miles, but it is only as deep as the sea, an average of about 12,000 feet, so its wave height is only one five-thousandth of its wavelength.



Learning Center Five: Resources and Extension Activities

All of the following links can be found at: http://www.teachinteract.com/tsunami

- The Web link that was mentioned in the "Read the Moon, Read the Tide" handout: http://home.hiwaay.net/~krcool/Astro/moon/moontides/

- *Science Wire,* an online site created in cooperation between the Exploratorium and Public Radio International's *The World,* sponsors pages that discusses the connection between tides and surfing: http://www.exploratorium.edu/theworld/surfing/tides.html

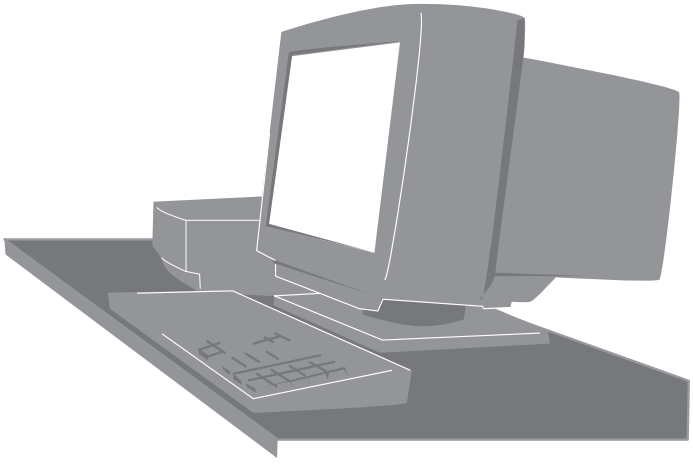
- The online *Water Encyclopedia* has a detailed discussion of tides that is written in a fairly simple style: http://www.waterencyclopedia.com/St-Ts/Tides.html

- If you can watch it, this short video from Britannica shows time-lapse footage of the Bay of Fundy's famous low and high tide in less than two minutes, and it includes a good animation explaining what causes tides: http://www.youtube.com/watch?v=zOUi-m8UyFk

- An online slide show that goes into some depth about tides, but keeps its explanation simple enough for general readers, is available from NOAA: http://oceanservice.noaa.gov/education/kits/tides/tides02_cause.html

- Fun for all ages, a whole-class group activity from the University of Southern California's Sea Grant Program: http://www.usc.edu/org/seagrant/Education/IELessons/Docs/MoonAndTides.pdf

- From *Science Buddies,* fairly ambitious project involving analysis of scientific data: http://www.sciencebuddies.org/science-fair-projects/project_ideas/Astro_p009.shtml http://www.ocregister.com/articles/tide-201358-surf-best.html



Name: _____ Date: _____

Wave Riders

Learning Center Six

Why Do Things Float?

Let's do a "thought experiment."

Imagine you have a big glass tank like a fish tank, but a tank so big that a surfboard could float in it. Wait a minute, don't put your surfboard in yet! First take a grease pen and mark the side of the glass tank right at the water line.

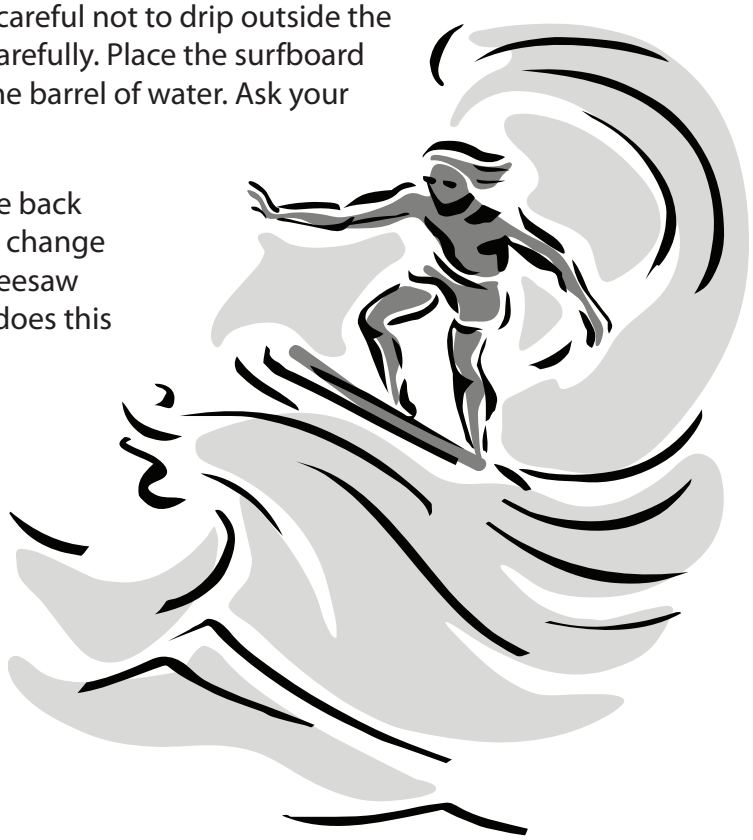
Okay, now lower your surfboard into the tank. It floats, right? But what if you also lower your favorite surfer dude or dudette onto the surfboard? Does it still float? Sure it does; floating is what surfboards are for. Surfer and all, the surfboard floats.

But look again at that grease mark you put on the side of the tank. It used to be right at the level of the water. Where is it now? Several inches below the surface of the water, right?

Now get your bucket. Dip out a bucket of water and carry it from the tank to the empty barrel sitting on the seesaw conveniently located beside the tank. Empty your bucket into the barrel, go back to the tank, move more water from the tank to the barrel, don't spill a drop, and keep doing that until the water level in the tank is even with the grease mark again.

Now ask your surfer to get out of the tank, careful not to drip outside the tank, and to remove the surfboard just as carefully. Place the surfboard on the seesaw, on the opposite end from the barrel of water. Ask your surfer to sit on the surfboard.

Which end of the seesaw is heavier? Use the back of this page to explain why. How could you change the experiment to make both ends of the seesaw equal in weight? What scientific principles does this experiment involve?



Learning Center Six: Directions

Design a real experiment to test the prediction you made in your answer to the thought experiment involving a tank of water, a surfer and surfboard, a grease pen, a bucket, a seesaw, and a barrel. Your exact materials may vary, but you need some kind of transparent water tank, and a tall, thin container will work best because the water level will change more than it would in a wider container.

Compare your ideas for the experiment with the ideas of your teammates. Combining the best of your ideas with the best of their ideas, design and execute an experiment that will prove or disprove the hypothesis that an object floating on a fluid will displace its own weight.

Working as a team, write down a description of the materials to be used in your experiment and the experiment's protocols (step-by-step methods).

Also draw a diagram showing your experimental apparatus.

Following the protocols, perform your experiment and describe what you observe.

As a team, write a complete description of your experiment and its results. Conclude your report by explaining how your results prove or disprove the hypothesis that an object floating on a fluid will displace its own weight.

Learning Center Six: Resources and Extension Activities

All of the following links can be found at: http://www.teachinteract.com/tsunami

- For kid-friendly explanations of buoyancy, density, and displacement accompanied by experiments you can do in class or at home, see this Web page from the Idaho National Laboratory's Environmental Surveillance, Education and Research Program: http://www.stoller-eser.com/nie/PDFs/Buoyancy.pdf

- On PBS's NOVA Web site, diagrams, animations, and text explain buoyancy: http://www.pbs.org/wgbh/nova/lasalle/buoybasics.html

- The Marine Advanced Technology Education (MATE) Center offers an explanation of buoyancy and some ideas for experiments (involving tinfoil hulls) that can be accomplished using simple materials: http://www.marinetech.org/downloads/buoyancy.pdf

- For a terrific explanation of the physics of surfing, see these pages from *Science Wire,* an online site created in cooperation between the Exploratorium and Public Radio International's *The World*: http://www.exploratorium.edu/theworld/surfing/physics/index.html

- A little more technical than *Science Wire,* more physics of surfing can be found on the *How Stuff Works* Web site: http://adventure.howstuffworks.com/outdoor-activities/water-sports/surfing4.htm

Name: _____ Date: _____

How Big Is a Tsunami?

Learning Center Seven

Tsunamis and Scale

How Big Is a Tsunami?

All your life you've heard teachers and other grown-ups say it: "There's no such thing as a stupid question." And don't they usually say it about three seconds before everyone starts laughing at you for asking such a stupid question?

You've heard that tsunamis are very big waves. Maybe you remember hearing about waves that are 30 feet high, or even 100 feet high. So how big are tsunamis?

Isn't asking, "How big are tsunamis?" kind of like asking, "How big are people?" If "big" means tall, well, the shortest person in the world is probably a baby that was born a few hours ago. The shortest adult might be Khagendra Thapa Magar, who is said to be only 20 inches tall. The tallest person might be Sultan Kosen, who is said to be eight feet and one inch tall. But does "big" mean "tall"? Maybe the biggest person in the world is the heaviest person in the world, someone like Manuel Uribe, who was said to weigh 1320 pounds before he went on a diet.

"How big is a tsunami?" is a stupid question because it is so imprecise. On the other hand, it's a great question because tsunamis are so big and powerful that, the more you know about them, the more they blow your mind.

So the first purpose of this learning center is to practice asking better questions, more precise questions; and the second purpose is to learn as much as you can about the enormous scale of tsunamis, the granddaddies of all waves.

Learning Center Seven: Directions

Brainstorm better questions to ask about tsunamis.

- You might ask, for example, what is the range of the wave heights of tsunamis?
- You might ask, what were the heights of all the tsunamis in recorded history, and you could record the answers in a table and report the results in a graph.
- You might ask what factors control the wave height of a tsunami.
- You might ask how fast a tsunami moves, and what factors control that speed.
- What causes tsunamis? Are there different types of tsunamis?
- Is it possible to estimate the total amount of energy in a tsunami?

Brainstorm more questions, stop to do some initial research, then regroup to add more questions and, by debating the wording of the questions, to make them more precise.

The goal is to create a class book called *How Big Is a Tsunami?* Each page of the book should have a question at the top, followed by a written answer to the question. Some pages should include diagrams, charts, maps, or other illustrations if those will help make the answer to the question clear. At the bottom of each page, cite the most useful sources consulted in finding the answer to the question at the top.

Each student should create at least three pages. Teams will choose which pages to put into the final class book.

Learning Center Seven: Resources and Extension Activities

Web Resources

All of the following links can be found at: http://www.teachinteract.com/tsunami

- United States Search and Rescue Task Force explains tsunamis succinctly: http://www.ussartf.org/tsunamis.htm
- The NOVA Web site offers an excellent interactive explanation of the December 26, 2004, tsunami—its creation, force, movement, etcetera: http://www.pbs.org/wgbh/nova/tsunami/anatomy.html
- The Water Encyclopedia has an online page about tsunamis: http://www.waterencyclopedia.com/St-Ts/Tsunamis.html

Books

- *How Does an Earthquake Become a Tsunami?* By Linda Tagliaferro. Raintree. Chicago, IL. ©2009.
- *Tsunamis: True Books—Earth Science.* By Chana Stiefel. Children's Press. ©2009.

Extension Activities

Create your own tsunami in a plastic tub by following the specifications found at this Web site: http://school.discoveryeducation.com/lessonplans/programs/tsunami/

Read the book *How Much is a Million?* (By David M. Schwartz. Illustrated by Steven Kellogg. HarperTrophy. New York. 20th Edition. ©1993.) This picture book for all ages is great for helping us get a sense of scale. How much is something? How big is something? How small is something? For example, the book shows that, if a goldfish bowl were big enough for a million goldfish, it would be big enough for a whale. After reading and discussing the book, design your own posters to illustrate interesting examples of scale.

Name: _____ Date: _____

Planning to Write an Article

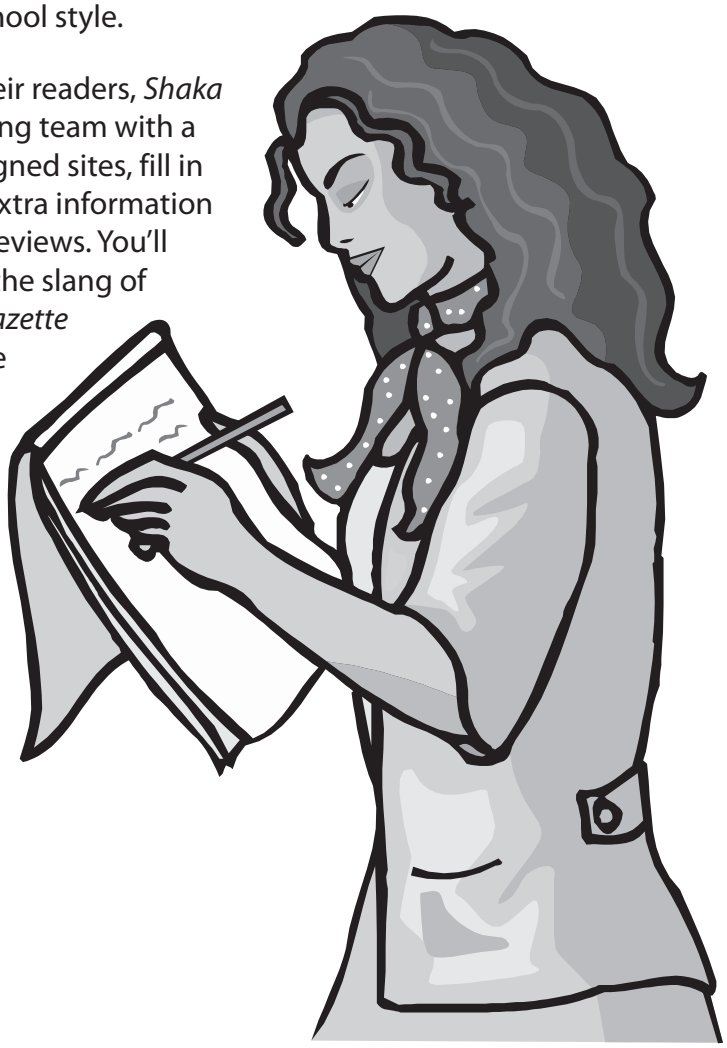
Learning Center Eight

On Assignment for Shaka Surf Review

You work with a team of freelance reporters. The magazine *Shaka Surf Review* has advanced your team some ducats to travel to three of the world's best surf sites, learn about each of the breaks, pick the best of the best, and write an article to persuade readers that this surf spot really might be the planet's best place to surf: the perfect wave in the perfect place.

The editors of *Shaka Surf Review* want you to study a rival magazine, *Surfer's Gazette*. You must analyze the content and form of the *Surfer's Gazette* articles, and then model your article on *Surfer's Gazette*'s example—with one difference. *Surfer's Gazette* is written for silver surfers and divas—the old-school surfers of your parents' generation. *Shaka Surf Review*'s readers are young and cool, like you. They are serious surfers who want solid old-school content, but they want it packaged in lively articles full of fresh slang and a zesty new-school style.

To help you find the content important to their readers, *Shaka Surf Review*'s editors have supplied your writing team with a Surf Break Analysis Sheet. Research your assigned sites, fill in your Surf Break Analysis Sheets, and gather extra information so you can add "local color" to your surf site reviews. You'll also need to study the science of waves and the slang of surfers. Then analyze the formulaic *Surfer's Gazette* articles paragraph by paragraph, making sure you understand each paragraph's purpose. Once the whole team has a clear grasp of the structure of a surf site review, you'll be ready to write your article.



Learning Center Eight: Write Like Tarzan!

You know how Tarzan swings through the jungle? Feet planted on a strong branch, the ape-man grabs a strong vine, sweeps through the treetops, and lands on another strong branch. Grabbing the next strong vine, he swings again, branch to branch, vine to vine, swinging and swinging until he arrives, beats his chest, and looses that bloodcurdling cry. But what if Tarzan landed on a weak branch or grabbed a weak vine? He'd tumble from the trees, smash to the forest floor, and whimper, whimper, whimper.

Knowing strong from weak is the secret to swinging like Tarzan—starting on a strong branch, ending on a strong branch, and never grabbing a weak vine.

To write like Tarzan, follow these rules:

1. Identify the strong words
2. Put your strongest words first to grab the reader's interest
3. Put strong words at the end so the sentence goes somewhere good
4. Get rid of all the weak words you can

Advanced techniques? Rule number five: Replace weak words with stronger words.

Those five rules will improve any first draft.

What's the most famous thing Tarzan ever said, aside from his famous yell? "Me Tarzan, you Jane." That's Tarzan: no words but the important ones.

Learning Center Eight: Sample Essay

Tavarua
The Perfect Wave

By Scott Carlton

Sapphire blue barrels curl around the serene coral reef that surrounds Tavarua. The minute your toes hit the warm water, the minute you duck into the perfect barrel, you're stoked for life. Epic is the only word to describe these gnarly waves. They can reach to 18 feet on special days, but mostly the size is ideal for many people. The fast moving, powerful wave is first class, and totally necessary for hardcore surfers. It provides a long and legendary ride for those willing to surf it.

This island paradise is one of thousands of islands that dot the tropical chain of Fiji. Sunny and humid weather is always expected on this small, remote heaven. Sandy white beaches line Tavarua, making this already beautiful place gorgeous. Tavarua is a 29-acre, heart-shaped piece of land. The center of the island is lush with fruit trees and exotic plants. Not only is it a beautiful island, but so is the palapa-roofed resort, making it about the best spot on the globe. As the sun sets over the watery horizon, you can't help but think that heaven couldn't be much different.

Despite this island paradise, the perfect wave has its dangers. Tavarua is severed fresh with extremely sharp coral reef and a side of big waves that can hold you under for more than ten seconds.

It is extremely expensive to visit Tavarua. It's a privately owned, limited-access island, and to make it out to the world-renowned surf, you must rent a boat to take you to the different breaks. The fast waves require either a short board or a long gun. Although the costs are steep, it is totally worth it for die-hard surfers who wish to ride the perfect wave.

The months most likely to give people the best ride of their lives, are February through October. The mind-blowing Cloudbreak surf spot is a mile out so it's not affected by the tides. At peak surf season the water is an average of 79 degrees. Not bad. The air is also a warm 85 degrees.

The limited dangers, the fabulous wave, and the island itself all contribute to the perfect wave. These wonderfully formed waves pound the beautiful coral reef, making this heart-shaped island beat. This place is truly a surfer's dream.

Learning Center Eight: Resources and Extension Activities

- Use the "Write Like Tarzan" rules to edit Scott Carlton's review of Tavarua.
- Use the Surf Break Analysis Sheet to analyze how well Scott Carlton has done his research. Identify any further research that should be done to complete the analysis.
- Compare the format of Scott Carlton's review with the formula derived from the articles in *Surfer's Gazette*. In what ways, if any, does Scott stray from the formula?
- Use your *Surf Tsunami* vocabulary to make your own crossword, and then trade crosswords with your classmates. http://justcrosswords.com

Name: _____ Date: _____

What Do You Know About...?

1. Surfing?

2. Places people surf?

3. Latitude and longitude?

4. What makes waves?

5. Air pressure?

6. Buoyancy?

7. The vocabulary of surfing?

8. Tsunami waves?

9. Surfing in these places: Australia, Brazil, California, Fiji, France, Hawaii, Ireland, Mexico, New Zealand, North Carolina, South Africa, Spain, and Tahiti?

Continue your answers on the back of page if more space is needed.

Name: _____ Date: _____

Surf Site Preference Sheet

Surf Break	Country or State	Preference Rank
Banzai Pipeline	Hawaii	
Bells Beach	Australia	
Cape Hatteras	North Carolina	
Dingle	Ireland	
Dungeons	South Africa	
Hossegor	France	
Isla Todos Santos	Mexico	
Jeffreys Bay	South Africa	
Kirra	Australia	
Mavericks	California	
Mundaka	Spain	
Puerto Escondido	Mexico	
Raglan	New Zealand	
Rincon	California	
Rio de Janeiro	Brazil	
Steamer Lane	California	
Sunset Beach	Hawaii	
Tavarua	Fiji	
Teahupoo	Tahiti	
Trestles	California	

Tourism, Surfing, Visas, and Currency in Countries With Surf Sites

All of the following links can be found at: http://www.teachinteract.com/tsunami

Australia: http://www.australia.gov.au/topics/tourism-and-travel
Surfing in Australia: http://www.surfingaustralia.com/
Getting a visa to visit Australia: http://www.immi.gov.au/visawizard/
Currency: Australian Dollar (AUD)
Current exchange rate: 1 AUD = 0.9221 USD

France: http://www.diplomatie.gouv.fr/en/espaces_dedies.php3?id_rubrique=159
Surfing in France: http://www.globalsurfers.com/country_details.cfm?land=France
Getting a visa to visit France: http://www.diplomatie.gouv.fr/en/france_159/coming-to-france_2045/getting-visa_2046/index.html
Currency: Euro (•)
Current exchange rate: 1 Euro = 1.4357 USD

Spain: http://www.spain.info/index.html?l=en
Surfing in Spain: http://www.surfing-waves.com/travel/spain.htm
Getting a visa to visit Spain: http://www.justlanded.com/english/Spain/Spain-Guide/Visas-Permits/Visas
Currency: Euro (•)
Current exchange rate: 1 Euro = 1.4357 USD

South Africa: http://www.southafrica.net/sat/content/en/us/home
Surfing in South Africa: http://www.wavescape.co.za/
Getting a visa to visit South Africa: http://www.services.gov.za/ServicesforForeignNationals/Temporaryresidence/Applicationforavisa.aspx?Language=en-ZA
Currency: South African Rand (ZAR)
Current exchange rate: 1 ZAR = 0.134749 USD

Tahiti (French Polynesia): http://www.thetahititraveler.com/default.asp
Surfing in Tahiti: http://www.surfing-waves.com/travel/tahiti.htm
Getting a visa to visit Tahiti: http://www.thetahititraveler.com/touristinfo/visasreq.asp
Currency: French Pacific Franc (XPF)
Current exchange rate: 1 XPF = 0.01205 USD

Fiji: http://www.fiji.gov.fj/
Surfing in Fiji: http://www.fijisurfco.com/
Getting a visa to visit Fiji: http://www.fiji.gov.fj/index.php?option=com_content&view=article&id=597:fiji-faqs&catid=81&Itemid=161
Currency: Fiji Dollar (FJD)
Current exchange rate: 1 FJD = 0.5345 US

Fate Cards

A Fate Card would be read to the entire class. If the fate card applies to a group, they must do what it says. You may decide to create more fate cards, or you may decide not to use any fate cards.

There has been an outbreak of malaria in regions prone to this disease. In order to protect your team members, everyone must be vaccinated. Cost per vaccination is $52.00. Write a check for this amount made payable to:

International Medical Center for Disease Control

Deduct the amount from your bank account.

Fate Card

Two team members were injured while riding a reef break. Both visited the local emergency room, where they required stitches. The cost for the visit was $150.00 each. Make checks payable to:

[name of city you flew in to] Emergency Center

Deduct the amount from your bank account.

Fate Card

The country you are visiting charges a departure tax to all nonresidents. The tax is $60.00 per person. Pay this tax for all team members before leaving the country for your next destination. Checks may be made payable to:

Treasury Department, [name of country]

Be sure to deduct the amount of the check on the team's balance sheet.

Fate Card

Many popular surf breaks host annual professional surfing contests. If you can verify that the site you are currently visiting holds a pro-surf contest (verify through surf magazines, Internet sites, or other credible sources), consider yourselves winners of the third-place prize of $5000. Deposit this amount into your team checking account.

Fate Card

Fate Card

Fate Card

A PERFECT WAVE

is hereby awarded to

_____

for mad skills and achievement in

_____

this _____ day of _____, _____.

_____

Teacher Signature

Group Presentation Rubric

Team Name: _____

Team Members: _____

_____

4—Exemplary

Your team presentation provided an excellent persuasive essay, making the case that your group's site is the best surf spot in the world. It included plenty of scientific terms and concepts, surf lingo, and pictures.

3—Expected

Your team presentation provided an accurate persuasive essay for making the case that your group's site is the best surf spot in the world. It included some scientific terms and concepts, surf lingo, and pictures.

2—Nearly There

Your team presentation offered generally accurate information for making the case that your group's site is the best surf spot in the world. It included a few scientific terms and concepts, surf lingo, and pictures.

1—Incomplete

Your team presentation offered too little information for making the case that your group's site is the best surf spot in the world. It may have been missing information including scientific terms and concepts, surf lingo, or pictures.

Surf Tsunami

In Search of the Perfect Wave in the Perfect Place

Introduction

Surf Tsunami has everything to do with surfing! Don't let the name confuse you, though. The term *tsunami* in the name does not have to do with the wave caused by earthquakes and sudden tectonic movement, but rather is a term used to express a surfer's feeling about the size and "awesomeness" of a spectacular wave!

Have you ever dreamed about traveling to some of the most beautiful, exotic places on earth? Well, here is your chance! You and your teammates have been contracted to travel as journalists to some of the most amazing places on the planet. In search of the perfect wave in the perfect place, you will discover interesting facts about the countries, people, and cultures you experience along the way.

Surfing has become one of the most popular sports in the world! All that's needed to surf is a board, a wave, and some basic scientific know-how. Like boxing, surfing could be called "the sweet science"—and it *is* all about science! How do waves form? Where do they come from? How does the ocean floor, below the waves, help form the waves' shape and power? Well, understand the physics of wave motion and you've got your answer. To know where to find the perfect wave, surfers also become meteorologists, watching ocean storms, understanding the significance of the wind, air pressure, and tides. Once you've figured out how all this fits into the surfing equation, you're ready to start tracking the perfect wave.

Your Assignment

You will be "traveling" with a team of surf journalists to wave breaks around the world in search of the "perfect wave." Your team assignment is to research some of the most famous surf sites on the planet, analyze the data you collect, and ultimately pick one surf break as the perfect wave. You will then write a persuasive article about this break for a youth-oriented surf magazine and present your article at an editorial board meeting. The magazine's readers are gonzo surfers who require solid technical information, so you'll have to study the science of waves to gain their respect, but they are also fun-loving young people who love lively writing and creative use of surfer slang.

Surf Team Responsibilities

Your team will "travel" to surf breaks around the world.

Because there is traveling involved, there will be "expenses" to consider. You are being sent as journalists from *Shaka Surf Review.* Your team will receive a lump sum of advance money to get you started. The primary cost to your team will be the purchase of plane tickets to each of your surf destinations. Other expenses depend on how your deal with *Shaka Surf Review* is set up. You may be met by a local surf organization that will host your visit, providing transportation, lodging, and food for your team. On the other hand, you may have to pay all your expenses out of your advance.

Your teacher will provide the details.

Each team member has a specific role to complete every day. Assignments rotate daily so that all members will participate in all aspects of the project. Upon completing individual tasks, all members should help with the research.

The Accountant will:

- research costs
- purchase plane tickets (one per team member)
- write checks for other purchases as needed
- complete the Bank Balance Sheet

The Cartographer will:

- locate and mark each surf spot on the team map
- complete the Cartographer Data Sheet.
- move the team surfboard to the team's current location on the classroom map

The Researcher(s) will:

- read the *Surfer's Gazette* article to the group
- search surf magazines, books, Web sites, Google Earth, Google Ocean, and any other approved information sources for information and photographs

The Recorder will:

- work closely with the group to complete the Surf Break Analysis Sheet
- work closely with the group to complete the Information About Surf Location Sheet

The Manager will:

- coordinate the group's tasks and responsibilities
- facilitate discussion
- keep team members on task

Team Packet

Team Name

_____

Team Members

_____

_____

_____

_____

_____

_____

The *Surf Tsunami* Team Packet contains the forms your team will need as you travel to your assigned surf destinations. Each team should make four folders configured as indicated below, with photocopies of the relevant pages put in folders.

Team Accountant:
- Team Checkbook
- Team Bank Balance Sheet

Team Research:
- Surf Break Analysis Sheet
- Surf Break Analysis Sheet: Explanation of Categories
- Metric Conversion Sheet

Team Cartographer:
- Cartographer's Data Sheet
- World Map

Team Resources:
- *Surfer's Gazette*
- Surfer's Dictionary
- Information source list

Team Checkbook

Surf Journalists Team _____ CHECK # _____

123 Pipeline Drive, Surf City, California 94367

DATE _____

PAY _____ $ _____

to the Order of

_____ DOLLARS

Wave Savings
Surf City, California

MEMO: _____ _____

Signature

⑆600000000⑆ 1234567890000⑈

Surf Journalists Team _____ CHECK # _____

123 Pipeline Drive, Surf City, California 94367

DATE _____

PAY _____ $ _____

to the Order of

_____ DOLLARS

Wave Savings
Surf City, California

MEMO: _____ _____

Signature

⑆600000000⑆ 1234567890000⑈

Surf Journalists Team _____ CHECK # _____

123 Pipeline Drive, Surf City, California 94367

DATE _____

PAY _____ $ _____

to the Order of

_____ DOLLARS

Wave Savings
Surf City, California

MEMO: _____ _____

Signature

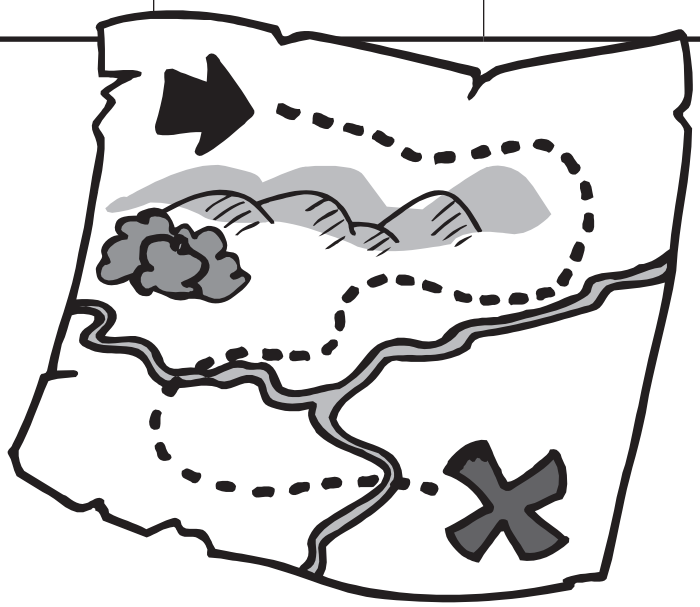
⑆600000000⑆ 1234567890000⑈

Team Bank Balance Sheet

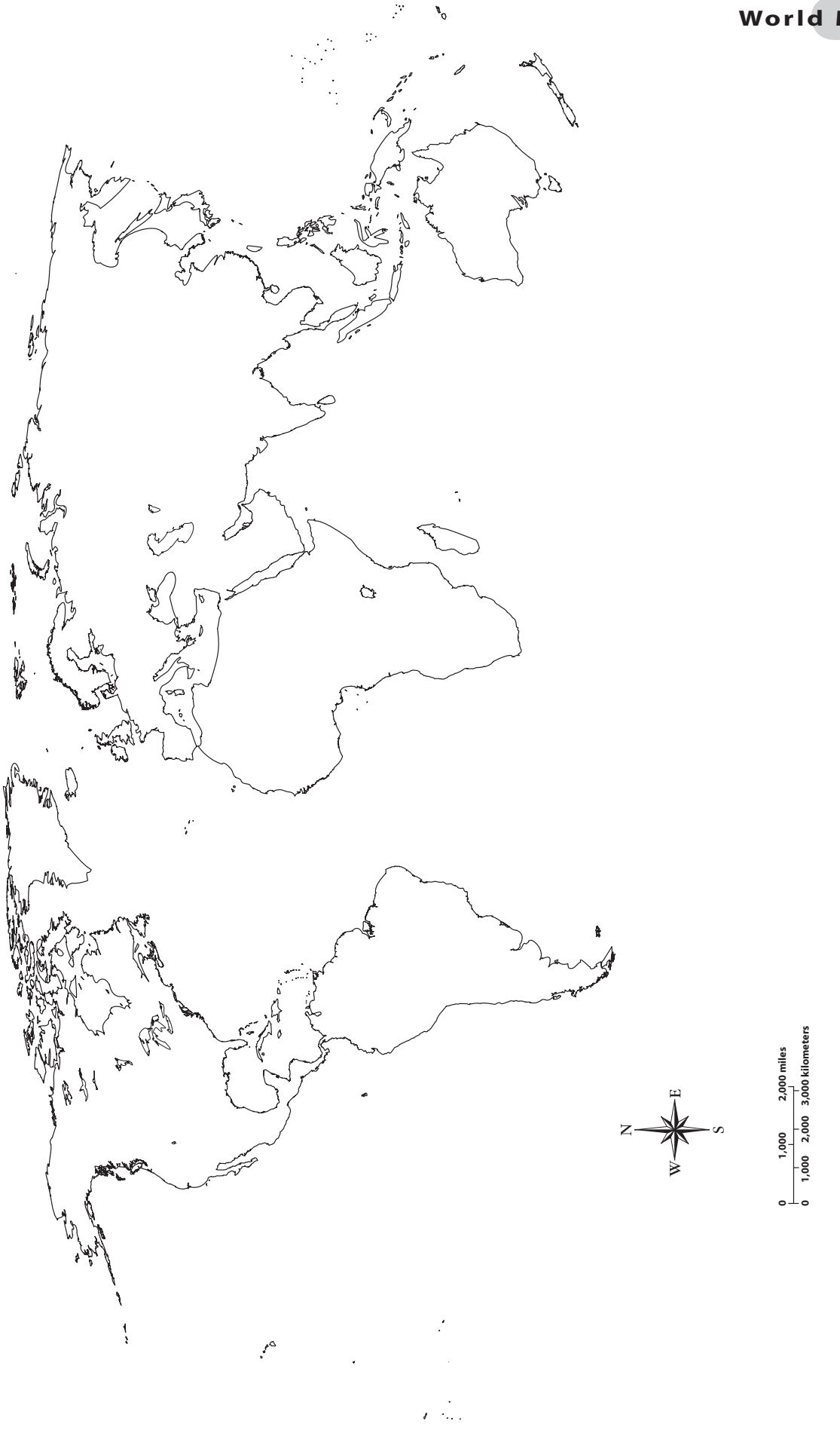
Check#	Date	Transaction	Payment	Deposit	Balance

Cartographer's Data Sheet

	Destination	Nearest Major City	State/Country	Latitude/ Longitude
1				
2				
3				
4				
5				



World Map



Surf Break Analysis Sheet

Name of Break: _____

Wave size
Water temperature
Type of break
Swell direction
Access
Season
Weather conditions
Type of current
Air temperature
Crowd factor
Wind direction
Experience level
Board type
Safety concerns
Affordability
Best tide
Special equipment

Surf Break Analysis Sheet

Explanation of Categories

Use this sheet to help you understand the meaning of the categories on the Surf Break Analysis Sheet.

Wave size: What is the average wave size in feet and meters during peak surf season? What range of sizes? What is the maximum wave size?

Water temperature: What is the average water temperature in Fahrenheit and Celsius during peak surf season?

Type of break: Point, reef, or beach?

Swell direction: From what direction do the best swells come?

Access: How do you get to this break, by beach or by boat? Is tow-in to the wave required?

Season: What are the best surfing seasons?

Weather conditions: What is the weather like during peak surfing season?

Type of current: Use your map of currents to determine if the break has a cold or warm current.

Air temperature: What is the average air temperature in Fahrenheit and Celsius during peak surf season?

Crowd factor: How crowded is the break during peak season?

Wind direction: Which wind direction is most common during peak season: onshore, offshore, or side shore? Which is the most favorable wind?

Experience level: For beginners, intermediate surfers, or experts?

Board type: What types of surfboards are used on this break?

Safety concerns: What are the hazards at this break?

Affordability: How expensive is visiting this break?

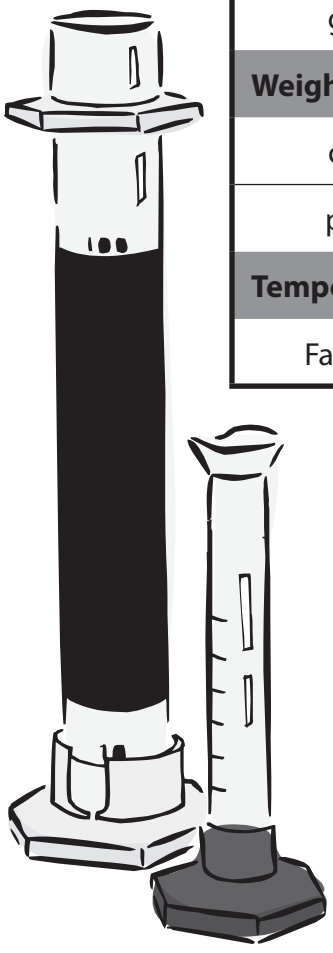
Best tide: High, low, incoming, outgoing, spring, neap, or a combination?

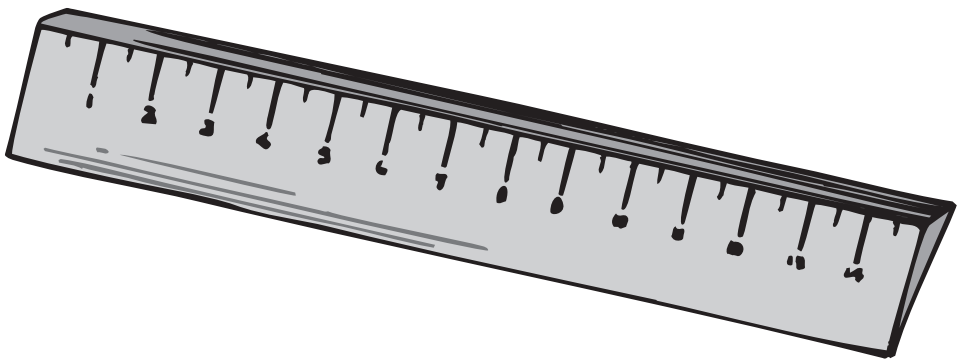
Special equipment: Is any special equipment recommended, for example, a winter wetsuit?

Conversion Factors

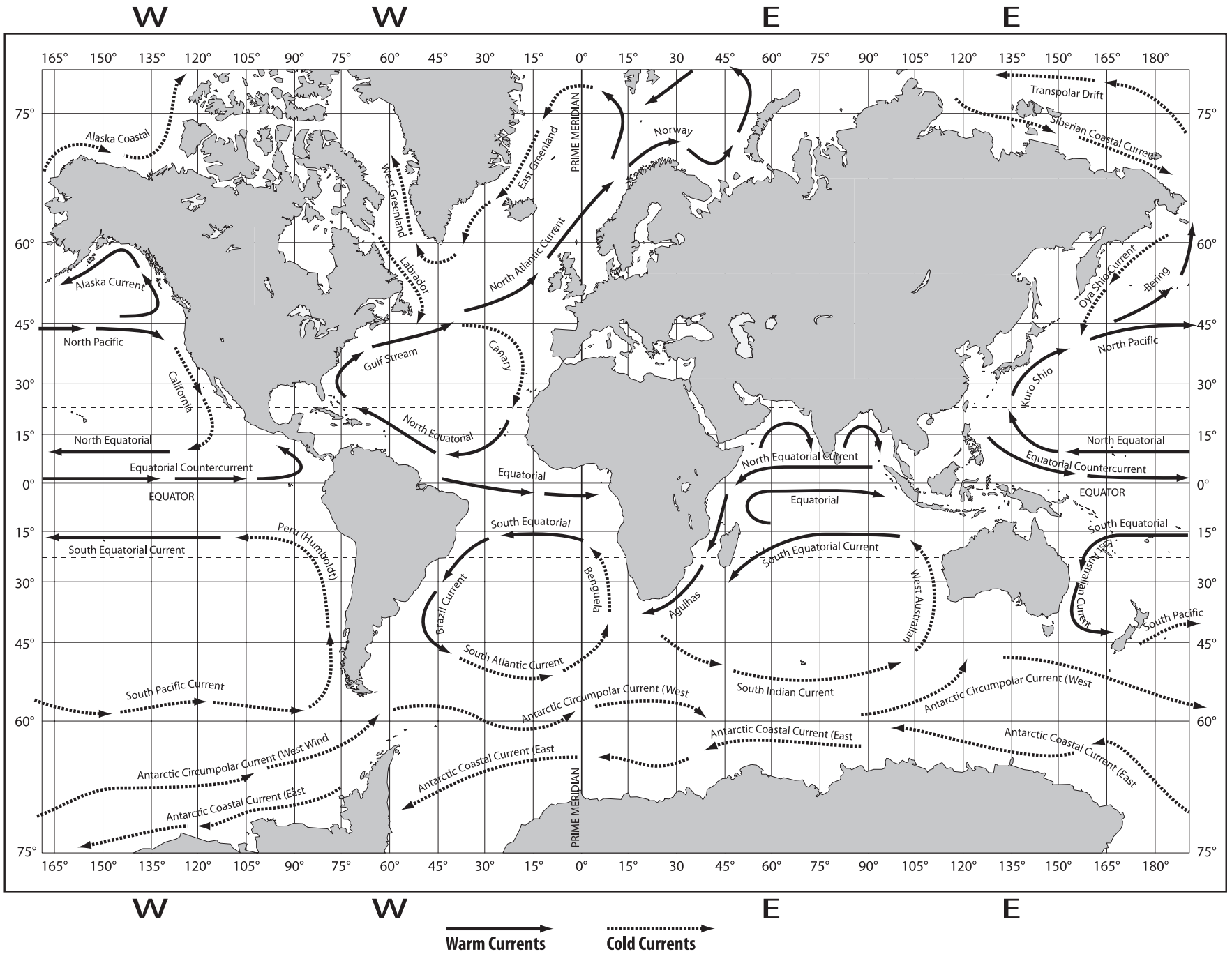
For full credit, all measures should be given in both U.S. customary and metric. The standard format is to put one measure first and the other in parentheses immediately after it. Be consistent, either always putting metric first or always putting metric second.

Unit Measure	Multiply By	To Get
Length		
inches	25.4	millimeters
feet	.305	meters
yards	.914	meters
miles	1.61	kilometers
Volume		
gallons	3.785	liters
Weight		
ounces	28.35	grams
pounds	.454	kilograms
Temperature		
Fahrenheit	(F−32) ÷ 1.8	Celsius





Main Ocean Currents



Master

Conversion Factors

Surfer's GAZETTE

Team Members

_____

_____

_____

_____

_____

Contents

Banzai Pipeline 2
Bells Beach 3
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Kirra 10
Mavericks 11
Mundaka 12
Puerto Escondido 13
Raglan 14
Rincon 15
Rio de Janeiro 16
Steamer Lane 17
Sunset Beach 18
Tavarua 19
Teahupoo 20
Trestles 21

Banzai Pipeline

Without question, Pipeline is the most famous surf spot on the planet.

Ground swells from North Pacific winter storms launch monster surf onto Ehukai Beach on the North Shore of Oahu, Hawaii. Because the Hawaiian Islands are formed from volcanoes that sit on the ocean floor, no continental shelf or barrier reef surrounds them to slow the surf as it approaches. The result is the baddest surf on Earth! Waves pound onto the North Shore in excess of 20 feet.

Pipeline, also called Banzai Pipeline or "The Pipe," is a monster left-hand reef break. It is dangerous not only because of the killer surf, but also because, near shore, shallow coral and lava reefs lie just a few feet below the surface, perfectly situated to shred a surfer and board to pieces. If the waves and razor sharp reefs aren't bad enough, Pipeline's rip current moves as fast and as powerfully as an underwater river. On average, one surfer per season dies at Pipeline, and lots more get hurt. It is the world's most lethal surf break.

It's these near-shore lava reefs that give Pipeline its ferocious surf. Fast-moving swells suddenly hit and drag across the reef plateaus that surround the island, forcing the wave up and then over onto itself. That power, acceleration, and uplift forms Pipeline's explosive tubes, large enough to drive a Mack truck through.

The incoming swells form two breaks. The left-hander forms Pipeline and a right-hand break, peeling off behind it, is called the Backdoor. Backdoor has the heaviest, fastest, deepest, longest tube ride anywhere.

High performance surfing is the name of the game on the Pipe, where surfers say they never really have the ride under control. Whether the pros are riding short boards or big guns, the objective is the same: paddle in, get the drop, hang on through the barrel, and make it out the other end without wiping out. When the surf is breaking, Pipeline is exclusively for the best of the best. The danger factor is so great that anyone without advanced skill and experience risks their life going into the Pipe.

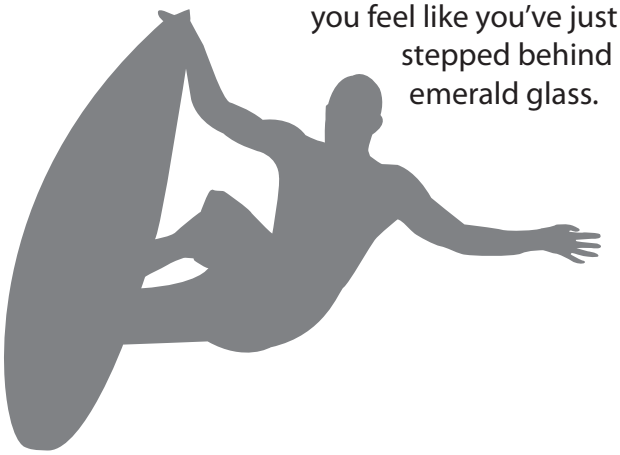
The waves at Pipeline can be temperamental and may only produce surf of epic proportions a half dozen times a year. The best surf for big-wave riding comes on the westerly swells between October and March. During summer months, the surf can actually be flat. In December, when the surf is pumping, the Pipeline Masters, an elite pro international surf contest, is held. Big-wave riders from around the world arrive through Honolulu airport and make their way to the North Shore. Spectators pack the shoreline to watch this ultimate surfing event. Pipeline is the most photographed and documented surf spot in the world. Over 75% of all surfing movies and videos include footage from the Pipe. In the surfing world it is in a class all its own.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	73˚	74˚	75˚	76˚	77˚	78˚	79˚	80˚	81˚	80˚	79˚	75˚
Air Temp (F)	79˚	80˚	80˚	81˚	83˚	84˚	85˚	86˚	84˚	83˚	81˚	80˚
Average Swell (ft)	10	10	8	7	4	4	3	2	5	6	9	10

Bells Beach

Australia's most popular big-wave town is Bells Beach in Victoria. Famous for its consistent surf, producing perfect small and super-sized waves on any tide, Bells reverberates with thunderous surf crashes that shake the earth.

Located on the southeastern coast of Australia, the state of Victoria faces the Indian and Pacific Oceans as well as the Tasman Sea. Bells Beach is a small bay wedged between two points of land along Victoria's southern coast. The huge surf at Bells Beach is caused by storm swells traveling across all three of these bodies of water. From the cliffs above the beach, you can see line after perfect line of swells rolling in like an army of soldiers, advancing row upon row towards the shore, invading the crescent-shaped beachfront. Bells is a right-hand reef and point break, with one of the breaks called "Rincon" after the famed Rincon surf break in California. Waves are powerful and offer gnarly rides although they rarely barrel. When they do, though, the famous "green room" at Bells makes you feel like you've just stepped behind emerald glass.



In the autumn and winter months of March through November, cyclones form in low-pressure systems over the South Pacific. They travel down and around Australia's eastern and southern coastline, creating massive swells that run into the shallow reefs along the coastline at Bells and are forced up, delivering huge waves that can reach 25 feet in height. Dangers to consider: a pounding shore break, strong rip currents, rocks, and hardcore waves. Bells Beach is ideal for intermediate surfers when the swells are not too big, but when the monster surf kicks up, it's safe only for the best of the best.

Victoria's coastline is made up of rugged limestone cliffs that drop vertically into the sea. It offers a stunning and diverse countryside that includes mountains, rain forests, and semi-arid desert. This southern tip of Australia is home to 34 national parks, keeping much of the state protected and preserved.

Bells Beach is named after the pioneer family who farmed this region of Victoria in the 1800s. Rip Curl and Quicksilver wetsuits were first created in Victoria. Bells is also known as a testing ground for new designs in surf boards, including the twin-fin and tri-fin board designs. More than 40 surf movies have featured Bells Beach, including the classic surf film *The Endless Summer.*

This Southern Hemisphere surfing destination offers a beautiful landscape, epic surf, and ideal climate for surfing big waves. Just 40 miles from Melbourne, access is easy and many surfers would agree that there is no better place to surf than Bells Beach.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	64˚	63˚	62˚	61˚	60˚	59˚	55˚	55˚	57˚	58˚	59˚	60˚
Air Temp (F)	79˚	78˚	66˚	65˚	61˚	60˚	62˚	63˚	63˚	65˚	73˚	74˚
Average Swell (ft)	3	3	7	7	6	6	6	6	4	4	3	3

Cape Hatteras

Cape Hatteras is the eastern seaboard's hottest wave. Located on the Outer Banks of North Carolina, Hatteras is part of the barrier island system that buffers North Carolina from the rough seas of the Atlantic. These islands have earned a reputation as the "Graveyard of the Atlantic" because of the numerous shipwrecks that dot the seemingly harmless sandbars just offshore. It's these same sandbars, though, that create a world-class surf break at Cape Hatteras.

Off Hatteras, the continental shelf is narrow and steep, permitting the full force of the ocean to crash over the sandbars, creating a beach break that can deliver waves in excess of 12 feet. The best riding waves, though, run three to six feet.

There are several great breaks formed by sandbars, jetties, and inlets in the area—breaks like Rodanthe, Oregon Inlets, and Wrightsville Beach. Most notable, though, is Cape Hatteras Lighthouse. Although the lighthouse was moved from this break to keep it from falling into the sea, the spot where it once stood still holds the name. It is this break that has made Hatteras famous. A sandbar jutting out more than 200 yards from the beach creates a point that breaks right, forming consistent hollow waves for swells coming in from any direction.

Hurricanes of late summer and fall generate the best surf at Hatteras, driving storm waves up the coast and straight at these barrier islands. Winter surfing is also good when a nor'easter (a storm out of the northeast) creates ground swells that travel south through the Atlantic before slamming head-on into Hatteras. These barrier islands find themselves at the convergence of two strong ocean currents, the powerful Gulf Stream and the Labrador Currents. Both deliver surf to Cape Hatteras. The combination of all of these factors makes Hatteras a great place to surf—a versatile, consistent, exciting break that is just right for beginner to expert surfers on both long and short boards.

Air temperatures at Hatteras climb into the 80s (Fahrenheit) in the summer and drop into the low 40s in the winter. Water temperatures range from high 70s to high 40s, making full wet suits a must for winter surfing. Surfers share the water with jellyfish, sharks, and stingrays, and strong rip currents can also make surfing dangerous. But the beach at Hatteras is picture perfect! Cape Hatteras National Seashore Park is a protected preserve where sea grass, sand dunes, and undeveloped open space treat the eye.

Over the years, Hatteras has grown in popularity as the place to surf on the U.S. East Coast. Interest in surfing has grown to such a degree that several dozen surf shops have recently opened to meet the demand for surfboards and gear from those who come to surf. Hatteras now hosts the annual Eastern Surfing Association Pro Championships each year. Surfers arrive from around the world through either Richmond or Norfolk, Virginia, or Wilmington, North Carolina. Regardless of the level of surf experience, Hatteras is pumping out sweet waves for anyone lucky enough to paddle in.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	42˚	43˚	45˚	47˚	60˚	61˚	66˚	67˚	63˚	61˚	58˚	54˚
Air Temp (F)	42˚	43˚	48˚	50˚	74˚	77˚	84˚	85˚	72˚	69˚	48˚	42˚
Average Swell (ft)	3	3	2	2	2	2	1	1	1	2	2	3

Dingle Peninsula

Dingle Peninsula is a surfer's paradise due to its numerous breaks, the diversity of its waves, and the skill required for its most demanding surf.

Being a peninsula, Dingle has breaks that face north, south, and northwest. With so many choices from which to pick, surf is always pumping somewhere on Dingle. You'll find point breaks, reef breaks, and beach breaks pumping out surf all around the peninsula. There is surf to be found for right or left handers, longboards and shortboards, beginners to experts. "Sandy Bay" is great for beginners just getting the hang of surfing. "Garry Williams Point" is a great right-hand break that kicks up great surf on any swell, even when everywhere else is flat. "Mossie's" breaks on a reef, creating a fun right-hand wave that rides best when the southern winds are up. "Dumps" does just that—it's a beach break that, when it closes out, dumps you right on the beach. "Coomeenole" is a left-hand break with sweet, barreled waves. "Inch Reef" is a right-hand reef-peeler breaking along the cliffs.

Usually the surf breaks between four and eight feet along this stretch of coast, but swells generated from storms raging hundreds of miles out in the Atlantic roll right at Dingle Peninsula, lifting the surf as high as 15 feet or more. Surfing is at its peak in spring and autumn. Weather, though, is changeable, so surfers keep a close eye on the forecast. The air rarely drops below freezing in the winter, when water temperatures cool to 40 degrees F, making winter surfing a frigid experience. Summer temperatures are cool, with air temperatures peaking at about 66 degrees and water temperatures not breaking 60. Surfing here requires the right kind of wetsuit and gear, but is well worth it. Summer surf days are long since Ireland lies so far to the north, when diehards linger to ten at night. It's best to like surfing in the rain; Ireland is damp year 'round. It's the rain of course, that makes the "Emerald Isle" so green.

Getting to Dingle is easy. Surfers fly into Dublin, rent a car, and drive west to County Clare, home of Dingle Peninsula. Although popular, Dingle is not crowded, and offers great opportunities to surf at anytime, on any break. Ireland is gorgeous country—sheer cliffs that drop into the sea, moss-covered forests, green mountainsides, moorlands, medieval castles, ancient ruins, lakes, rivers, and isolated wild beaches. What's not to love about Ireland?

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	45˚	46˚	47˚	48˚	50˚	52˚	63˚	64˚	58˚	56˚	49˚	48˚
Air Temp (F)	44˚	45˚	51˚	53˚	60˚	61˚	70˚	71˚	67˚	65˚	55˚	50˚
Average Swell (ft)	7	7	5	5	3	2	2	1	2	2	6	6

Dungeons

Steep cliffs on the shoreline, Sentinel Mountain on the horizon, and seals bodysurfing big breaks alongside the boards—this must be Dungeons! Located in picturesque Hout Bay, a suburb of Cape Town, South Africa, on the Atlantic coast of Cape Peninsula, the southernmost point of the continent, Dungeons is a big-wave-rider's paradise, often called the Southern Hemisphere's answer to California's Mavericks.

Surfers say Dungeons has the biggest, orneriest surf in all of Africa, and why not? Dungeons sits at the juncture of two oceans, the Atlantic and the Indian. Storms generating the swells that roll into Dungeons are right out of the Roaring 40s, the name given by sailors to the latitudes between 40 degrees and 50 degrees, known for their extremely strong westerly winds that blow out of the Indian Ocean and right towards the southern tip of Africa. These waves build as they cross a series of reefs. The most popular is called "2.5" since it is 2.5 meters deep (about eight feet). Beyond 2.5 is "3.5," which is 3.5 meters deep (about 11 feet). One reef at Dungeons has been known to kick up swells up to 47 feet!

Dungeons doesn't even start to break until the surf reaches a height of 12 feet. Even then, the waves don't get really good until the surf kicks up to 18 feet, and this right-hand reef break easily produces 25-foot waves, and the best days see waves that reach 40 feet. In surf this size, surfers and boards are easily pounded to dust! Rides of up to 300 yards are possible when the tide is receding and best when the tide is out. Surfers who attempt Dungeons must have the physical stamina and board skills to paddle-in (although tows from jet skis have recently become available) and ride such a powerful wave—and they must also be able to hold their breath. Local lore says the break got its name after a surfer was pounded underwater and stayed down so long that he felt like he was being held in a dungeon that he could not escape.

The dangers at Dungeons are many: treacherous rip currents, enormous surf, a jagged coastline, and great white sharks (that come to feed on the seals—or anything that looks like seals). Water temperatures, affected by the cold-water currents that circulate off the coast of South Africa, make the surf chilly, usually in the low 50s (Fahrenheit), so wetsuits are a good idea, but maybe not black ones. Surfers at Dungeons tend to ride big guns and rhino chasers—lighter, thicker boards specially designed for speed and stability.

Surfing is a popular spectator sport at Dungeons. Those who aren't riding, are watching! The annual Red Bull Big Wave Africa competition is held here, and those not watching the surfers may be watching the right whales that frequent this stretch of coastline.

Arriving in South Africa near Dungeons is easy: visitors can fly into either Cape Town or Johannesburg (both have international airports). Leaving can be more difficult. South Africa is a breathtaking country with lush green mountains, mile after mile of vineyards, exotic big game animals, and world-class surfing. Those who visit want to stay.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	76˚	76˚	76˚	76˚	75˚	74˚	73˚	72˚	72˚	73˚	74˚	75˚
Air Temp (F)	81˚	81˚	81˚	81˚	79˚	78˚	77˚	76˚	78˚	78˚	79˚	80˚
Average Swell (ft)	5–6	6	6	6	6	6	8	8	6	6	4	4

Hossegor

Ranked in the "top ten waves every surfer should ride" (by Australia's *Surfing Life* magazine), the emerald green surf of Hossegor, France, draws surfers from all over Europe.

Hossegor has a unique ocean floor which helps increase the size and force of the waves. Just offshore, there is a narrow canyon created by a river that empties into the nearby surf. As the swells approach the shore, they are forced into a narrow channel. Limited by space, the waves are forced up. These powerful swells then drag across an offshore sandbar, forcing the wave to fall over itself as it approaches the shore. Once past the sandbar, these deep-water waves provide great drops, long walls, and huge barrels that break both to the left and right with perfect peelers that ride for 300 yards.

Featured in dozens of surf movies, this destination offers surfing opportunities for a wide range of talent and ability from beginner to expert surfers. The several surf sites each offer their own flair. La Graviere, at the south end of Hossegor, is a right hand break offering the biggest surf in the area. Les Estagnots is where the annual Rip Curl World Pro Surfing Tour is held. La Piste offers a gnarly right hand tube break and La Nord is the main wave break that's front and center in Hossegor. As a paddle-out beach break, breaking on all tides, high and low, Hossegor is a short-boarder's paradise, but its rip currents can test even the strongest surfers, and when the big surf arrives, inexperienced surfers pull out the guns and leave riding to the pros.

The surf breaks best in the fall and winter, from September to December, when storms in the North Atlantic create groundswells that roll across the ocean to the French shore, producing surf that can reach 20 feet in height. These strong, sometimes terrifying swells provide consistent surf for this break. In the summer months, Hossegor gets crowded as tourists and beachgoers from all over Europe arrive to try out the legendary surf. When the days of summer are over, Hossegor clears out and the pro surfers get down to business.

Hossegor's picturesque landscape is another reason for its popularity. Barrels unload onto a white, sandy beachfront lined with sand dunes and pine forests, while the village of Hossegor offers all the amenities—food, lodging, and shops to meet any surfer's needs. Long a home to whalers, Hossegor is named after the chief of a band of Viking raiders that seized the place in 840.

Located on the Atlantic coast a short distance north of Bayonne and about 60 miles north of France's border with Spain, Hossegor can most easily be reached by international travelers who fly into Bordeaux, rent a car, and drive to the beach through the some of France's most scenic countryside.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	51˚	52˚	55˚	57˚	60˚	63˚	70˚	70˚	67˚	66˚	55˚	54˚
Air Temp (F)	54˚	55˚	57˚	58˚	68˚	70˚	74˚	75˚	73˚	72˚	58˚	57˚
Average Swell (ft)	8	8	6	5	5	4	3	3	4	4	6	7

Isla Todos Santos

An uninhabited, rocky island eight miles off the western coast of Mexico's Baja Peninsula has become one of the hottest surf destinations in the world because of mountainous surf that sometimes reaches a staggering 60 feet in height.

Isla Todos Santos, "All Saints Island" (actually a pair of islands, but the surf spot fronts the smaller of the two) is an awe-inspiring place to surf. An underwater canyon channels ocean swells toward the island. The narrow canyon funnels the swell, speeding the motion of the water—and this fast-moving swell has nowhere to go but up. The resulting uplift creates the mountains that surfers ride at Todos. These waves are powerful and heavy. Breaks here have names like "Thor's Hammer" and "Killers" (it's not hard to guess how that break got its name). Then there's Chickens, the smaller break (relatively speaking) where those who "chicken-out" at Killers go to find surf they can handle.

These big breaks are ridden only by the best of the best, and when these surfers come, they bring their big guns. In 1999, pro surfer Taylor Knox won the K-2 Big Wave Challenge at Todos Santos by riding a wave that was at least 52-and-a-half feet high. A photograph taken of the ride was all the proof he needed to win the $50,000 prize money. In 2006, the winner of the Billabong Pro surfed a 68-foot monster! World-class surf breaks consistently here from October to April, when giant swells roll out of the North Pacific all the way from the Aleutian Islands. Unlike other big-wave sites around the world that require waves to reach at least 12 feet before they begin to break, Todos Santos breaks even when the surf is only small or medium in size. Although winter surfing is great, the water can get very cold. Wetsuits, hoodies, and booties are a must. And with waves the size of high-rise buildings moving like freight trains, paddle-in is next to impossible, so surfers use wave runners and tow ropes to reach the waves and to get up to speed before they drop in.

The islands are arid deserts, undeveloped and uninhabited other than two lighthouses. Those who venture to Todos must bring everything they will need—boards, food, water, shelter, first-aid kits, and all personal necessities. To get there, surfers usually charter a boat out of Ensenada, about 12 miles away.

Todos offers a ride like no other place on the planet. For those who can handle its extremes, Todos Santos is the perfect wave!

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	57˚	58˚	58˚	59˚	61˚	65˚	69˚	72˚	72˚	72˚	64˚	59˚
Air Temp (F)	65˚	65˚	66˚	67˚	71˚	73˚	78˚	79˚	75˚	74˚	72˚	70˚
Average Swell (ft)	6–7	4–5	3–4	3–4	2–3	2–3	2–3	3	4–5	4–5	5–6	6–7

Jeffreys Bay

Jeffreys Bay, South Africa, has become, to many surfers, the Mecca of surfing. Thousands make the pilgrimage to Jeffreys Bay—also known as "JBay"—every year, attracted by its reputation for fast, long rides. When conditions are right, a surfer at JBay can catch a ride that is 1200 yards long. That's the length of 12 football fields! Can you imagine a ride that long?

The waves that reach JBay form from storms that brew 1000 miles south, in the ocean off Antarctica. Winds blow this powerful surf across a vast expanse of ocean and right into the eastern coast of Africa, delivering the perfect wave to Jeffreys Bay. The southeast swells during medium to low tide at Jeffreys Bay offer opportunities for small-, medium-, and big-wave surfing, making this an ideal destination for intermediate-to-expert surfers. To the inexperienced surfer, Jeffreys Bay offers serious challenges: high surf, rocks, sharks, and a strong undertow. Even for the expert surfer, it requires skill, fitness, and daring to take on this surf.

Jeffreys Bay offers surfers a right-hand point break with barrels and tubes that rival the best in the world. JBay is actually a combination of several surf spots—including Supertubes, Tubes, and the Point—that merge into one great surfing experience, with each stretch of water presenting its own challenges and opportunities. You'll see surfers riding a variety of boards at JBay—from shortboards to guns, all offering surfers the chance to catch a perfect ride.

Surfing is great all year round at Jeffreys Bay, but ideal conditions are from June to August, sometimes beginning as early as April and lasting through September. The Billabong Pro World Championship is held here each year for ten days in July. Remember, JBay is in the Southern Hemisphere, so it's winter during these months. Surfers must be prepared with adequate gear and excellent wet suits to surf these conditions.

Because Jeffreys Bay is such a famous surf spot, it can be crowded. The break is most crowded when the surf is small. When the waves get over ten feet, the crowds thin out and it's time for the expert surfers to "hit the beach."

Jeffreys Bay has a lot of colorful history. An African legend tells of a Zulu king who surfed Jeffreys Bay long ago and loved the experience so much that he named it Kingdom of the Waves. In the 1960s and '70s, JBay became famous as a hippie hangout where the new sport of surfing was taking root.

South Africa's history of apartheid—racial separation with second-class citizenship for blacks—continues to create tensions within the country even though apartheid ended in 1994. South Africans today are struggling to build a country that is racially and socially equal, but these continuing tensions are still a factor to consider when traveling to South Africa.

Jeffreys Bay is located in the Eastern Cape province of South Africa. To reach it, it is best to fly into Cape Town or Johannesburg and then take a connecting flight to Port Elizabeth, the closest major city. Surfers can drive right to Jeffreys Bay, making this world-class surfing destination, one of South Africa's surfing gems, easily accessible.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	75˚	76˚	75˚	74˚	73˚	72˚	72˚	72˚	72˚	72˚	73˚	74˚
Air Temp (F)	82˚	82˚	80˚	79˚	77˚	76˚	75˚	74˚	75˚	76˚	78˚	79˚
Average Swell (ft)	4	4	4	5	6	6	6	5	5	4	3	3

Kirra

Take a lightning-fast, flawless, funneling tube ride; wrap it in a sheltered, sandy, point beach break; and locate it on the Gold Coast of Queensland, Australia. What have you got? Kirra, Australia's best surfing wave, considered by many top-ranked surfers to be the best wave in the world.

Kirra's sandbar point break is created by sands shifted by the tide and currents that bend around a rocky headland. When deep-ocean swells roll up and onto the sandy point, the wave is forced upward, forming the perfect hollow tubes that Kirra is famous for. Riding from the point at Kirra requires a concentrated effort. As the sandbar dips and rises, the waves above also dip and rise, requiring constant adjustments by the surfer as he or she moves across the wave.

The point at Kirra is divided into three sections, each producing its own waves. Big Groyne, the Point, and Little Groyne all make up what is called the "Kirra Break." They are all right-handers and sweet to ride. When conditions are just right, the surf between all three connects, and then a surfer can catch an incredibly long 800-yard ride.

Kirra does have its share of dangers. The power of the shallow shore break can be bone jarring. The fierce rip currents can surprise even a seasoned surfer. At peak times of the year, the line-up can be frustratingly crowded ("Kirra," fittingly, is an aboriginal word meaning "gathering place"). Locals can be very possessive of this break. There is also the occasional shark.

The subtropical weather found at Kirra makes for ideal surfing year round. Cyclones produced in the Coral Sea bring perfect surf out of the northeast from December to March. Winter surf (May to August) brings the year's biggest surf out of the southeast. Waves of four to eight feet are ideal for surfing Kirra, and are good at all stages of the tide. Kirra offers opportunities for beginners near the shore, and for intermediate and advanced surfers out on the point. You'll see both short and longboards in the surf at Kirra.

Surfers fly into Gold Coast (Australia's sixth-largest city) or Brisbane to reach Kirra's gorgeous white sand beaches, magnificent tropical rainforests, perfect temperatures, and totally epic aquamarine surf. The waves are fun, powerful, fast, and hollow. They are, in a word, perfect.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	76˚	75˚	75˚	75˚	72˚	70˚	68˚	65˚	67˚	68˚	71˚	72˚
Air Temp (F)	85˚	85˚	83˚	82˚	75˚	74˚	68˚	68˚	75˚	77˚	82˚	83˚
Average Swell (ft)	3	3	4	4	5	5	5	5	4	3	3	3

Mavericks

Mavericks is a killer deep-water reef break at Half Moon Bay, not far south from San Francisco, California. Now considered a paradise for big-wave, elite surf riders, for many years Mavericks was considered too dangerous to surf. Considered to be among the world's most difficult waves, the break at Mavericks has been known to reach higher than 60 feet. Surfing Mavericks is like surfing down the face of an angry, moving mountain!

Mavericks's giant, unpredictable waves are born in the Gulf of Alaska, roll across the northern Pacific, and pound into this California beach. Offshore buoys have documented these Pacific groundswells off Mavericks at 60-plus feet high and rolling in every 17 seconds! The epic waves at Mavericks form because a vee-shaped underwater rock formation on the ocean bottom channels the full force of these large swells into a small area as they approach shore. The tremendous energy moving in the swells transfers kinetic energy from forward momentum into the rise of gigantic waves.

This right-hand reef break is not for the faint hearted. Not only are the waves gargantuan, but the rip currents are deadly and dangerous rocks seem to appear in the surf out of nowhere. As if this wasn't enough to contend with, frigid water temperatures and frequent fogs compound the challenge. This is surf for only the biggest boards, so surfers here ride eight- to 12-foot guns. When the surf is up and the word is out that "Mavericks is kickin," as many as 30,000 spectators will gather on the cliffs above the shore to watch surfers risk their lives to ride the perfect wave.

Waves reach their peak in the winter months, between December and March, sometimes sparking the unique Mavericks Surf Contest. Once called "Men Who Ride Mountains," this spontaneous athletic event has no set annual date. Instead, the surf director watches wave forecasts for Mavericks between December and March, and when it seems that Pacific storms, weather, swell direction, and wind factors are aligning to create perfect conditions, he sends out a "wire" (a call) to "the 24"—the 24 top-ranked big-wave riders in the world. These surfers have 24 hours to reach Mavericks to compete in the contest. Surfers from as far away as South Africa and Australia book flights into San Francisco, the closest international airport, in order to compete in what is sometimes called the Super Bowl of big wave surf competitions. Judged on the size of the wave, the steepness of the wave face, and the duration and style of the ride, these elite surfers test their courage and skill when they enter the perilous waters of Mavericks.

Mavericks is named after a German Shepherd dog. In 1961, when three surfers were trying out the tail end of the break—and deciding the waves were just too dangerous—Maverick, the dog they'd left on the beach, paddled out to join them, so they started calling the place "Maverick's Point." One day in 1975, after hearing his junior high school teacher refer to this spot as Mavericks, local boy Jeff Clark paddled out to catch some ten- to 12-foot waves. For 15 years, Clark was the only surfer known to surf Mavericks, but in 1990 a photograph taken by a friend of Clark's was published in *Surfer* magazine and big-wave surfers began trying their skill on California's only Hawaii-sized waves. Since then, what Clark has described as "the biggest, baddest paddle-out surf spot in the world" has rapidly gained in fame and importance.

The danger of Mavericks is never far from the minds of those who surf it. In 1994, pro Hawaiian surfer Mark Foo wiped out while riding an 18-foot wave at Mavericks. His body was pounded into the surf and he drowned. His death was a stark reminder: at Mavericks, any ride could be your last.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	45˚	47˚	50˚	52˚	55˚	56˚	57˚	58˚	59˚	59˚	51˚	48˚
Air Temp (F)	55˚	57˚	60˚	61˚	65˚	67˚	71˚	72˚	73˚	75˚	62˚	60˚
Average Swell (ft)	7	8	5	4	4	4	3	3	4	4	5	6

Mundaka

Four barrels in one run! Considered one of the sweetest, longest left-hand waves in the world, Mundaka, Spain, produces row after row of perfect peelers, and when conditions are at their best, you can catch a ride that combines as many as four individual barrels in one run for more than 300 yards!

Mundaka, a north-facing beach on the Atlantic Ocean, is a shallow river-mouth sandbar formed where the Guernica River flows into the sea. Sand and other sediments from the river build up a sandbar that creates the break. Surf runs between two and 12 feet at Mundaka, but the sweetest rides come from six- to ten-foot waves, and Mundaka can produce awesome barrels at just about any height.

Surfing Mundaka is at its best from September to early December, which is the rainy season, so the sandbar that forms the break is completely filled in with sediment. During this time of year, winds often blow offshore, making clean, smooth waves, and storms that form in the North Atlantic set powerful swells into motion. Approaching from the northwest and west, these swells roll right into the Bay of Biscay, hit the sandbar, and rise up to form Mundaka's fast, powerful left-hand break, which is best from mid-tide to low tide and for intermediate to advanced surfers.

Mundaka has its dangers. Powerful storm waves slamming into the towering, rocky coastline make for treacherous waters. Adding to the unpredictability, shifting currents continually alter the sandy bottom. Paddle-in from the harbor and across the river mouth strength and stamina; it also requires caution because of river traffic and strong currents. A powerful undertow can catch surfers off guard. Because the waves are steep and hollow, shortboards are most commonly used; longboards can snap in half easily in this wave. The break is very popular and can get very crowded. Locals can be very possessive, so visitors need to be considerate.

This Basque region of northern Spain, located close to the southern border of France, is home to the Mundaka fishing village from which the surf break gets its name, and Guernica is a picturesque town for tourists, but if it's surfing you want, Mundaka is widely considered the best left-hander in Europe.

Surfing lists Mundaka as one of the world's 25 best waves, and Australia's *Surfing Life* puts it in their top ten.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	52˚	53˚	54˚	55˚	60˚	62˚	69˚	70˚	67˚	66˚	56˚	54˚
Air Temp (F)	54˚	55˚	56˚	57˚	65˚	67˚	75˚	75˚	73˚	72˚	60˚	57˚
Average Swell (ft)	8	8	6	6	4	4	2	2	3	4	5	5

Puerto Escondido

The premier surf break in all Mexico, Puerto Escondido is frequently referred to as "the Mexican Pipeline" after the famed Pipeline break in Hawaii, and Australia's *Surfing Life* magazine has named Puerto Escondido one of the "Ten Waves Every Surfer Should Ride."

Puerto Escondido, Spanish for "Hidden Port," produces a powerful beach break tube that gets its power from an offshore, underwater canyon that magnifies the strength of the Pacific ground swells rolling out of the south and southwest. Sandbars near the shoreline force the waves up, slamming mountainous surf into this Mexican beach break. Due to the closeness between the break and the beach, surfing these waves is tricky and requires skill.

Puerto Escondido has two main breaks. The combination of Carmelitas, a powerful right-hand break also called "Wheelchair Bar" (did I mention these waves are tricky and require skill?), and Far Bar, a left-hander, gives this area the versatility surfers look for. During the summer, swells from as far away as Antarctica roll into Puerto Escondido. During the winter months, Puerto Escondido catches swells from the northwest. From late spring through fall, waves are rarely below four feet. Most often the surf breaks at six to eight feet, and at times 15 feet or more! Puerto Escondido is without question the biggest surf break in Mexico.

Puerto Escondido not only offers sick surf but also a soft, sandy ocean floor with no rocks or reefs to contend with. It does, however, have its dangers. Strong ocean currents, swift rip tides, crushing waves, and a very crowded line-up are factors that made *Surfer* magazine call Puerto Escondido "One of the World's Most Dangerous Waves."

The prevailing winds at Puerto Escondido are just what surfers dream of, consistent offshore breezes that blow from sunrise till noon, and blow again in the evening, creating smooth, clean waves. Afternoon winds change to an onshore breeze, not as ideal for surfing but giving surfers a nice break from the intense heat and humidity common during summer afternoons. Summer air temperatures can reach into the 90s, with Jacuzzi water temperatures climbing into the 80s. But a big draw to Puerto Escondido is that, when most of the rest of the Northern Hemisphere cools down, this break stays warm. The water temperature never drops below 70 degrees.

Puerto Escondido was the best-kept secret of local Mexican surfers until the 1970s, when surfers traveling down from California discovered it. Quickly gaining a reputation as a world-class break, the beach became a popular destination for surfers from around the world after the Puerto Escondido International Airport opened in 1986. Since then, surf tourism has become the number one industry in Puerto Escondido.

Located on the northern tip of the Gulf of Tehuantepec along the western coast of Mexico in the state of Oaxaca, Puerto Escondido's waves are undeniably Mexico's best—"must-surf" for serious wave riders.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	71˚	75˚	82˚	83˚	84˚	85˚	87˚	88˚	84˚	82˚	74˚	70˚
Air Temp (F)	80˚	83˚	87˚	87˚	88˚	88˚	90˚	90˚	89˚	88˚	80˚	80˚
Average Swell (ft)	4	4	4	5	5	6	6	6	6	5	5	4

Raglan

Surfers tired of the Northern Hemisphere's cold winters can head south of the equator for summer warmth and the long hours of summer daylight that extend a day of surfing. These south-flying snowbirds often end up on New Zealand's North Island. Along the black sand beaches two hours south of Auckland, New Zealand's capital city, awaits one of the finest breaks in the world: Raglan.

Groundswells rolling across the Tasman Sea build in intensity and speed as they approach the town of Raglan. Considered one of the sweetest surf havens in the Southern Hemisphere, the Raglan Peninsula creates three gnarly reef breaks.

Manu Bay, known as "The Point," has the longest left-hand ride in the world. Waves break at a consistent two to ten feet, offering surfers a ride that peels for over a mile and seems to last for forever. The Point, one of the surf breaks featured in the epic surf movie *The Endless Summer,* is the most surfed wave at Raglan. The Point is also one of the most easily accessible breaks in the world, making it a perfect wave.

Indicators, the second reef break at Raglan (and also known as "Indies"), is a razor-edged left-hander, more exposed to the prevailing winds than Manu Bay, so Indicators usually produces the largest waves at Raglan. These waves barrel down the point break for 300 to 600 meters with surf upwards of ten feet. Indies delivers a fast, awesome ride—but be careful or you could find your board pounded into the rocky reef ledges just below the surface.

Whale Bay, the final break of the Raglan trio, is known for its shallow tube ride. Because it breaks close to the rocks, it is the least popular of the Raglan surf sites.

All three Raglan breaks deliver epic rides that allow surfers to do what they love best—make turns and maneuvers, as many as ten to 15 on any given wave. Raglan is awesome for the beginner as well as expert surfer, where you'll see surfers riding short boards and long boards alike. Surfing is best at low tide, but strong rip currents, rocks, and storms can bring an element of danger to Raglan. Waves at Raglan can kick up to a point where it can eat surfers and their boards alive. One of the restaurants in town has made all of its tables out of boards broken in the surf at Raglan.

Although surfing is most popular from October through November, Raglan offers a consistent break all year long, and locals like it best when the crowds of spring and summer go home.

Surfers not only have epic surf at Raglan, they also have panoramic views of the Tasman Sea. Natural waterfalls, like Bridal Veil Falls, cascade down to the beach below. Black-sand beaches backed up against a lush, green, unspoiled, mountainous countryside make Raglan a top tourist destination. The small seaside town of Raglan is rich with Maori culture and a laid-back lifestyle most preferred by surfers. Whale Bay, the final break of the Raglan trio, has a long cultural history as a Maori healing site. Who could ask for more? Raglan is a world-class surfing destination!

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	58˚	59˚	55˚	54˚	51˚	49˚	45˚	49˚	59˚	59˚	50˚	57˚
Air Temp (F)	72˚	74˚	72˚	68˚	62˚	55˚	56˚	57˚	63˚	65˚	67˚	70˚
Average Swell (ft)	7	8	4	5	4	4	3	3	4	4	5	6

Rincon

Known as the "Queen of the Coast," Rincon is regarded as the benchmark by which other American surf breaks are measured. A classic California right-hand point break, this flawless wave can deliver a marathon ride that's more than 300 yards long!

Ground swells rolling across the ocean from Pacific storms deliver powerful surf to Rincon, creating some of the sweetest waves on the planet. As a beach break, Rincon's ocean bottom is a combination of sand and stones, so low tide is the best time to surf Rincon; when the tide begins to recede, tubes often begin to form. Wave size can vary from two to 12 feet, with the best surfable waves ranging between four to eight feet.

Formed by a river mouth that empties onto the beach and then out to sea, Rincon Point sets up three overlapping point breaks. The first of these is Indicator, found at the top of the point and delivering a big, thick wave that rides for about 75 yards. Rivermouth, a slightly smaller wave that forms right at the mouth of the river, breaks for about 50 yards. The Cove, the third of the breaks, is the centerpiece at Rincon. Although not as powerful as the other two breaks, the Cove funnels riders into an awesome ride right to the rocks some 300 yards down the beach. In summer, sometimes a fourth break forms, a left-hand break just north of Indicator called "Backside Rincon." And there's something else, something rare, that Rincon's surfers sometimes enjoy: when conditions are just right, surfers can ride Indicator, pick up Rivermouth, and peel all the way through the Cove for an epic killer ride of 500 yards! The combination of all of these ranks Rincon as one of the best point breaks in the world.

Surfers ride both short and long boards at this break. Sheer perfection between October and May when the swells are out of the west and northwest, Rincon attracts surfers with experience and is best suited for those with intermediate to expert skill. A strong undertow, rip currents, and overcrowding in the line-up are challenges for surfers, and pollution dumping into the ocean from river runoff can at times cause a serious bacterial problem, closing the surf break for days at a time. It can get chilly surfing Rincon, where air temperatures can be in the 50s and 60s (Fahrenheit), with water temperatures ranging in the 50s. Full wetsuits become a necessity when the temperatures get this low.

Rincon sits on the border between Santa Barbara and Ventura, California. Located in Rincon Beach State Park, a tree-lined beachfront and boulder-strewn shoreline give this picturesque surf spot breathtaking views. Surfing at Rincon dates back to 1907, and in the 1960s Rincon became the testing ground for the original short-board designs that would eventually launch a revolution in the surfing industry. Locals fiercely protect their break, keeping pro surf competitions away from Rincon, although they haven't been able to prevent the break from being featured in over 40 surf movies. Despite its fame and international appeal, Rincon maintain a mellow lifestyle that locals think is perfect.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	48˚	49˚	57˚	58˚	60˚	63˚	64˚	66˚	67˚	66˚	57˚	54˚
Air Temp (F)	61˚	62˚	65˚	67˚	70˚	72˚	77˚	78˚	79˚	72˚	70˚	65˚
Average Swell (ft)	7	8	7	6	5	5	4	4	4	5	6	7

Rio de Janeiro

Lined up along 45 miles of coast, one awesome break after another is unrolling perfect waves in Rio de Janeiro, Brazil. Rio's beaches offer diversity. There are breaks for beginner, intermediate, and advanced surfers. Reef breaks, beach breaks, and point breaks are stacked up along this stretch of coast, waves breaking left and waves breaking right at more than two dozen high-quality surf breaks. What are you waiting for?

A few of the most renowned breaks deserve mention. Ipanema (the name is Portuguese for "dangerous waters") is one of the most famous tourist beaches in the world, and it is also a left-hand beach break where the surf kicks up fast-moving barrels. Below world-famous landmark Sugar Loaf Mountain close to the center of town, Copacabana is a right-hand shore break. Prainha, one of Brazil's most famous surf spots, produces high-performance waves inside a cove, breaking either left or right depending on tide and swell conditions. Arpoador is a left-hander famous for the stadium lights that, lining the beach, illuminate the break so surfers can ride through the night.

There's good surf in Rio between April and October. The sweetest surf, though, is in July and August when storms out of the South Atlantic generate trains of swells. Waves generally break at three to six feet and rarely above ten feet. Waves of this size are fun to ride and ideal for short- and longboard surfing.

Surfing Rio does have its dangers. Sharp reefs, rocks and ledges below the surface, strong currents, occasional sharks, and crowded line-ups (more than 40,000 surfers call Rio home) are factors surfers must consider. Water pollution from the densely populated urban areas can be a problem.

Rio de Janeiro (literally "River of January") is a very popular tourist destination. Carved out of the rain forest, this major city sits between lushly forested mountains and white-sand beaches beside the sea. It is especially crowded during the annual Carnival, a four-day spring festival that precedes the season of Lent in the Christian faith. Rio's seasons are reversed from North American expectations, but air temperatures vary only slightly between summer and winter. Water temperatures range from the low 60s (Fahrenheit) in winter to the 70s in summer. The city's fast-growing surf culture has had a significant cultural and economic impact. Many of today's pro-world class surfers come from Rio.

In short, Rio is a warm, versatile, consistent, perfect surfing destination.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	78˚	78˚	77˚	76˚	75˚	74˚	70˚	69˚	68˚	69˚	71˚	72˚
Air Temp (F)	84˚	83˚	82˚	81˚	78˚	77˚	77˚	76˚	77˚	77˚	78˚	80˚
Average Swell (Ft)	2	2	2	2	3	3	4	4	3	3	2	2

Steamer Lane

Steamer Lane has been known as the classroom for big wave surfing, the place to gain the skill and experience needed to take on other big-wave spots around the world. Located in Santa Cruz, California, at the north end of Monterey Bay, the area boasts 15 reef and point breaks, of which Steamer Lane is the most famous. The picturesque hillside cliffs that line the shores of Steamer Lane make watching surfers take on the big waves convenient and exciting.

The ocean floor below Steamer Lane is a mix of rocky reef and kelp forest. It's the reef that transforms the powerful North Atlantic ground swells that roll towards the California coast, forcing them up as they drag across the reef and then collapse, forming this famous break.

Four different reef breaks converge at Steamer Lane. To the north is the Point, with its right-hand break that pushes its riders straight toward a rocky outcrop. When the swells are out of the south or southwest, the Point gets pumping. The Slot, located just yards south of the Point and another right-hand break, breaks best when swells are out of the north or northwest. Both breaks produce tubes on occasion, but are best known for thick-based waves that allow surfers to perform skilled maneuvers. The third break, called "Middle Peak," is created by a series of reefs that jut out into the ocean for more than a mile. Middle Peak both left and right on swells from the north, northwest, and southwest, making it a consistent, dependable surf spot. Indicators is the fourth break at Steamer Lane. Located just off Middle Peak, it produces five- to eight-foot surf when swells are out of the north or northwest. Indicators rides for a good 300 yards and then dumps surfers into an easy breaking wave called "Cowells." With these four awesome surf break options, Steamer Lane is grinding most of the time!

The chief challenge of Steamer Lane is that there is no beach. Surf explodes against the rocks and cliffs, making the paddle-in depend on carefully timed choreography, and ill-timed pullouts can smash surfers on the rocks. Before surfboards had leashes, numerous boards were mangled and destroyed when riders lost them in the surf and they were bashed against the cliffs. The surf leash, now used by surfers worldwide, was actually invented in Santa Cruz in the 1970's because of this. Steamer Lane can also get crowded though due to its popularity and the fact that Santa Cruz is a college town that attracts students who love to surf. Steamer Lane is not for beginners. The experience of intermediate and advanced surfers is necessary to survive the surf at Steamer Lane.

The surf is up at Steamer Lane for the much of the year. Most Northern California surf breaks are affected by strong springtime northwest winds that shut down the surf, but Steamer Lane, protected by the bay in which it sits, produces primo surf—best at medium low tide to medium high tide—except for a few months of summer.

Steamer Lane, and all of the Santa Cruz area, is part of the Monterey Bay Marine Sanctuary, which makes it a protected marine environment frequented by an abundance of sea life. Whales and sharks have been spotted at Steamer Lane, sharing the sea with the hundreds of amateur and professional surf contests have been held there through the years.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	44˚	45˚	49˚	50˚	54˚	56˚	58˚	58˚	59˚	56˚	50˚	48˚
Air Temp (F)	55˚	56˚	60˚	62˚	67˚	68˚	71˚	72˚	74˚	71˚	63˚	60˚
Average Swell (ft)	6	6	5	5	4	4	3	3	4	4	5	6

Sunset Beach

Likely the world's most consistent big wave break, Sunset Beach is part of a cluster of Hawaiian surf breaks where enormous waves advance like marching soldiers towards the shore. The "best of the best" surf Sunset Beach.

Because of Sunset's location (as the name implies, Sunset faces west—it's actually just around the corner and two miles down the coast from north-facing Pipeline), Oahu's northwest facing reef break throws up waves whenever the swells are out of the west, northwest, north, or northeast. These waves rise up in the shallows created by a gnarly lava-rock reef that lines the floor below the surf, and then they open out like a reverse funnel to thunder down on a horseshoe-shaped beach sometimes referred to as "The Bowl."

Sunset Beach's vast wave field comprises six breaks. Val's Reef is a short right-hander breaking close to the beach and named after a local surfer. The Bowl lies right on the edge of the reef and a deep-water channel; when swells are rolling out of the north, waves reach 12 feet here. The famed West Peak is the centerpiece at Sunset, producing a fast-moving monster wave that crests at 18 feet when swells roll out of the west or northwest. Sunset Point on the eastern end of Sunset produces smaller waves that break at about five feet. North Wall catches swells out of the north, breaks in excess of 18 feet, and peels for 300 yards. Backyard is a right-hand break stretching along the north end of Sunset. Taking all six breaks together, waves at Sunset are versatile, predictable, and epic!

In addition to the mountainous surf that makes Sunset dangerous, there is also a wicked rip current and a powerful shore break that can pound a careless surfer right into the beach. Sunset can also get crowded during peak season when the surf is pumping. Trade winds that blow hard along this stretch of Oahu can interfere with a surfer's ability to paddle fast enough to catch a wave. The unevenness of the reef below the surface causes waves to shift and tilt as they approach the shore, requiring surfers to continually adjust their ride. Physical stamina, expert skill, and lots of experience are a necessity to survive a ride on this world-class wave—but if you can catch it and stay with it, harnessing Sunset will give you an awesome adrenaline rush.

Surf is at its peak between October and April when winter Pacific storms create swells that roll right at Sunset Beach and deliver waves that can break at up to 30 feet.

Surfing has been part of Hawaiian culture for hundreds of years. Sunset Beach gained immense popularity as a big-wave surf break in the 1950s and '60s and has appeared in countless surf movies. It even graced the cover of the very first *Surfer* magazine (1960). Numerous world-class competitions have been held at Sunset including the World Cup, the Billabong Pro, and the Rip Curl Cup. *Surfer* magazine listed Sunset Beach as one of the "Ten Best Waves in the World."

Giant waves, masterpiece sunsets, sugary white beaches, lush tropical plants, and a fringe of palm trees put Sunset as close to paradise as Earth can get! It's Sunset and Pipeline that earned Hawaii the sobriquet "big-wave capital of the world."

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	74˚	75˚	75˚	76˚	77˚	78˚	78˚	79˚	80˚	81˚	78˚	76˚
Air Temp (F)	79˚	79˚	80˚	81˚	83˚	84˚	85˚	86˚	85˚	84˚	81˚	80˚
Average Swell (ft)	7–8	8	6	6	4	4	3	2	5	6	6	7

Tavarua

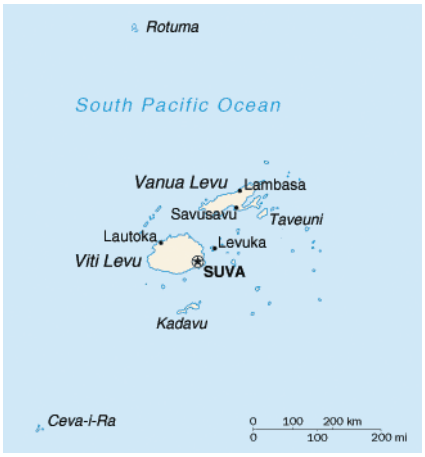
Nearly a thousand islands dot the island chain of Fiji, but in all those islands exists only one Tavarua. You hear the roar, you feel the earth shudder, even before you see the monster 18-footers that made *Surfing* magazine name Tavarua one of the "Top 25 Best Waves in the World."

The surf at Tavarua is created by offshore coral reefs as waves out of the north and northwest slam the island. There are several major breaks along the reef. Cloudbreak is an open-ocean reef about a mile south of Tavarua and kicks up for a thunderous 300-yard barrel ride. Fast-moving swells roll out of the Pacific straight toward the steeply sloping coral reef, rapidly forcing up perfect surf that breaks at a staggering 18 feet. Cloudbreak actually picks up speed as it hits shallower water, forming tubes as it approaches the shore. Restaurants, another break at Tavarua, funnels around the western edge of the island, breaking in very shallow water right onto the sharp coral. The wave, although half the size of Cloudbreak, is a perfectly formed tube that rides for 15 seconds. It gets its name from its closeness to the main resort's kitchen, but the break is so consistent that it has also earned a second name: "The Machine." Both breaks are best between February and October and are considered two of the smoothest, cleanest left-handers in the world. A third site at Tavarua is Cloudbreak Right, a right-hand tube break on the southeast side of the island that breaks best between November and March.

Waves at Tavarua are affected by winter storms from the Pacific Ocean and cyclones (hurricanes) forming in the Coral Sea between February and March. With waves the size of mountains and packing the power of locomotives, you'll find surfers riding everything from shortboards to the big guns. When the surf is pumping, you'll find only expert surfers in the line-up.

One thing about the heart-shaped island of Tavarua and its surf breaks stands unique in the surfing world: the island, and even the breaks, are privately owned. Only 50 people at a time can stay at the resort, which is reached by flying into Nadi on Fiji's main island (called Viti Levu), chartering a boat, and motoring to the island. Between airfare, boat rental, and lodging, the cost can easily be $3000 a week—but those who have forked out the big bucks experience the surf adventure of a lifetime!

Tavarua has hosted numerous pro surf competitions and has appeared in many surfing movies, including surf classic *Endless Summer II*. Cloudbreak also gained notoriety as the location for the 2000 Tom Hanks movie *Cast Away*. Australia's *Surfing Life* magazine ranks Fiji's Tavarua and Hawaii's Pipeline as the two best surf breaks on the planet.



Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	S	S	F	F	F	W	W	W	Spr	Spr	Spr	S
Water Temp (F)	82°	82°	82°	81°	81°	80°	79°	78°	77°	78°	80°	81°
Air Temp (F)	89°	89°	88°	87°	86°	85°	84°	84°	85°	85°	86°	88°
Average Swell (ft)	4	4	5	5	6	6	7	7	6	6	5	5

Teahupoo

The world's most difficult and treacherous wave break might also be the most difficult to pronounce. Teahupoo (pronounced by non-locals as "cho-poo") throws up mountainous surf that can easily reach 18 feet and then crash down to crush surfers on its underlying coral reef, making this Tahitian break literally killer surf.

Tahiti comprises two circular islands in French Polynesia in the middle of the Pacific Ocean. Teahupoo is a village on the southwestern tip of the smaller island, Tahiti Iti, meaning "Little Tahiti." The famed break is generated by coral that forms a barrier reef about a third of a mile offshore. Ground swells rolling across the ocean rise up abruptly from the deep ocean floor when they encounter these shallow reefs around Tahiti. This sudden switch from deep to shallow causes monster surf to roar with the power of an out-of-control freight train into the crescent shaped beachfront of Teahupoo. These waves are thick, fast, and heavy. When they collapse, the earth shudders beneath them. The waves are so fast, in fact, that surfers often find themselves unable to paddle fast enough to catch them. The ride is only about 75 yards, but that 75 yards is an explosive ride in a tube big enough to drive a school bus through.

So ferocious is the Teahupoo break that paddling out is too taxing and dangerous, so most surfers get towed into the line-up by boat or wave runner. Because of the power of the surf, most surfers ride guns, but when surf is not going ballistic, shortboards and longboards come into play. Teahupoo is such a powerful, dangerous wave that a board has been designed specifically for this wave—a wave that seems to dry up as it approaches shore, leaving only razor-sharp coral upon which to land. Ouch!

Tahiti isn't just about big wave surfing, although that is its biggest draw. Wherever deep-water channels meet shallow coral reefs, a break forms. Teahupoo offers a number of breaks, both reef and shore breaks, upon which beginners can test their skill. Waves break over the barrier reefs of Tahiti at a consistent three to 15 feet, offering something for everyone. Tahiti's monster surf breaks are primarily left-handers, but other breaks around the island break both left and right.

Monster surf at Teahupoo is pumping between May and October, during the dry season in this tropical Southern Hemisphere location. Ocean swells are driven out of the south during the winter season, but ocean storms of the summer months send swells into Tahiti from the north.

Tahiti is a tropical island paradise with emerald surf, pure white sand, and backdrops of mountains, waterfalls, and lagoons.

It became a world-class surfing destination in the 1960s, and in recent years has become a prime big-wave surfing break. When the surf is up at Teahupoo, surfers around the world drop everything and head to Tahiti's international airport at Faa'a, just 20 miles away from the killer surf of Teahupoo.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	Rain	Rain	Rain	Rain	Dry	Dry	Dry	Dry	Dry	Dry	Rain	Rain
Water Temp (F)	82˚	82˚	82˚	82˚	81˚	81˚	79˚	78˚	77˚	77˚	78˚	79˚
Air Temp (F)	87˚	87˚	87˚	87˚	85˚	84˚	84˚	84˚	83˚	83˚	84˚	85˚
Average Swell (ft)	4	4	5	5	6	6	7	7	6	5	5	4

Trestles

Consistent surf all year long regardless of swell direction, gnarly waves that break both right and left, and surfable breaks even when other surf zones in the area are flat—these three elements combine to make Trestles one of the most reliable and versatile surf spots in the U.S.A.

Ground swells created by Pacific storms roll across the ocean into Trestles. Shallow waters that extend for almost a mile offshore slow down the bottoms of the waves while the tops are forced up and over, generating great surf. Waves usually run between three to six feet high, but occasionally reach eight feet. Shortboards and longboards are the boards of choice, and Trestles calls for full wet suits to keep intermediate and advanced surfers warm in the chilly Pacific temperatures. During the summer months, though, you may find as many as a hundred surfers in the line-up.

There are four distinct breaks at Trestles. Cotton Point, at the north end, is a sweet left-hand break with big waves best when they are rolling out of the south or southwest. Conditions are best at Cotton Point between May and October. Upper Trestles is a right-hander that breaks best at high tide when swells are out of the west or northwest. The optimum time to surf "Uppers" is between November and March. Lower Trestles, at its prime from May to October, is the premier wave at Trestles, breaking both left and right when the swells are coming out of the south and southwest. Church, the final break at Trestles, is just south of "Lowers." It's a year-round break with the best surf at medium-high tide when swells are rolling in from either the north or south.

Trestles has several of the same types of hazards that other surf spots have—high surf, strong currents, a cobblestone surf line, and even sharks—but offers an unusual obstacle as well. San Mateo Creek empties into the sea near Trestles, sometimes closing the beach due to polluted storm run-off. It's not just the sewage run-off that surfers encounter after these storms, though; an occasional rattlesnake washes into the surf and ends up in the line-up as well!

Located just three miles south of San Clemente, about halfway between Los Angeles and San Diego, Trestles gets its name from the two wooden train trestles, built by the Santa Fe Railroad, that pass by the entrances to the beach. Part of San Onofre State Park located to the north, the area's isolated beaches, marshes, estuaries, and creeks are undeveloped, so it's not unusual to see deer, bobcats, coyotes, or mountain lions. Just south of Trestles is Camp Pendleton, the Marine Corps training base. Until 1971, anyone who surfed Trestles (and there were many) risked arrest by marines patrolling the beaches. When public access was granted, San Diego surfer Chuck Hasley commented, "Trestles is the one beachhead the marines could never hold."

With waves for all seasons and all conditions, Trestles may be the perfect wave.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	W	W	Spr	Spr	Spr	S	S	S	F	F	F	W
Water Temp (F)	56˚	57˚	57˚	58˚	60˚	61˚	62˚	62˚	62˚	61˚	59˚	57˚
Air Temp (F)	66˚	66˚	67˚	68˚	71˚	72˚	77˚	79˚	77˚	75˚	73˚	71˚
Average Swell (ft)	6	6	4–5	5	3–4	4	3	3	4	4	5	6

Surfer's Dictionary

Largely adapted from the *Rippin H2O* Web site with the site owner's permission, this dictionary of surf lingo comprises mainly terms that describe surf, surfing maneuvers, people who surf or hang out with surfers, and surfers' expressions of approval or disapproval. Listed under surfboards, readers will also find a rundown of some of the main types of boards. Note that the letter "G" has a tendency to rust off the tails of words used by surfers.

360: A surfing move in which surfer and board spin 360 degrees on the face of the wave

accessory man: Person who gets every piece of surf gear imaginable

ace: To be alone or in a solitary state of mind

acid drop: When the bottom falls out so you free-fall down the face of the wave

action: (1) A dumb or mean act; (2) The motion of water, as in, "Check out the action of that rip"

aerial: A surfing move that involves taking off from the lip of the wave, traveling some distance in the air, then landing back on the face of the wave and continuing the ride

a-frame: A large wave that forms with distinct shoulders on either side (left and right) of the peak; can result in two surfers surfing the same wave, one going frontside and the other going backside

aggro: Aggressive, crazy

air: Surfer and board leave the face of the wave to become airborne

airdrop: A very late takeoff when the surfer drops through the air to the bottom of the wave

akaw!: Something surfers shout when they spot a huge perfect wave, or when they are shocked or surprised

aliham: Totally hot surfer chick

alright dude: (1) A radical wave man; (2) Someone you can trust

all skate: When more than one person shares a wave on a slow day. When the only rideable bump in the past hour comes through, someone shouts, "All skate!"

aloha: A Hawaiian word used in place of hello and goodbye

aloha spirit: The traditional Hawaiian attitude of peace and fellowship

amped: Excited. See **stoked**

ankle snappers: Tiny waves not worth riding; also known as "ankle breakers" (East Coast)

as if!: Ain't gonna happen, not true

ASP: Association of Surfing Professionals, responsible for organizing the annual world professional-surfing circuit leading to the crowning of the world champion

ate it: Fell off the board

awesome: Great, gnarly, cool

axed: Hit by the lip of the wave, leading to a wipeout

babe: A girl who surfs

babanees: Very sexy babes

babelini: Girl

backdoor: Pulling into a tube from behind the peak

backhand: Surfing with your back to the wave

backoff: The change in a wave's shape after it moves from shallow water (like a reef or sandbar) into deeper water closer to shore

backside: Turns or rotations in the direction your toes point towards, so that your back is facing the outside of the waves arc

backside air: Getting up in the air with your back to the wave

backwash: The rush of water coming off the shore against incoming waves

badass: Very good

baggies: Surf trunks about knee-length or a little longer

bail: To jump off your board without regard to its future

bawler: Someone who cries on the beach when they break their board

bammerwee: When something is just okay, not all that good

bangin: Hot, excellent

bangbroek: South African term for being wigged-out or scared over surf conditions

bank: Sandbank on which waves break

barbi: Air-headed female too attentive to her appearance

barnie: (n.) a fight; (v.) to fight

barney: A beginner, someone who doesn't know how to surf. See **kook.**

barnwaller: A barney. Barnwall can also be a verb, as in "That guy is barnwalling down the line"

ba roos: Awesome, sick, as in, "That move was ba roos!"

barrel: The inside of a hollow wave, synonym for **tube**

beach break: Wave that breaks close to the beach

beat down: Worked or rag-dolled by a wave

beach bum: Someone who basically lives at the beach

beach bunny: A chick who hangs out with surfers but doesn't surf

benny: Someone who comes to your beach but isn't a local

betty: A girl who surfs

biffed it: Fell off the board, wiped out

big kahuna: The best dude on the beach (often used sarcastically)

big mamma: Anything big, but especially a wave

bitchen: Cool, awesome, totally sick

biter: (1) Someone who copies ("bites off") someone else does; (2) Anyone who is annoying

black ball: A "no surfing" sign, which sucks because it means the surf is dangerous, which means it's awesome but they won't let you surf it

blah-malah: When you take a board to the face and can't talk right, as in, "The chick was all blah-malah"

blank: Block of foam from which a custom surfboard is made

blasted: Having wiped out

blissed: Too happy to pay attention; when you're about to get cranked by a big wave but don't really care 'cause you're watching that blonde girl who just caught the wave instead

blown out: Adjective used when good surf becomes choppy because of strong winds

bodacious: Extremely awesome

bogged: To have your board stuck on an object

boglius: (BO-glee-us) Cool, awesome; antonym for **bogus**

bogus: Wrong, lame

bomb: A wave larger than others in the set

boner style: A totally stiff style in which the surfer hardly moves on the board

bonus!: Said when someone does something awesome in addition to something normal

booger: A boogie boarder, generally hated by surfers for getting in the road

boogie board: A bodyboard or soft foam board ridden on the belly by those who can't or won't stand up

boss: Cool, awesome

botsford: A short fat **zaboob**

bottom: The lowest rideable point of a wave

bottom turn: A turn at the bottom of the wave face. Taking off on a steep drop at or near the bottom of the wave, it's a must-situation to make the bottom-turn either right or left to establish speed and direction

bowled: Being completely covered by the lip of the wave with only one way out

box: A surfboard fin box

bra or **brah**: Hawaiian pronunciation of **bro**; a brother or a friend; a courtesy title for any surfer, even a chick

brainfreeze: What you feel in the cranium and sinus cavity immediately after the first duck-dive when paddling out in very cold water

breaker: (1) A breaking wave; (2) The wave that breaks your spirit, or anything that breaks your spirit like the last wave you attempt before being washed ignominiously back to shore with your dignity in tatters

bro: A buddy or friend

brodad: Someone you don't really care for

brody: Another word for bro or dude

brosef: Another word for bro or dude

broski: Another word for bro or dude

brudda: Another word for bro or dude

brutal: Hardcore conditions

bummer: A huge let-down

bump: (1) A small swell; (2) When a light wind adds very small waves to the water surface, but the bigger waves are still good, the small waves are called "bump"

bum rap: (1) A false accusation; (2) A punishment that exceeds the crime

buoy: Someone who acts like they surf but really just sits on the board pretending to wait for the perfect wave

cactus: To hit the reef or sandbar so hard that you get scratched up

canvas commando: Person surfing in a canvas raft

carve: To make fluid, symmetrical turns

carving: Moving up and down the face of a wave; powerful, high-energy surfing. See **rippin**

caught in a fish net: Having a bad day, like when you can't seem to stay on the surf

caught inside: Caught on the shore side of a breaking wave, getting tossed around a lot, and having difficulty paddling out

cave: Barrel, tube

cavefish: A pale surfer

channel: (1) A deep-water gap between sandbanks or reefs; (2) A design feature on the underside of some surfboards

chargin: Riding a huge wave with aggressive confidence

cheater five: A stance in which the surfer squats down and extends one foot forward, five toes on the nose, to trim the balance of the board

check it: What surfers say to direct attention to something that is totally radical

cherry: In perfect condition, like new, real nice

chill: Calm down

chillax: To totally calm down. From "chill" plus "relax."

chinese wax job: Wax on the underside of your surfboard, usually from a board being stacked against another waxed board. Makes the board slower and less responsive.

chocka: Cool, awesome, gnarly

chonner: Somebody who totally fakes being a surfer and almost can pull it off, but never goes in the water and probably never will. See **waxboy**

chop: Waves so bumpy from the wind that it's difficult to look out for a good set. Like **bump**, but worse.

chow: Goodbye. From the Italian word *ciao*.

chubbie: A big fat roller, not much of a break

chubby checker: A heavyset male surfer who spends an excellent surf day checking all the best spots, chatting about conditions, and bragging about the cherry longboard strapped permanently to his roof

churley: The mixture of sand and small stones swirled up in the water

and stinging you in the face

clean: Describes glassy, peeling waves

clean-up: A large wave that breaks outside the normal line of the break, catching everybody "inside" and pushing the whole line-up toward the beach

clidro: The process of turning up and down the face of a wave, a technique for gaining and killing speed while traversing the wave face

close-out: A wave that breaks along its entire length simultaneously, usually causing a wipeout

cloud nine: To be on cloud nine is to be hovering on top of the lip

clutch: Crucial, as in, "That wave was clutch." Also used to mean cool and/or desired, as in, "Her board is clutch."

coming down!: What you shout when you are the first one up on the wave and it is yours, shouted just when you start dropping, often shouted as, "Coming down left," or, "Coming down right." Akin to yelling "fore" in golf.

cooha: A gnarly surfer girl

cookin: When the surf is really good

coolaphonic: The coolest of the cool

cowabunga: An exclamation of happy excitement

crackin: Describes powerful, clean, perfect surf

cranked: Beaten up by a wave or waves

crew: Group of surfers, especially the locals who "own" the break

cross-stepping: To walk the length of a board while maintaining balance, usually a longboard maneuver

crucial: So important you'd hate to miss it, as in, "That wave was crucial"

critical section: The hardest and most challenging part of the wave to surf

cruncher: Hard-breaking wave that folds over, almost impossible to ride

crusher: Someone who surfs hard

curl: The top part of a breaking wave where it begins to roll over, taking its name from the shape

cutback: A turn on the face of the wave that takes you back towards whitewater

cuz: Same as brah

da bomb: The greatest

da kine: A Hawaiian term used to describe something as the best

dank: Sweet

dawn patrol: Early morning surfers

dead: No surfable waves

deck: Upper surface of surfboard

delamination: When the fiberglass skin of a board separates from the foam

diddy mow: A totally harsh wipeout that results in losing teeth, breaking arms or legs, etc. A phrase from the American experience in Vietnam, "di di mau" means "go quickly," words often followed by violence, injury, and slaughter.

ding: A dent or hole in the surfboard, exposing the foam

dismount: A polite name for a radical fall

diva: A 40-ish woman surfer

doe: Awesome chick

dogged: Having bailed badly and nearly drowned

doke: Unbelievable, crazy

dole surfer: A poseur who talks like a **soul surfer**

donk: A stupid dude or dudette

donkey: A Hawaiian insult

down the line: Riding a wave along its length, just ahead of the breaking part of a wave (a.k.a., "on the line")

drop: To take off on a breaking wave and ride down the face to the bottom

drop in or **dropping in**: Catching a wave that is already occupied; taking off on the shoulder while someone is taking off deeper. When one surfer takes off on a wave already being ridden by another surfer nearer the peak, it is considered very bad style (a kook move) and often ends in bloodshed

duck dive: Method of getting through a breaking or broken wave by pushing the board underwater and surfacing on the wave's backside

duckets: Money, from "ducats," the international gold coins once beloved by pirates

dude: A guy that is a friend

dudette: A girl that is a friend

dumping: A wave not holding its form, not good surf

dunzo: Totally rad, awesome, best thing ever

durfer: A dumb surfer, origin Kauai

eat foam: To wipe out on a big wave and get caught in foamy water

emma: An ultimate hot surfer chick

epic: Conditions near perfect

eskimo lidders: An offensive term for bodyboarders

face: The unbroken surface of the wave (also known as "green water"), a very rideable area

fade: To carve in the opposite direction of a take-off point, regardless of the waveform

fakey: A bottom turn or carve back toward the curl's whitewater, as in "He went fakey."

falls: Where the top of the wave pitches forward and hurls a waterfall shoreward

fambo: To really like a guy or a girl, as in "in total fambo"

far out!: Surprising; something said a lot in the '70s for reasons no one completely understands today

fat shack: A giant wave that overwhelms a surfer or, as one dude explained, "To get so pitted and spit out and punched through the back, brash"

fat wave: That enormous and sweet ride that comes along maybe once a day

fibro: Surfboard

fierce: Riding a wave hardcore with no fear

fig: Young surfer (boy or girl), used in the late '60s to early '80s regionally in Florida from Ormond Beach to Sebastian Inlet

flail: To lose all control, to freak out

floater: (1) A maneuver that involves launching the board off the lip of

the wave onto a section of broken or breaking wave, unweighting, and free-falling down the face with the breaking whitewater; (2) A surfer waiting for a wave; (3) A person (normally a tourist) who swims or body-surfs in the water and gets in your way while surfing. Also see **speedbump**

flounder: Someone splashing around in the line-up and not catching waves

flushopolis: When the waves are too close together and are all closeouts (large but choppy)

fly-ah: To take a flyer, to go flying over the wave and land head first

foamer: A person riding the foam ball of the wave. Okay for kids, first timers, and old people, but not cool to do if your girlfriend is on the beach watching.

forehand: Surfing with your face to the wave

fo' sho: Naturally!

freakshow: Crowded beach

frogs on toast: Inexperienced or untalented surfers

frontside: To surf down the line while facing the wave

frothing: Excited, stoked, anxious; in Australia, when a surfer's having a good session

gaper: Someone who watches surfers in awe but never gets in the water

gettin covered: In the tube

gettin tubed: When the wave curls over your head so you are surfing inside the wave; in the barrel

gettin wet: Going into the water, paddling out, as in, "Dude, you wanna get wet?"

gettin worked: Caught helplessly in the action of a breaking wave

gidget: A surfer girl who can hang with the crew, derived from a fictional character of the '50s and '60s

gladiator: Male who has more than one strap on his sandals

glassy: Smooth seas resulting from calm wind conditions, giving the surface a sheen

gnarly: (1) Describes heavy, intense, difficult, dangerous waves, usually quite big; (2) Describes anything heavy, intense, difficult, dangerous; (3) According to one sarcastic surfer, "Stuff that proper surfers can do that you can't." Roger Callen writes: "I was the creator of the word gnarly. I was taking metal shop in junior high school at Freemont Junior High in Anaheim about 1975. There is a tool for…the lathe called a gnarl tool, it makes a bumpy surface for grips on handles. I really liked the pattern it made. I was also surfing with my friends a lot from Huntington to San Diego… I started calling choppy waves gnarly, then all my friends started saying 'that was gnarly,' then the word mutated."

goat boater: A kayaker getting in the way

going off: Surf real high, a lot of big waves going off like bombs

goofy foot: A surfer who rides with his or her right foot forward on the board

gnar-gnar: Way sick, awesome

graze 'za: To eat pizza

green room: The space inside a full cover-up tube

gremmy or **gremlin**: A young hanger-on who is troublesome to surfers

grindage: Food, as in "get some grindage"

gription: Having fresh wax on the deck of the board

grom or **grommet**: A young surfer

ground swell: A clean swell with evenly spaced lines, usually from a distant storm

gun: A big-wave board, long and narrow in shape

hacked: Cut off by another surfer

hack shack: A huge wave that hammers you

hammered: When a big wave breaks right on top of you, you get hammered

hang five or **hanging five**: To ride with five toes curled over the nose of the board (more common on longboards)

hang loose: In a clear-minded state of relaxation

hang ten or **hanging ten**: (1) To ride with ten toes over the nose of the board, a very stylish and difficult longboard move; (2) Hanging back ten feet from the shoreline because the waves are really scary

haole: (HOW-lee) A Hawaiian term meaning white person or non-Hawaiian; an outsider. Sometimes used as a neutral descriptor, other times meant as an insult.

haters: People who diss other people

Haydn: The best surfer ever in South Australia; used as a standard of excellence, as in "Oi mate, you surfed like Haydn today"

head dip: Catching the lip with your head as it pitches over

heaving: (1) Large surf conditions; (2) When a wave throws out a thick, heavy lip

hodad or **hodaddy**: A kook, a weasel, a person trying to be a surfer just to pick up chicks. The original hodaddies were car guys who hung out with the scene but weren't surfers.

hogger: Someone who takes all the waves

hotdogger: A great and showy performer on a surfboard

hot dog budget: To safari at the lowest possible cost

hugungus: (hyoo-JUNG-giss) Very, very big

hype out: To eat it due to overenthusiasm

impact zone: The area in which the swell is breaking most heavily and frequently

indicator: A reef, bank, or rock beyond the line-up. Only a big swell or big set will break on this, so it acts as a good indicator of something big approaching

inside: (1) Shoreward of a breaking wave or set, as in "caught inside"; (2) An expression for life in the tube; (3) The rail nearest the wave face

inverted aerial: Airborne and upside-down

jazz the glass: To ride the waves, a vintage term from the '60s

juicy: Adjective for waves with power, speed, and clean faces, as in, "The waves are really juicy today"

judith: A newbie surfer chick who's only there to get the boys

ka-biff: What you say when a good lead-up ends in a bad let-down, as in this scenario: First dude says, "I could sooo carve that smackable." After the first dude totally wipes out, the second dude says, "Ka-biff!"

kahuna: (ka-HOO-na) A Hawaiian term for a skilled surfer

kai: Hawaiian for "ocean"

kamikaze: Rad, awesome, as in "That was a kamikaze wave!"

keg: Barrel

khaki: Faux beach bunny who hopes you'll believe she got her spray-on tan from being outside all the time

kick-out: To make a controlled exit from a wave by riding up the face and over the top

killer: Difficult, challenging, intense, as in, "That was a killer wave"

knarley: See **gnarly**

komizzie surfer: A surfer who heads straight for the other surfers paddling outside

kook: Someone who claims to surf, but really can't. Also used to describe a new or inexperienced surfer. See **waxboy**

kookdom: The philosophy of the surf weasels that just because they exist, they deserve the right to paddle into the line-up

lacerate: Demolish or tear up a wave. See **carve**

lake: No waves

lala: Totally awesome, mad, cool, sweet, rad

landlord: A great white shark

lame: Weak

later!: How surfers say goodbye

launched: Thrown in the air, usually from a wipeout

leash: Urethane cord that attaches the board to the surfer

left!: What you shout when you catch a wave and intend to go to the left, leaving the right for someone else to catch

left-hander: A wave that breaks from the left to right, as viewed from the shore

legend: Excellent surfer over 50, man or woman; amazing, should be remembered

lid: Bodyboard

lidiot: Bodyboarder

lines: A set of waves spotted outside and approaching the line up

line-up: (1) The area just beyond the impact zone where surfers wait to catch waves; (2) The line of surfers in that area

lined-up: Term describing an even, well-developed swell or set

lip: The top edge or crest of the wave, which may "throw out'" to create a tube

lip bash: When the board hits the breaking lip of the wave before continuing along the wave

locals: The group of surfers that have been surfing a particular break almost daily for years and years

loserer: Someone who is double loser-ish

lull: Time between sets, when the waves are much smaller, as in, "Wait for a lull before you paddle out"

macking: Cranking or extremely heavy surf, derived from what it would feel like to get hit by a Mack truck

mad: Sick, cool, rad

mahalo: Thank you

mahi mahi: Chick who hangs with surfers but only sunbathes and combs her hair

mahina: Surfer chick who just likes low, flat waves

maja: A cool surfer mom

major: Big, huge

make wave: To go for a wave and make it, as opposed to getting tossed off your board and pounded

malibu board: Longboard

man in the gray suit: Shark

maytagged: Having been worked by a wave. From Maytag washing machines

maxed-out: When the swell is so big that a break will no longer break cleanly, but instead will close out, or "section"

mega-ripper: Great surfer

men in grey suits: Sharks

menehunes: Teenaged surfers, boys and girls

mint: Perfect

most excellent!: Awesome, usually an exclamation but sometimes an adjective

mushy: Slow and poorly formed surf having little power and barely rideable

nacho: Surfers say this when they mess up

nah, brah: A way of saying no in a more polite manner

naked: Good, as in, "Those waves were naked"

naked deer: A shoobie who wears a speedo while attempting to surf on the most unrighteous waves

natural or **natural foot**: A surfer who surfs with his left foot forward, which is considered the natural stance

nectar: Sweet, juicy waves

nicorico: A girl who gets a surfboard and says she's gonna surf but she never does

nitchen: Totally lame, the opposite of **bitchen**

noahs: Sharks, from Cockney rhyming slang in which "Noah's ark" equals "shark"

noice: Surfer pronunciation of "nice," from the Australian

noodled: Exhausted

nose: The front of the board

nose dive: When the weight on the board is too far forward and the nose dips into the water. See **pearl**

nose-riding: Technique used by longboarders who attempt to ride as close as possible to the nose of the board

notorious: That's crazy, awesome, huge

nutter: (1) A crazy person you should

be careful of getting too close to; (2) A respected surfer who attempts something extreme on a large wave

off the lip: A maneuver in which the surfboard turns abruptly, rides up onto the lip of wave, and then drops down onto the wave face

offshore winds: Blowing from the land out to sea, these winds help to hold up the face of the wave, thereby producing ideal surfing conditions, especially when the wind is light

onshore winds: Winds blowing from the sea onto the land that tend to mess up the face of the wave and produce poor surfing conditions

orbitsville: To launch off the lip and land on the back of the wave. Compare with **aerial**

outside: (1) The area beyond the impact zone; (2) When shouted, "Outside!" means "look out because there is a big set coming"; (3) The rail of the surfboard furthest from the face of the wave

out there: Crazy. Can be good or bad. See **nutter**

over it: Expression used for anything that you don't like, don't want, or don't want to do again, as in, "I'm over this rainy weather."

over the falls: To fall down the face of the wave inside the falling lip

paddlepuss: Someone who stays in the shallows riding the whitewater

party wave: When more than one person takes a wave

peachy: When something goes exactly the way you want it to go. Often said sarcastically to mean the exact opposite

peak: The point at which a wave breaks first, from which it peels in one or both directions.

pearl: When the nose of the board buries itself underwater and the surfer usually goes flying over the front. Originally from "pearl diving."

peel: A wave is said to peel when it breaks away evenly and cleanly from the peak

perf: Perfect

pit: A breaking wave's hollowest part, the bottom point in front of the peak of a wave

pitchpole: When your nose goes under, you go over the nose, the board flips behind you, the wave closes on you, and you become a sandwich

pocket: The steepest and most powerful part of the wave, just ahead and under the breaking lip

point break: A break where the waves are refracted around a headland or point and then peel along the inside of the point

pop-out: A machine-molded surfboard, ideal for beginners

pop-up: On your board, a quick jump up to standing or crouched position

poseur: (pronounced PO-zer) a wannabe

pounded: Getting hit hard by a gnarly wave or waves

pro-bro: A guy who sucks up to the cool guys, in hopes of being seen as one of them

prone-out: Dropping from your feet to your belly to ride the board into the beach

psyche: Just kidding, dude

psyched: Thrilled, excited, stoked, amped

pull a kali: Do something stupid or dorky

pumping: A term used to describe above-average swell

pumping the board: A means of increasing the speed across the face of a wave

pwned: (PONED) Showed up or outridden, as in "You just got pwned!" From a typographical misspelling of "owned."

quantum: Sweet, awesome

quiver: A surfer's collection of boards

rad or **radical**: Awesome, cool, insane, sick

rad man: Surfer who is skilled in many maneuvers

rag-dolled: Smashed by a wave

rail: The side or edge of a surfboard

random stander: Inexperienced surfer

raw: Awesome

reef break: Waves breaking over a projection rising from the seabed, usually a coral reef or rock shelf

re-entry: Maneuver which involves surfing up into the lip of a breaking wave, then coming back down with it

regular: A surfer who surfs with the left foot forward

rhino chaser: Big wave board

richt: (RICKT) awesome. From the Richter scale.

right!: What you shout when you catch a wave and intend to go to the right, leaving the left for someone else to catch

right-hander: A wave that breaks from right to left as viewed from the shore

righteous: (1) Totally awesome (2) honorable

right on! An exclamation of approval

rip: To surf your max

rip or **riptide**: A channel of water running out to sea

rippin: To surf hard and energetically, making excellent maneuvers and totally owning the wave

road block: Someone or something who gets in your way when you are riding a wave

rocker: The curve of a surfboard when viewed side-on

rocket: Hot guy

room: The space inside a large barrel

sacred: Highly esteemed, as in, "That betty is sacred"

salty sister: Girl who surfs

sandbank: An elevation in the level of the sea floor on a beach, causing waves to break over it

sandbox: An old VW van with a bunch of boards on the roof

score: To acquire, gain, or achieve, as in, "I scored some great rides today"

section: When a wave divides into several separate areas with clean faces separated by whitewater

seniors: Old surfers who can still paddle out and catch a ride

set: A group of waves coming in at a

regular pace

shaka or **shocka**: The universal surfer's hand signal where you stick out the thumb and pinky and fold the other three fingers in and usually rock the hand back and forth. It has several meanings, including cool, hang loose, or just hello

shacked: To get caught under a closed-out wave

shanked: After catching a sweet wave, having wiped out right at its peak

sharkbait: The surfer who is the farthest out from the shore

shave it: To shave the top off a wave

shazzam: Term used after pwning a weasel or barney

shifting: To shift the board from side to side

shoobies: Tourists who spoil the waves. Originally from "shoebies," referring to people who come to the beach wearing shoes

shootin the pipe: Getting into, riding, and getting out of a pipe

shommy: Not too good

shore break: Waves breaking very close to shore or right on the beach. More suited for short rides or working on beginner skills

shoulder: The steep part of the wave directly in front of the breaking area

shoulder hopping: Dropping in on someone else's wave (the surfer closest to the break owns the wave)

shred: Execute rapid repeated turns on a shortboard

shut down: Closed out while surfing inside the barrel

sick: Excellent

silver surfer: See **seniors**

sinister: Excellent

slammin: Cool or awesome

smackable: A certain type of wave that makes it possible to smack your board off the lip

snake out: When person backs out of wave at the last minute, making you miss it

snap up: Stand up fast on your board

solid: Decent, as in "that's a solid set"

soul surfer: A talented surfer who scorns competition and commercialization and instead surfs for spiritual fulfillment. Derived from the title of a 1963 instrumental by surf guitarist Johnny Fortune

soup: The whitewater of a broken wave

soup bowl: A wave that has a steep peak with weak shoulders on both sides

speedbump: A kook who blocks your ride

spiffy: Good

spiking: To launch your board into another surfer or their board. Considered a misdemeanor assault, or felony assault with a deadly weapon. See **toenail**

spin cycle: When you get wiped out and thrashed underwater until you don't know which way is up

spinner: Turning 360 degrees on your board while still steering the board straight

spin-out: When the fins of the board break loose from the waters surface

spit: The spray of water coming out of the barrel when the barrel is closing

sponger: Boogie boarder who drops in on the shoulder of an occupied wave

spring suit: Wetsuit with short arms and short legs

squid: A beginner or newcomer

squished raccoons: Waves so small they are practically nonexistent

stall: A maneuver where the board is slowed to allow the curl to catch up with the surfer

steamer: A full wetsuit with long arms and long legs

stellar: Gnarly, rad

stick: Another name for a board

stink bug: Kook stance, legs wide apart, butt up in the air

stink eye: Hard, cold, menacing stare

stringer: The thin piece or pieces of wood running down the center of a board to add strength

stoked: Full of enthusiasm

stuffed: Being driven under the water by a wave coming down on you

sucky: (1) Not cool; (2) A hollow, often heavy wave

sunnies: (1) People who spend all their time tanning; (2) Sunglasses

surf gypsy: A surfer who would rather sleep on the beach than drive home from the coast in the evening

surf nazis: Aggressive surfers who think they own the beach and all the waves

surf rat: Some little grommet who rips every wave

surf swami: Your surf teacher

surf weasel: One who purports to have the Aloha Spirit but practices kookdom without respect for the local community

surfari: Out-of-town surf trip

surfboard: An elongated platform used to ride a breaking wave, originally invented in Hawaii. Some types of surfboards: **egg** (midsized length and rounded contours, a forgiving board for beginners); **fish** (short, wide board with twin fins, designed for smaller waves); **fun board** (midsized board, designed as transition between longboards and shortboards); **gun** (a big-wave board from seven to 12 feet long, narrow, teardrop-shaped with a single fin); **longboard** or **malibu board** (from eight to 14 feet in length, traditionally with a single fin, but modern longboards come in many variations); **mini tanker** (a shortened form of longboard for smaller surfers); **shortboard** (between five and seven feet long, designed for maneuverability)

surfing safari: A road trip expressly for surfing

surfmobile: Vehicle covered in surf stickers, toting surfboards, driven mostly to get to and from the beach

swell: Waves generated far out at sea

switch-foot: A surfer who can surf with either foot forward

tail: The rear end of the board

tailslide: When the surfer lets the board's fins lose their grip on the

wave and the board slides on the face

take-off: The beginning point of the ride when the board is begins to be propelled by the wave

tesani: A carved-out wave

thruster: A three-finned surfboard

tiki style: When you surf the whitewater standing still like statue, the way grommets and beginners normally surf

toenail: Resin on the nose of the board formed into a sharp point to spike surfers or their boards with. Considered a deadly weapon and is now a felony assault with a deadly weapon in most states

toes on the nose: When you stand with your toes on the front of the board, usually on a longboard. See **hang ten**

totally: Absolutely. Used in combination with other words as an intensifier ("I was totally surprised") or alone as a sign of agreement (Question: "Do you like my new surfboard?" Answer: "Totally")

totally, dude! How surfers say yes

tow-ins: Being towed into waves that are too large to paddle into

tribe: A group of lifelong friends who surf together, a stronger group than a crew

trim: The skill of keeping a surfboard at the correct angle to the face to gain maximum speed

trimming: Adjusting weight and position on the board so that the board retains maximum speed

trippy: Weird, strange

truckin: A term used when someone is owning a wave seriously fast

trunkin: Surfing in really cold water without a wetsuit

tube: Barrel, the hollow part of the wave

tubed: Riding inside the wave's hollow pocket

tubular: Awesome. Expresses the exhilaration of surfing the barrel of a wave

tunnel love: Staying in the tube for more than ten seconds

turtle: To roll your board over to go through a wave to get outside, commonly used with longboards

u-boats: Longboards in the hands of those who can't control them

ultimate: Excellent, perfect, the best

unit: Term for disliked people

vaycay: With "total," an awesome vacation, as in, "Dude! This trip's been a total vaycay!"

vee: Convex shape on the bottom of the board

wack: Not good, as in, "That surfer is wack"

wacko: Daredevil when surfing

wahine: Hawaiian word for "girl"

walled off: The situation when an entire wave breaks at once and the surfer has nowhere to go

wannabe: Poseur

wasssssabi: What's up?, in Southern California

waxboy: Someone who sits on the beach with their board and never goes out, but just keeps waxing their board

wax: Material applied to a board's deck for traction

weak sauce: Someone or something lame, in Northern California

weasel: Nonsurfer or bad surfer who tries way too hard to hang with real surfers

whitewater: The foamy part of a breaking wave

whoopsydangit: A big mess-up

wicked: Awesome, rad

windswell: A weak swell generated by local winds

wipe out: When you fall off the surfboard and get pummeled by the wave. The noun form is "wipeout."

wonker: A loser who pulls off cool moves by accident

woody: The station wagon with wooden side paneling made famous by surfers in the '60s

worked: Thrashed by a wave

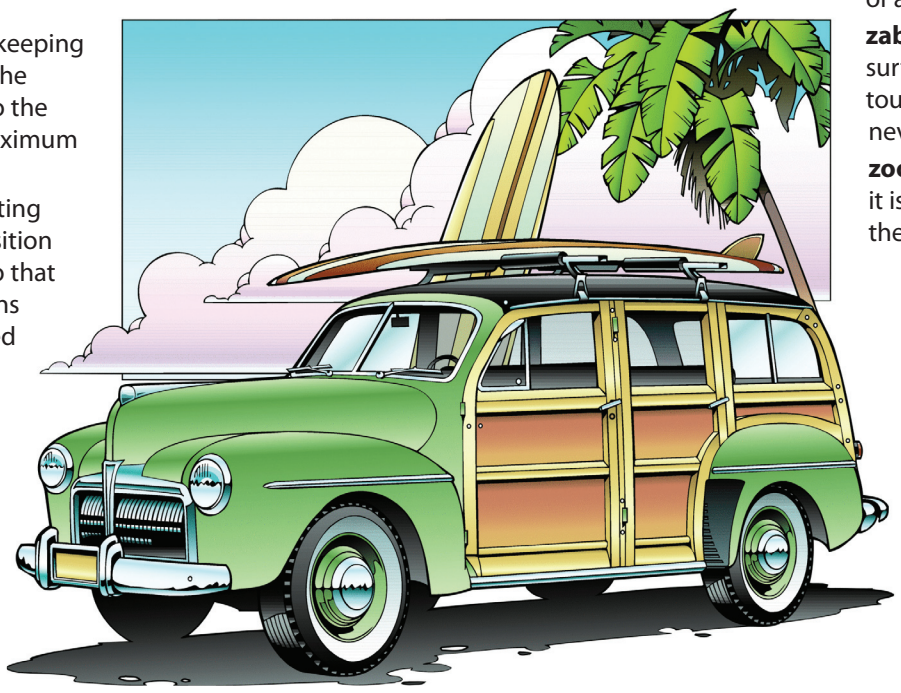
wrecked: Destroyed by a wave

yar: Yes, derived from pirate talk

yo!: How a surfer gains the attention of another person

zaboob: A newbie surfer who either never touches the water or never should

zoo: The beach when it is so crowded that there is no place to surf



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