



Cache Creek Conservancy

Final Grant Report to Water Resource Agency: Watershed Education and Wacky Wilderness Days

The Cache Creek Conservancy (Conservancy) requested funding to purchase a streambed table and 12 stereoscopic microscopes to enhance the existing environmental education and outreach efforts. This request included developing curriculum regarding Cache Creek hydrodynamics and water quality, which also can be used during the Conservancy's popular Wacky Wilderness Days children's summer program.

The Water Resource Agency awarded \$11,000 to the Conservancy and the Conservancy added another \$5,000. In addition to paying for staff time to write curriculum and run the Wacky Wilderness Days program, the Conservancy was able to purchase 4 new stereo microscopes, and 4 new compound microscopes (that are battery driven), a new streambed table, Wacky Wilderness Days T-shirts for participants, supplies for the Wacky Wilderness Days, and supporting supplies for the new curriculum.

In the original grant the Conservancy proposed 6 monocular and 6 dissecting microscopes for a total of \$3,228. After talking with various suppliers, it became clear that to achieve the desired durability and usability, we needed to rethink our original plan. In talking with I. Miller Percision Optical Instruments, the Conservancy determined that purchasing fewer but superior microscopes better fit the goals and needs of the program. The microscopes have rechargeable batteries, greater range of magnification, and are better in the field. They also are more "student friendly," providing an enhanced learning experience with smaller groups and more teacher-student interaction. The change in microscope order was cleared with the grantor before purchase and the Conservancy stayed within budget. The Conservancy partnered with Woodland Joint Unified School District (WJUSD) for a new summer school program for K-6th grade students. During the sessions for 4th, 5th, and 6th grade students we were able to incorporate the plankton lessons and the stream table. In addition to WJUSD we also had groups from Woodland Recreation Foundation and the Auburn Rancheria that were able to use some of the new curriculum and equipment.

The streambed table was purchased from Nasco Modesto. It was custom made by American Educational Products in Colorado. Ordering this model also was within budget. The table sits on a portable cart that can be moved to different teaching locations.

Wacky Wilderness Days was held on six Wednesday's during July and August. This series of free, interactive programs introduces students of all ages to the wonders of the natural environment around them. The Conservancy purchased T-shirts that included the WRA logo and supplies needed for the WWD activities that allowed all participants to take something home on several of the days.

Deliverables:

- **Flyer.** A flyer for Wacky Wilderness Days was developed and given to visiting school groups and other visitors during the spring. Wacky Wilderness Days T-shirts were printed and given to WWD participants. The Conservancy sent out the flyer to its email distribution list. An estimated 2,500 contacts received the flyer through email or by picking it up. A copy of the flyer is attached to this report. The WRA is listed as a sponsor of the program on the flyer.
- **Publicity.** In addition to the flyer, the Woodland Daily Democrat ran stories in June about the program. The Conservancy posted information on its website and ran several Facebook posts. The posts reached an

average of 451 people per post including several shares. In all advertisement, the WRA was thanked and acknowledged for funding the program.

- **Curriculum:** Below is a brief description of each new lesson. (Complete lessons are attached.)
 - **Microscope Instructions:** This activity introduces students to the use of both dissecting microscopes and the more complicated stereoscopic compound microscope handling and use. Students will learn the basic microscope parts and how to properly use each part for the best specimen observation.
 - **Plentiful Plankton:** This activity introduces students to the concept of plankton (microscopic floating life in water). Students learn sampling techniques and observe plankton under a microscope.
 - **Plankton Model:** Students build a plankton model that has to meet specified criteria (neutral buoyance of how plankton are suspended in the sunlit region in water).
 - **Secchi Disk:** This lesson is designed to work in conjunction with Plentiful Plankton. Students learn to use a Secchi Disk to determine depth of sunlight penetration in wetlands water.
 - **Stream Table:** Students will explore stream morphology by watching and manipulating water flow through sand to observe geological processes to show and experience how these processes work.
 - **Wetlands:** Students explore what wetlands are and how they work. Students using scientific methods learn about wetland hydrology.

Performance Metrics

Three performance metrics were used to evaluate the success of the program: attendance, pre-and –post surveys, and social media data.

Attendance:

The Conservancy held 6 Wacky Wilderness Days which had the following attendance: Summer Kick Off – 38, Rock-n-Roll – 60, Bugs in the Creek – 67, Nature through the Arts – 39, Wonders of Water – 30, Fun and Games – 60. The Wonders of Water activity was our second water related activity and we rolled out the new stream table. In addition to the Wacky Wilderness Days we had 30 students from the Woodland Recreation Teen program, 109 students from the WJUSD summer school program and 25 students from Auburn Rancheria, all of which used new curriculum, microscopes, and the stream table.

Surveys:

The Conservancy designed this year's WWD activities from surveys that were filled out by participants from the 2015 program. The post-surveys were informal, feedback was positive, and indicated that at each session children had learned something new. Observationally, at each session children and parents appeared fully engaged in the activity by actively participating in the activity. After several of the sessions, many of the participants stayed beyond the two hours to explore the Nature Preserve and enjoy a picnic lunch with their family.

Social Media Data:

The Conservancy posted the Wacky Wilderness Days on its Facebook page. After the initial post there were many follow up posts with pictures and video to show the upcoming activity or results from the activity. The average reach per Facebook post was 451 people, the average likes per Instagram post was 8.

Conclusion

The Cache Creek Conservancy considers the Wacky Wilderness Days successful; the program engaged children and helped them learn about and explore the natural environment. Furthermore, the Conservancy used the new lessons and equipment during a Woodland Joint Unified School District Summer School program. Additionally, the lessons

and the newly purchased equipment were successfully used during visits from the Auburn Rancheria and with the Woodland Recreation Foundation's summer program for pre-teens and young teenagers. In addition to the specific grant-related activities conducted to date, Conservancy staff are incorporating plankton and stream table activities into program offerings for school visits during the 2016-2017 school year. These modules support newly-adopted earth/space science and life science standards now being implemented in the districts we serve.

Attachments:

Final Budget

Curriculum

Flyer

Examples of Publicity

Photo essay

Microscopes

(30 Minutes)

Background:

There are many types of microscopes. For lower magnification of macroscopic materials typically a dissecting microscope is used. When the specimens are microscopic, typically a compound microscope is used for viewing. Specimens that are too small to be viewed with a compound microscope are viewed with electron or neutron microscopes. For examination at this level, the dissecting scope has magnification levels of 10X and 20X which is sufficient to view macroinvertebrates. The compound microscopes has more magnification levels. Magnifications of 10X, 40X, 100X and 400X are useful in examining microscopic material.

Objectives:

Students will:

- learn the two types of microscopes.
- know the names of the basic microscope parts.
- demonstrate proper use of both microscopes to view specimens.
- be able to make a wet mount slide.

Materials and Setup:

- dissecting microscopes
- compound microscopes
- microscope slides and cover slips
- specimens for observation

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Course focus adjustment – the larger of the two focus knobs that is used during focusing on larger specimens with the lower magnification lenses. Never used with the 40X objective.

Eye pieces – Lenses that a viewer looks through. They typically have a 10X magnification and are adjustable to the width of the viewers eyes.

Field of View – the circle of light the viewer sees looking into the microscope.

Fine focus adjustment – the smaller of the two focus knobs. This focus is used to obtain finer resolution at any power and is the only focus knob to be used with the 40X objective.

Objective lenses – lenses on the nosepiece of various magnification 1X, 2X, 4X, 10X, 40X.

Revolving nosepiece – the part of the microscope that has the objective lenses.

Stage – the base on which the slide with the specimen is placed.

Stage clips – to be used to hold the microscope slides firmly to the stage.

Total magnification – The multiplied magnification of the eyepiece lens times the objective lens magnification.

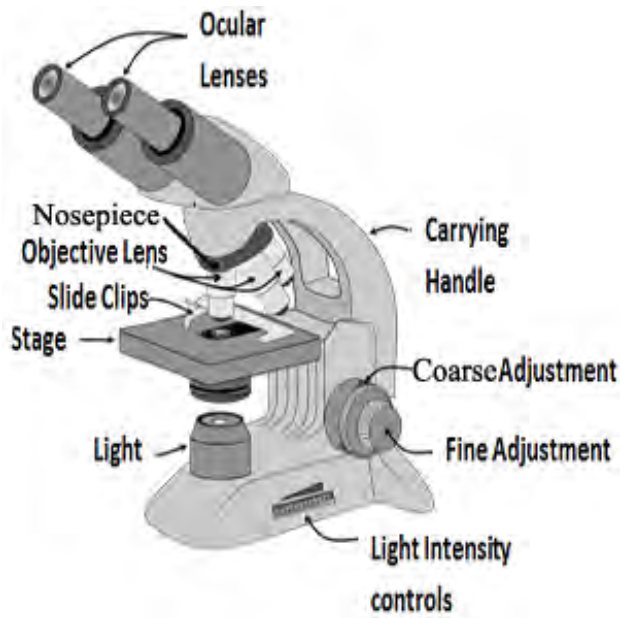
Instructions:

Explain the activity to the students and demonstrate what is expected of them during the activity without actually doing the activity. The students will be looking at two or three different specimens to learn the basic of microscopy. The first specimen will be a wet mount slide of a small letter “e” from newsprint. Put your sample on a microscope **slide**, which is a glass rectangle that holds your sample. The sample will be mounted on the slide with a drop of water and covered by a coverslip. The slide fits on the stage of the microscope and is held down by clips. A light will shine up through the image. When you look through the top of the microscope, you can see a magnified image of your sample. This lesson focuses on compound light microscopes, which pass light through different lenses. The part of the microscope you look through is called the ocular lens in the eyepiece. Inside this lens is a high-powered magnifying glass. The image you see looking through the ocular lens is magnified 10 times its normal size. You'll find other lenses on your microscope called objective lenses. By using the nosepiece, you can switch between these lenses. Your microscope could have anywhere from one to five of these lenses. A microscope is called a **compound microscope** if it has many objective lenses. The objective lenses magnify your sample even more. Your sample will be less magnified by a shorter objective lens. The longer the objective lens, the more you magnify your sample.

Start by looking at the “e” with the 1X objective. The student should focus on the letter with the coarse focus adjustment. The student should notice that the letter is upside down and reversed left and right. This means that the student needs to move the slide around in just the opposite of what they would do with their naked eye looking at the specimen on the stage. This is an extremely important concept in finding small specimens while looking through the microscope. The students should move the “e” to the very center of the field of view for switching to a higher power objective. Now, have the students switch to the 10X objective that has a total magnification of 100X by turning the revolving nosepiece so that the 10X lens clicks into place above the specimen. Students should notice that they see less of the letter but in greater detail due to magnification. Again, have the students center the letter and switch to the 40X objective as they did in the step before. Now, they should only use the fine focus adjustment to bring the specimen into better focus. The whole letter will no longer be seen, but the part they see should be in great detail.

The dissecting scope is much easier to use. This time they do not need to make a wet mount slide. The specimen they will use is a feather. Have them center the feather in the field of view and look at it under both 10X and 20X and describe the difference in detail. Time permitting, have the students take a small piece of the feather and make a slide to view under the compound microscope at both 100X and 400X.

Parts of a microscope:



Conclusion:

It is very important to know the parts of the two types of microscopes and how each microscope is best used to look at a variety of specimens. For larger sized specimens the dissecting scope is a first choice. It is especially useful in the field to look at macroscopic live specimens in greater detail for identification purposes and for looking at larger specimen structures. When it comes to observing microscopic specimens such as plankton the compound microscope is preferable. For finding and following a moving specimen under the microscope, it is imperative for the observer to be able to move the slide around knowing that everything is upside down and reversed. This concept and action takes practice.

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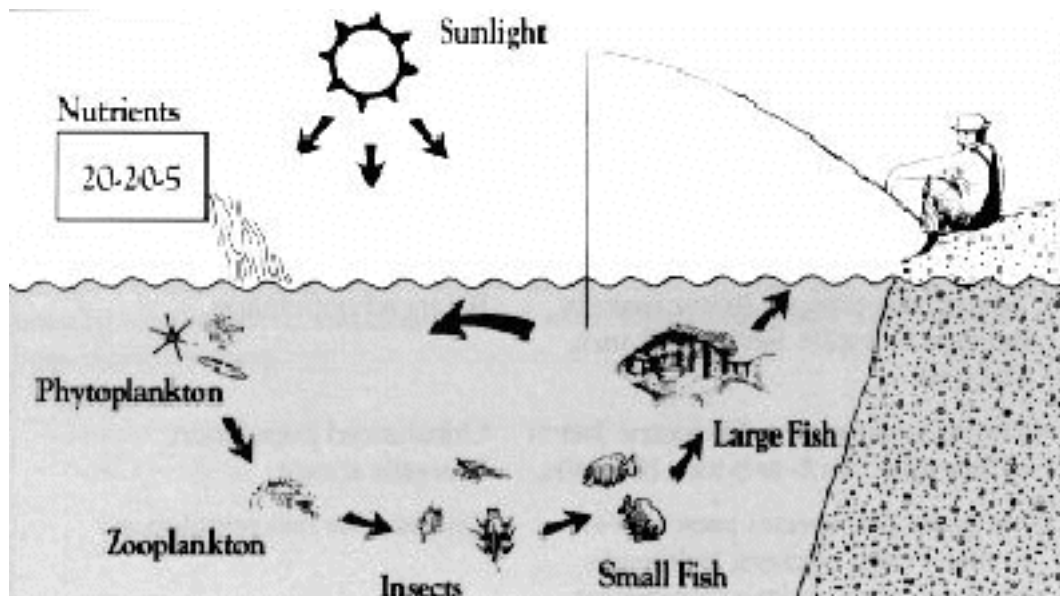
Plankton Model

(30 Minutes)

Background:

Plankton are living organisms that cannot swim against a current. These plants and animals are adapted to life in the water column. They have unique features that allow them to make or hunt for food. This food is then transformed into energy that is used to fuel all life processes. Phytoplankton live in the upper region of the water column; they are dependent on sunlight for survival. Most of the zooplankton live in this same region as they are dependent on the phytoplankton for food energy. There are two types of plankton. The plant-like organisms have no means of locomotion and have a green color due to chloroplasts; these organisms are called phytoplankton. Phytoplankton are photosynthetic and consequently are the basis of any aquatic ecosystem because they can produce food/sugar from carbon dioxide, water, and sunlight. This makes phytoplankton the producers in any aquatic environment. The second type of plankton are the zooplankton. Zooplankton are the consumers, both primary and secondary. Most zooplankton live in the same upper region of the water column as the phytoplankton. It is critical that plankton stay in this sunlit region. Hence, plankton have evolved many adaptations for maintaining as neutral buoyancy as possible. Plankton do not want to be on the surface nor do they want to sink beyond the sunlit region for extended periods of time or they will die.

FOOD CHAIN



FOOD WEB

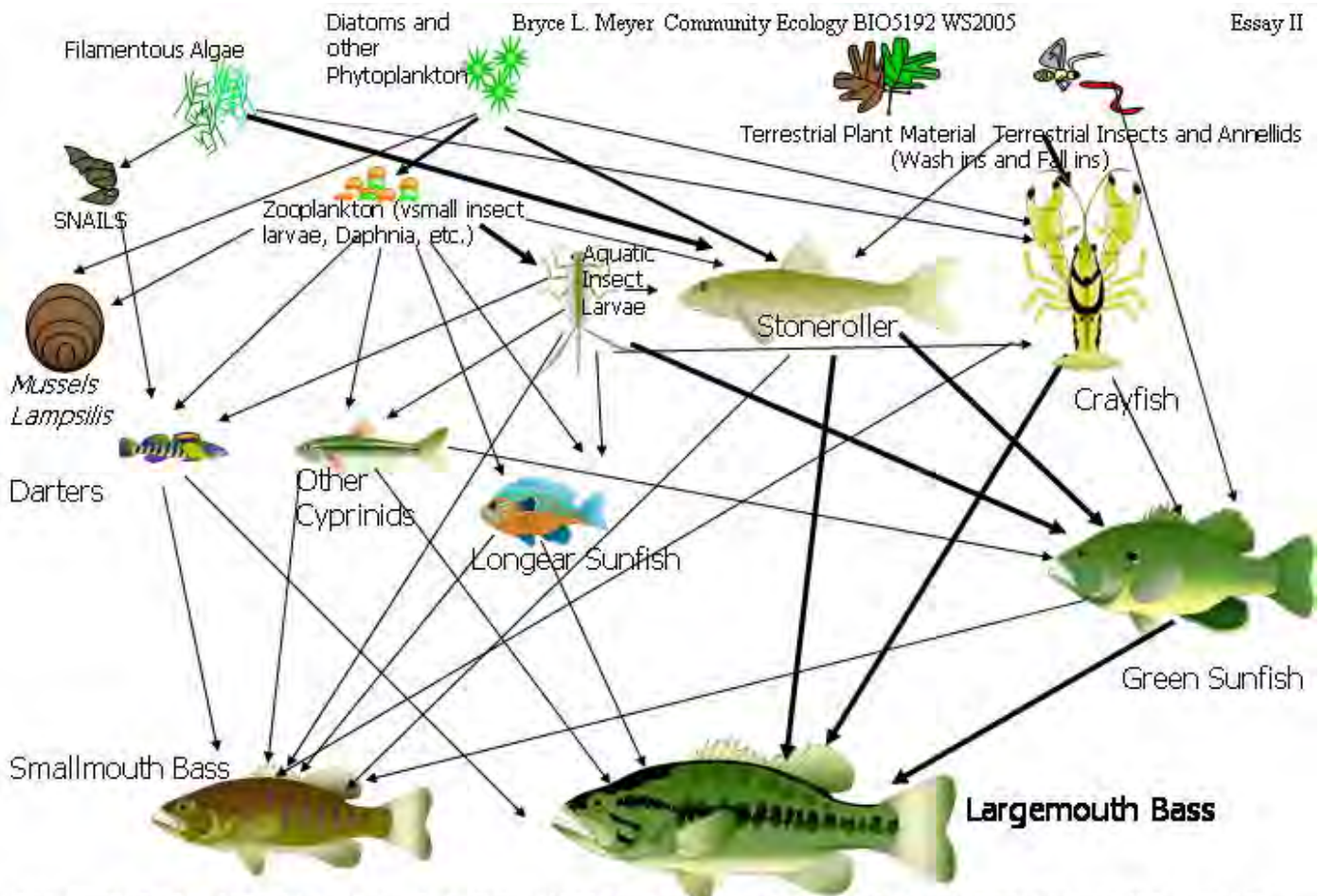


Figure #22: Simplified Food Web (Source Down) similar to Ozark Cool Water Low order Stream (or stream in heavy agriculture) example Dry Fork, Current Pre-Montauk: Spring, etc. Largemouth is dominant top fish predator, though most common fish is the Stoneroller. Filamentous algae and Detritus are base nutrients. Darters, Suckers, other Minnows are in lower concentrations. Green Sunfish is most common sunfish. Terrestrial Birds (Ospreys, Herons), Mammals (Humans, Otters, Raccoons, Minks), and Reptiles (Turtles and Water Snakes) feed at all levels. p. 27

Objectives:

Students will:

- understand the meaning of plankton
- know the role of plankton in a freshwater ecosystem
- understand the concept of what it takes to float
- construct a model plankton
- test their model for correct buoyancy

Materials and Setup:

A table and all required materials should be present when you arrive at your teaching location. Please familiarize yourself with the following items:

Aluminum foil
Balsa sticks
Coffee stirrers
Cork
Feathers
Fishing weights
Paper clips
Straws

Toothpicks
Small nails
String
Styrofoam “peanuts”
Scissors
Timer
Waterproof clay
Yarn

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Buoyancy -- the ability of an object to float in a liquid, such as water.

Buoyant force -- it is the volume of fluid displaced by the surface area of the immersed body

Negatively buoyant – When an object that sinks to the bottom.

Neutrally buoyant -- When an object that hovers at the same level in the water.

Phytoplankton – Plant-like plankton, usually green, and are photosynthetic

Plankton – microorganisms that are unable to swim against a current

Positively buoyant – When an object floats in the water.

Surface area to volume ratio (SA:V) – to float, an organism must have a large surface area per unit volume.

Zooplankton – Animal-like plankton, usually show some structures for locomotion

Instructions:

In this activity students will design and build a model plankton.

- Organize students into teams of 2, 3 or 4, depending on group size.
- Have the teams brainstorm some of the adaptations used by plankton to keep them near the water's surface. A good way to do this is to have the students look at pictures of actual plankton and have them observe any structures that they have evolved for maintaining close to a neutral buoyancy.
- Have the students draw the prospected plankton

- Have the teams build the plankton model with the provided materials
- Test the plankton model in a bucket of water. The plankton model cannot float on the surface, the model must float, but just below the surface.
- Teams will record the sinking time the sinking time for each trial. They are striving for the slowest time. If the plankton sinks too fast or floats on the surface, they need to adjust their creations and retest. Have the students add to or subtract from the original picture as they make changes.
- Once the teams are satisfied with their creations there should be a contest between the teams for the slowest sinking plankton.

Conclusion:

Discuss the adaptations that students used and their results. What were the adaptations that helped slow down the sinking rate? Why do you think this change worked? How were the slower sinking plankton different from the faster sinkers or floaters? What improvements could be made to the plankton models? Compare the plankton models to the real plankton.

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Plentiful Plankton

(30 Minutes)

Background:

This activity introduces students to the concept of plankton. The Greek word plankton means wanderer. Plankton are typically microscopic or very small macroscopic organisms floating near the surface of the water. There are two types of plankton. The plant-like organisms have no means of locomotion and have a green color due to chloroplasts; these organisms are called phytoplankton. Phytoplankton are photosynthetic and consequently are the basis of any aquatic ecosystem because they can produce food/sugar from carbon dioxide, water, and sunlight. This makes phytoplankton the producers in any aquatic environment. The second type of plankton are the zooplankton. Zooplankton are the consumers, both primary and secondary. Most zooplankton live in the same upper region of the water column as the phytoplankton. However, some zooplankton occupy a niche near the bottom of ponds and lakes. These decomposers recycle the organic matter that falls to the bottom. Like larger animals, zooplankton have structures for locomotion and are capable of moving about to look for food or escape danger. However, both types are typically unicellular and cannot control where they move when subjected to currents or other forces that cause the surface of the water to move. There are other plankton that are colonial and others that are multicellular plants or animals. Still, they have very little control over stronger environmental forces that move the water. This activity allows students an opportunity to collect plankton from the CCNP wetlands pond and to investigate common plankton under the microscope.

Phytoplankton live in the upper region of the water column; they are dependent on sunlight for survival. Most of the zooplankton live in this same region as they are dependent on the phytoplankton for food energy. The first part of the activity has to do with sampling and collection techniques. The second part of the lesson focuses on collection from the sampling net. In the third part of the activity students observe the captured plankton under a microscope.

The focus is on identifying the two different types of plankton; the phytoplankton (plant-like) and zooplankton (animal-like and animals) should be observed. By observing some main differences between the two, they will gain an understanding diversity within an aquatic ecosystem. Time permitting and if age appropriate, during this section focus can be on diversity as well as identification of common planktonic organisms. An extension for secondary students involves data collection, sampling techniques, microscopy, species identification as well as population diversity and density. Health of the wetlands should be emphasized in the lesson as plankton are the basis of life in the wetland ecosystem. However, in the short time most students have for the lesson, the emphasis will be on collection and observation of the samples.

Example of an aquatic food chain:

Algae (Phytoplankton) → Daphnia (Zooplankton) → Mosquito Fish (Small fish) → Blue Gill (Larger fish) → Blue Heron (Bird)

Objectives:

Students will:

- understand the meaning of plankton
- know the role of plankton in a freshwater ecosystem
- demonstrate how to use a plankton net to collect samples

- identify that plankton live near the top of the water column
- use a microscope to observe plankton

Materials and Setup:

A table and all required materials should be present when you arrive at your teaching location. Please familiarize yourself with the following items:

Compound microscopes	Petri dishes
Dissecting microscopes	Pipettes
Identification charts	Plankton nets
Microscope slides and coverslips	Transfer vials

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Aquatic – freshwater environment

Cilia – hair-like structures on the surface of a cell for locomotion

Ecosystem -- a community of interacting organisms and their physical environment

Flagella – whip-like structure protruding from a cell that provides locomotion

Food chain – simple sequence from Producer to Primary Consumer to Secondary Consumer

Food web – complex interaction between Producers and Consumers

Multicellular – organism made of many cell types

Phytoplankton – Plant-like plankton, usually green, and are photosynthetic

Plankton – microorganisms that are unable to swim against a current

Primary Consumer – animals that eat plants for energy

Producer – photosynthetic organism, they capture sunlight, H₂O, and CO₂, to make sugar and O₂

Secondary Consumer – animals that eat other animals for energy

Unicellular – organism of only one cell

Zooplankton – Animal-like plankton, usually show some structures for locomotion

Instructions:

Explain the activity and demonstrate what is expected of the students. The students are going to participate in a number of activities during this lesson. Explain that a number of factors determine the health of a wetland. Water clarity, water temperature, water chemistry, and pollution level affect the creatures that are able to live in the wetlands. There is a complex interaction between all the creatures and the physical environment, the water. Discuss the basic food chain from the illustration above. Let the students know that they are going to sample and look at the basic organisms in the chain, the plankton. At this point the students need to know the difference between phytoplankton and zooplankton.

Show the students the equipment they will be using in the activity. They need to know that all of the materials in this activity are expensive and that they need to be very careful when using the equipment. Tell the students that first they will be collecting samples down in the water using the plankton throw net and that they will collect samples from the net. Then, they will bring the samples back to put under microscopes to see what was found.

- Take the students down to the edge of the wetlands.
- Demonstrate how to throw the plankton net. Students need to work in pairs. One student will hold on tight to the end of the rope, the other student will toss the plankton net as far into the water as they can. Then, both students will slowly retrieve the net.
- Collect samples from the container at the end of the net and put into vials. Take the vials back to the microscope tables.
- Use a pipette to take samples from the vials and make microscope slides. These slide will be used with the compound microscopes.
- Use a pipette to take samples from the vials and put into petri dishes to be observed with the dissecting scopes.

Note: In advance half of the microscope will be set up with water samples that have been put on prepared slides that have the microorganisms slowed down so they do not constantly leave the field of view. The other half will be freshly prepared for student observation.

Microscope Instructions:

Students need to have some instructions about use of the microscopes. (The microscopes will be set up in the proper places with the magnification preset before students arrive.)

The compound microscopes have eyepieces which can be moved in a circle around the top of the scope so that the bottom of the scope never needs to be moved for another person to look through the eyepieces. Do not move the microscope from where it is positioned. The objective lens is preset to the proper magnification. Only the instructor should ever change the setting. The slide should be placed on the stage and placed under the stage clips for security. Once the microscope has been focused using the large knob (Coarse adjustment) you or the student can move the slide around on the stage to try and find plankton to observe. For observation with the compound microscope the light should come from the bottom light source. The Light Source Selector Switch is on the back of the scope behind the adjustment knobs. You need to adjust the light intensity using the ON/OFF Light Intensity Control Switch on the side near the support legs. ***Make sure that the lights are turned off at the end of each session. Students should never touch the light switches.*** (If you don't tell them about the light they probably won't touch them.)

The dissecting scopes have been preset to the highest magnification (30X). Students should not attempt to change the magnification. A petri dish should be placed on the platform. A sample of the plankton should be taken from one of the vials with a pipette and put into the petri dish for observation. If there needs to be additional illumination other than sunlight use the Right Brightness Adjustment dial. Bring the specimens into focus using the adjustment knobs on either side of the scope.

The students can rotate through the microscope stations to see what they can see under each microscope. Each student should try to identify an example of a phytoplankton and a zooplankton. They don't

necessarily have to identify any to species. If time permits, and it is age appropriate, have the students observe and identify specific organisms.

Conclusion:

Review what was completed during the activity. We want students to understand the importance of plankton. Even though they are very small, plankton are one of the most important factors in determining the health of a body of water. Review plankton's role in the ecosystem by reviewing where plankton are in any freshwater food web. Ask the students how they feel about the health of the CCNP wetlands based on what they found.

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The Secchi Disk
(30 Minutes)**Background:**

A number of factors determine the health of a wetland. Water clarity, water temperature, water chemistry, and pollution level affect the creatures that are able to live in the wetlands. There is a complex interaction between all the creatures and the physical environment, the water. Phytoplankton live in the upper region of the water column; they are dependent on sunlight for survival. Most of the zooplankton live in this same region as they are dependent on the phytoplankton for food energy. The Greek word plankton means wanderer. Plankton are typically microscopic or very small macroscopic organisms floating near the surface of the water. There are two types of plankton. The plant-like organisms have no means of locomotion and have a green color due to chloroplasts; these organisms are called phytoplankton. Phytoplankton are photosynthetic and consequently are the basis of any aquatic ecosystem because they can produce food/sugar from carbon dioxide, water, and sunlight. This makes phytoplankton the producers in any aquatic environment. The second type of plankton are the zooplankton. Zooplankton are the consumers, both primary and secondary. Most zooplankton live in the same upper region of the water column as the phytoplankton.

This activity is to determine the depth of sunlight penetration in the water to know where these planktonic creatures are concentrated. Secchi disk depth is the simplest and one of the most effective tools for estimating a ponds productivity. The Secchi depth is a measurement of water clarity. Water transparency directly affects the amount of light penetration into a pond. Algae and suspended particles from erosion make the water cloudy and decrease the Secchi transparency. The lower the Secchi depth, the higher the algal concentration and pond productivity. For our purposes, the Secchi disk will be used to determine the depth to which sunlight penetrates the water. When the disk is no longer visible we have measured the depth to which most of the sunlight penetrates the water. This then is the zone where most of the planktonic organisms live and thus is the area we want to sample a later time.

Objectives:**Students will:**

- understand the meaning of plankton
- know the role of plankton in a freshwater ecosystem
- demonstrate how to use a Secchi disk
- identify that plankton live near the top of the water column

Materials and Setup:

A table and all required materials should be present when you arrive at your teaching location. Please familiarize yourself with the following items:

- Secchi disk
- Clipboard and paper

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Aquatic – freshwater environment

Ecosystem -- a community of interacting organisms and their physical environment

Secchi disk – an 8" disk with black and white quadrants attached to a rope marked off in 1 foot and ½ foot intervals

Plankton – microorganisms that are unable to swim against a current

Phytoplankton – Plant-like plankton, usually green, and are photosynthetic

Zooplankton – Animal-like plankton, usually show some structures for locomotion

Instructions:

There are some guidelines for taking Secchi disk readings that need to be followed.

- Determine a monitoring site. The monitoring should be when the Sun is high in the sky. The best time is between 10:00 AM and 3:00 PM. The site should be in the shadiest area. Monitoring is most accurate on bright calm days. To be consistent, either wear sunglasses or not for the readings. The best place for monitoring the Clarity of the CCNP wetlands pond is from the Boardwalk. A site will be marked on the end of the Boardwalk.
- Students will use the Secchi disk to determine the depth to which sunlight penetrates the water. The Secchi disk measures water clarity, but for our purposes we will say when the disk is no longer visible we have measured the depth to which most of the sunlight penetrates the water. This then is the zone where most of the planktonic organisms live and thus is the depth range we want to sample later with a plankton net.
- How to use the Secchi disk
 - Slowly lower the disk off of the shady side of the boardwalk until it disappears from view. The cord is measured in 1 foot and ½ foot intervals.
 - Have the students make the determination and count the lines on the cord measuring the depth. Record that depth.
 - Lower the disk a little further until it is out of sight; then start slowly bringing the disk up. When it comes into view again, record the depth by counting the lines on the cord.
 - Average the two depth numbers. That number is the depth to which sunlight penetrates.
 - As time permits let the students lower and raise the Secchi disk to obtain depth readings.

Conclusion:

The CCNP wetlands pond can vary in water transparency seasonally, so it is important to take numerous Secchi depth readings over the year. Once a month measuring for May to September is the minimum, every two weeks would be better. If Secchi depth is measured in The CCNP pond for numerous consecutive years, the data can be analyzed for water quality trends. If a significant trend indicates increasing Secchi depth over time, the water quality is improving. If a significant trend indicates decreasing Secchi depth over time, the water quality is declining.

Stream Geomorphology

(30 Minutes)

Background:

Every stream is the product of water being pulled downhill by gravity over a particular landscape. Raindrops that fall on high points of land course down the slope and join other drops of water, forming a small creek that continues to flow downward. A creek eventually joins other creeks, creating a stream. Streams join other streams to form a river, and so on down the slope until the waters collect in the lowest valley. Eventually, this collected water flows out its “mouth” into the ocean. At every step in this process, water evaporates back into rain clouds, powering a continuous water cycle.

The creeks and streams that form at high elevations comprise the *headwaters* of a watershed. They come together to create tributaries, which flow into the larger river at the lowest elevation in the watershed. The stream table represents just one slice of a watershed and one section of a creek, stream, or river; it does not include any tributaries flowing into the main stream on the table.

Objectives:**Students will:**

- understand how streams move over time within a particular area
- watch a stream form meanders as they flow through valleys
- describe how streams follow patterns
- watch how streams deposit sediments as they flow
- demonstrate how streams respond to human impacts such as culverts, straightening, changing floodplains, or removing gravel

Materials and Setup:

A table and all required materials should be present when you arrive at your teaching location. Please familiarize yourself with the following items:

-

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Alluvial = the sediment material deposited by a river.

Corridor = the total area in which a stream flows.

Culvert = a drainage pipe under a roadway

Cut bank = forms along the outer bend in a stream because the water flows fastest in that region.

Floodplain = the area that is subject to flooding

Headwaters = the beginning of a stream

Meander = a bend in a creek.

Mouth = the end of a stream or river. Could be the beginning of a river if moving upstream.

Point bar = the point of land on the inner flow of a creek bend.

Riparian = habitat area associated with a river.

Tributary = a smaller creek flowing into a larger creek or river.

Watershed = the total land area drained by a river and its tributaries.

Instructions:

There are some guidelines for taking Secchi disk readings that need to be followed.

- Determine a monitoring site. The monitoring should be when the Sun is high in the sky. The best time is between 10:00 AM and 3:00 PM. The site should be in the shadiest area. Monitoring is most accurate on bright calm days. To be consistent, either wear sunglasses or not for the readings. The best place for monitoring the Clarity of the CCNP wetlands pond is from the Boardwalk. A site will be marked on the end of the Boardwalk.
- Students will use the Secchi disk to determine the depth to which sunlight penetrates the water. The Secchi disk measures water clarity, but for our purposes we will say when the disk is no longer visible we have measured the depth to which most of the sunlight penetrates the water. This then is the zone where most of the planktonic organisms live and thus is the depth range we want to sample later with a plankton net.
- How to use the Secchi disk
 - Slowly lower the disk off of the shady side of the boardwalk until it disappears from view. The cord is measured in 1 foot and ½ foot intervals.
 - Have the students make the determination and count the lines on the cord measuring the depth. Record that depth.
 - Lower the disk a little further until it is out of sight; then start slowly bringing the disk up. When it comes into view again, record the depth by counting the lines on the cord.
 - Average the two depth numbers. That number is the depth to which sunlight penetrates.
 - As time permits let the students lower and raise the Secchi disk to obtain depth readings.

Conclusion:

The CCNP wetlands pond can vary in water transparency seasonally, so it is important to take numerous Secchi depth readings over the year. Once a month measuring for May to September is the minimum, every two weeks would be better. If Secchi depth is measured in The CCNP pond for numerous consecutive years, the data can be analyzed for water quality trends. If a significant trend indicates increasing Secchi depth over time, the water quality is improving. If a significant trend indicates decreasing Secchi depth over time, the water quality is declining.

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Wetlands

(30 Minutes)

Background:

There are many different ways of defining a wetland. Many have evolved as scientists learn more about these unique ecosystems. Different scientific fields may define wetlands differently. Government agencies may also have a different definition. For the purpose of today's lesson, we will define wetlands as a "half-way world between terrestrial and aquatic ecosystems that exhibit some characteristics of each.

A wetland must have standing water for at least part of the year. The source may be from groundwater or from surface water. The soil must be of a type that can hold water. Soils that have a high clay content or have low permeability are typical of most wetlands. Furthermore, a wetland must have the right kind of biotic varieties living in the vicinity of the defined wetland. There are many types of plants that define a wetland area and grow if the water levels are correct.

One important aspect of wetlands is how they act as filter for the water that comes in. As water comes into the wetland and moves through the soil and roots of plants many of the particles suspended in the water are filtered out as water moves through the system. The water is much cleaner when it leaves than when it arrived.

Today, only about 7% of the natural wetlands still exist. Many of the historic wetlands have been converted to agriculture or urban development. Thus, rather than areas that filter out sediments and toxins, these areas now produce sediment and toxins in the runoff. The Cache Creek Nature Preserve wetlands are man-made. This low area was once a gravel pit. Now, it receives natural runoff and agricultural runoff. Before our wetland was built, all the water from Gordon slough went straight into Cache Creek. In 2000, our wetland was built. A pipe from Gordon Slough brings water into the wetland at the East end. Look for the pipe sticking out of the water. At one point, water flowed back to Cache Creek through an outlet pipe at the West end of the wetlands.

Objectives:

Students will:

- be able to define a wetland using different criteria
- use the scientific method to hypothesize and test what happens to water as it travels through a model wetland.

Materials and Setup:

A table and all required materials should be present when you arrive at your teaching location. Please familiarize yourself with the following items:

- model wetland
- tub for collecting run-off water
- measuring cup
- plastic box
- 5 gallon bucket as a clean water source.

Before Instruction:

Have students assemble in an area that allows them to focus on you without looking into the sun or pre-

engaging with the props at the table. Get them calm, grouped, and focused on you first, then, begin your introduction.

Introduction:

Introduce yourself and your station. Give a general idea of what the students will accomplish during the activity. Relax; you don't have to know everything. What you need is a willingness to explore and learn with the students; that will go a long way to fostering a passion for learning on their part.

Definitions:

Aquatic – belonging to or associated with the water

Ecosystem – a localized group of interdependent organisms together with the environment that they inhabit and depend on.

Hypothesis – a tentative explanation for a phenomenon, used as a basis for further investigation

Marsh – an area of low-lying waterlogged land, often beside water, that is poorly drained and liable to flood, difficult to cross on foot, and unfit for agriculture or building.

Scientific Method – the system of advancing knowledge by formulating a question, collecting data about it through observation and experiment, and testing a hypothetical answer

Swamp – an area of land, usually fairly large that is always wet and is overgrown with various shrubs and trees

Terrestrial – belonging to or associated with the land

Wetland – a marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife (often used in the plural)

Instructions:

- Give a brief demonstration of the activity. Ask for student volunteers to perform the activity.
- Show the students that the wetland is on a slope. Ask why? (A wetland needs an entrance and an exit for the water.)
- Ask the students to hypothesize what will happen to the water when it is poured through the soil side of the exhibit. (Will the water be clean, dirty, the same amount, etc.) A hypothesis should be stated in an "IF, THEN" statement.
- Ask the students to hypothesize what will happen to the water as it passes through the planted side. (Will it be clean, dirty, the same amount, etc?)
- Ask the students to compare the two sides. Which side represents the wetland? Why?
- Have a student take a measured amount of water (1 cup) from the water source and pour the water at the entrance (high end) of the soil side. Have another student catch the water as it exists at the low end. Measure the water and have students make observations as to the clarity, etc.
- Have a different student take a measured amount of water (1 cup) from the source and pour it through the planted side. Have yet another student catch the water at the exit end. Again, measure the amount and make observations.
- Have the group compare and contrast the two sides. Point out the benefits of having a wetlands area to filter water.
- Ask the students if their original hypothesis was correct? Did the data collected support the hypothesis? Did the data collected lead to a new hypothesis?
- Run the experiment again and compare the results. A good experiment is repeated often to ensure valid data.

- Have the students draw conclusions about the benefits of wetlands based on the data collected from the experiment.
- Discuss the benefits of a wetlands to plants and to animals. (Water, food, shelter, and reproduction are some examples of answers.)

Conclusion:

The CCNP wetlands pond can vary in water transparency seasonally, so it is important to take numerous Secchi depth readings over the year. Once a month measuring for May to September is the minimum, every two weeks would be better. If Secchi depth is measured in The CCNP pond for numerous consecutive years, the data can be analyzed for water quality trends. If a significant trend indicates increasing Secchi depth over time, the water quality is improving. If a significant trend indicates decreasing Secchi depth over time, the water quality is declining.

NOTE: This material is the intellectual property of Cache Creek Conservancy, please do not duplicate without permission.



Cache Creek Conservancy

2016 Wacky Wilderness Days!

Come join our Wacky Wilderness Days, an extension of our popular *Experience the Creek* outdoor education program.

Wednesdays - 9am -11am

June 22—Summer Kick Off Scavenger Hunt

June 29—Rock-n-Roll

July 13—Bugs in the Creek

July 20—Nature Through the Arts

July 27—Wonders of Water

**Aug 3—Fun & Games with
City of Woodland Rec2Go Van**

Come experience Nature. Enjoy the hands on learning station of the day; afterwards, take a walk on the Preserve, or bring your lunch and have a picnic.

Please, bring your own drinking water, sunscreen, and wear closed toed shoes.

For more information or to reserve a space (530) 661-1070

Email: gmartin@cachecreekconservancy.org

To sign up online visit www.cachecreekconservancy.org

Funding for this program provided by
Water Resources Association of Yolo County

The Nature Preserve is open Monday –Friday 8:00am – 4pm

34199 County Road 20, P.O. Box 8249 • Woodland • CA • 95695 • (530) 661-1070
www.cachecreekconservancy.org



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Join us!

Let's Meet at the Cache Creek Conservatory For a Free Wacky Wilderness Days

July 27 · 9:00 AM
Cache Creek Conservancy

Come to the Cache Creek Nature Preserve and learn more about the outdoor natural world! The Cache Creek Conservancy is featuring a new program this summer to introduce students to the outdoor world. On six summer Wednesdays starting at 9 AM until 11 AM Conservancy education specialists will be hosting interactive discovery stations for the public. People can drop by at any time during this two hour period and experience a hands-on learning activity. While the focus is on elementary age students, everyone is welcome and they will learn more about the natural environment of the area. There is no charge to participate in this event.

People are welcome to stay and take a walk along the trails or bring a lunch to enjoy following the presentations. Please wear closed toe shoes and bring your own water as drinking water is not available on site. For more information check out the Cache Creek Conservancy website

www.cachecreekconservancy.org

, or call the Conservancy at [masked]-1070.

For more information check out Cache Creek Conservatory's website:

<https://sites.google.com/site/cccpactice2/>

Join or login to comment.

Sandy

Thought we were going to be able to make it, but I overlooked my daughters summer program dates. Looking forward to meeting you all soon.
July 26

Tara and Erik W.

Sorry that I couldn't go. Need to do something for my family.
July 16

3 went

Tracy Kay G.
Co-Organizer,
Event Host

Aydin

Julia J.



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2016 Wacky Wilderness Days

June 29 @ 9:00 am - 11:00 am

Come join their Wacky Wilderness Days, an extension of our popular Experience the Creek outdoor education program.

Wednesdays – 9am-11am

June 29th – Rock'n'Roll

July 13th – bug in the Creek

July 20th – Nature Through the Arts

July 27th – Wonders of Waters

August 3rd – Fun & Games with City of Woodland REC2GO Van

Come experince Nature. Enjoy the hands on learning station of the day; afterwards, take a walk on the Preserve, or bring your lunch and have a picninc. Please bring your own drinking water, sunscreen and wear closed toe shoes. For more information or to reserve a space call 530.661.1070 or email gmartin@cachecreekconservancy.org

Funding for this program is provided by Water Resources Association of Yolo County.

The Nature Preserve is open Monday – Friday 8am-4pm.

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Details

Date:

June 29

Time:

9:00 am - 11:00 am

Event Category:

Community Events

Organizer

Cache Creek

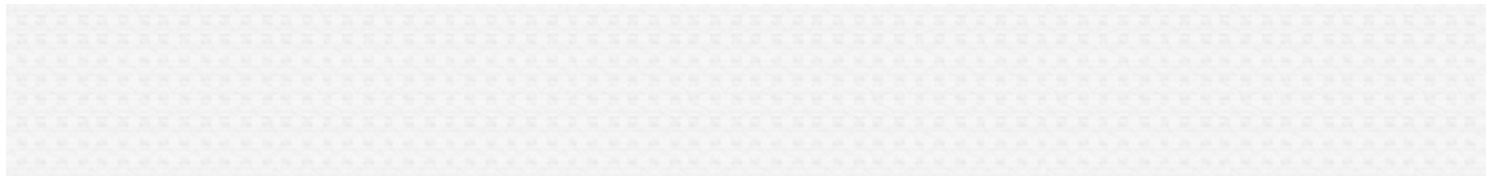
Conservancy

Phone:

530.661.1070

Website:

www.cachecreekconservancy



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Wacky Wilderness days

Wednesday, June 22 through Wednesday, August 3

Wacky Wilderness Days are back! Starting on June 22 and running through August 3, from 9am-11am. Each Wednesday we will feature a different topic, with new activities for those who are returning again this year. Each child will receive a T-Shirt, while supplies last. Visit www.cachecreekconservancy.org to register.



Family Safety



- Where:** Cache Creek Nature Preserve
- When:** 9:00 AM - 11:00 AM
- Who:** All ages welcome
- How:** Visit www.cachecreekconservancy.org to register.
- Cost:** No Charge

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Daily Democrat (<http://www.dailydemocrat.com>)

Wacky Wilderness Days are back at Nature Preserve

By Gina Martin, Special to The Democrat

Thursday, June 16, 2016



Come to the Cache Creek Nature Preserve and learn more about the outdoor natural world! The Cache Creek Conservancy is hosting “Wacky Wilderness Days” again this summer. This series of six free interactive programs introduces students of all ages to the wonders of the natural environment around them.

The Cache Creek Conservancy offers this unique summer program for school age children, accompanied by a parent, on Wednesdays from mid-June through Aug. 3. While the focus is on elementary age students, everyone is invited to come and learn about the Preserve and its environment.

The programs will be held at the Cache Creek Nature Preserve from 9 to 11 a.m. on the following Wednesdays:

- June 22 – Summer Kick Off Scavenger Hunt
- June 29 – Rock-n-Roll – Activities to learn about rocks
- July 13 – Bugs in the Creek – Explore Cache Creek looking for bugs
- July 20 – Nature Through the Arts – Haiku poetry, painting, collages
- July 27 – Wonders of Water – Explore and experiment the properties of water
- Aug. 3 – Fun & Games with the City of Woodland Rec2Go van

There is no fee for these activities thanks to funding from the Water Resources Association. Please register ahead of time to facilitate planning. Registration is available using the Cache Creek Conservancy website www.cachecreekconservancy.org, or call the Conservancy at 661-1070. The Nature Preserve is at 34199 County Road 20, Woodland. While supplies last, each child who attends will receive a free “Wacky Wilderness” T-shirt.

People are encouraged to stay beyond the Wacky Wilderness program and walk along the trails or bring a lunch to enjoy. Please wear closed toe shoes and bring your own water as drinking water is not available on site. Also, for the safety of pets, dogs are not allowed on the Nature Preserve.

URL: <http://www.dailydemocrat.com/environment-and-nature/20160616/wacky-wilderness-days-are-back-at-nature-preserve>

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Cache Creek Conservancy



2016

Wacky Wilderness Days at the Nature Preserve

***June 22, 2016—Wacky Wilderness Day Kick Off
Scavenger Hunt. 38 participants***

The majority of these visitors were first time visitors to the Nature Preserve and were excited to have the opportunity to explore and learn about the Nature Preserve.

All kids received a WWD T-shirt.





June 29, 2015 - Rock-n-Roll—60 participants

After visiting the creek where they learned how the rocks are formed and wash down the creek. They learned how to skip rocks, stack rocks, then they collected their own rocks to decorate and turn in to their very own "Tic-Tac-Rock" game.





July 13, 2016—Bugs in the Creek—67 participants

The hunt for bugs begins. This is one of our most popular days when participants spend 2 hours to explore and catch bugs then identify them and determine if Cache Creek is healthy.





More exploring in the Creek and enjoying the outdoors.





July 20, 2015 - Nature Art—38 participants

Participants enjoyed being creative outdoors, they had a chance to learn to write nature inspired Haiku's, construct and paint bird houses, watercolor paintings and make collages out of things collected around the Nature Preserve.





July 27, 2016—Wonder of Water—43 participants

The CCC volunteers helped participants learn about properties of water by conducting fun experiments which included: stacking water droplets on a penny, floating fruit in water, can water move uphill, and making bubbles.





August 3, 2016—Fun and Games—86 participants

Participants enjoyed good old fashioned games. The Woodland Rec2go van was here to share there games too.





The Hydro-Geology Stream Table

Mr. Mark and Mr. Fred, education specialists gave instructions on how the Stream Table works, encouraging the kids to start building lakes, dams and rivers to see what happens if they are built in the wrong place.



The Education team is looking forward to having this new activity to share with the classes that visit the Nature Preserve this Fall.



Microscopes

A group of young scientists from Auburn Ranchera visited the Nature Preserve this summer while here they learned how to collect plankton and identify the plankton using microscopes.



The Education team is looking forward to having this new activity to share with the classes that visit the Nature Preserve this Fall.