

Kokanee Salmon Conservation Education Program PRE-VISIT PACKET



AN EDUCATOR'S GUIDE TO TAYLOR CREEK

USDA FOREST SERVICE
LAKE TAHOE BASIN MANAGEMENT UNIT
TAHOE HERITAGE FOUNDATION
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KOKANEE SALMON PRE-VISIT PACKET

The purpose of this educator's guide is to help prepare students for their upcoming field trip to Taylor Creek where they will see the Kokanee Salmon spawn. It is based on third grade curriculum, but can be used by anyone.

The pre-visit packet includes:

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What to Expect

Taylor Creek is a beautiful place full of natural wonder. Quiet visitors will likely see small animals that inhabit the area. Guided programs will be led by Forest Service program leaders. The hour and a half walk follows the **Rainbow Trail** making several stops including the **Stream Profile Chamber**.

The Program Leader will cover:

- The Kokanee Salmon lifecycle & spawning behavior
- Predator vs. prey interactions
- Elements of a healthy ecosystem

Most important, program leaders provide students time to observe wildlife behavior.

The Rainbow Trail:

The Rainbow Trail is an accessible, 0.6 mile paved or boardwalk loop trail. The trail includes views of forest, meadow, marsh and stream ecosystems. During guided programs, groups may be led off the main trail to a gravel stream bank. Throughout the trail, it is important to remind students to *keep their hands and shoes out of the water* because dead salmon can cause high bacteria levels in the stream water, leading to illness.

Stream Profile Chamber:

The Stream Profile Chamber is an underground viewing area located along the Rainbow Trail offering a cross section of Taylor Creek. The chamber provides visitors the opportunity to see the world from a fish eye view. Occasionally, red-colored clothing near the viewing glass may stimulate territorial behavior in Kokanee Salmon, and may allow an even closer look at fish behind the glass. *Quiet voices in the Stream Profile Chamber allow fish to act naturally.*

Visitor Center Expectations of Guided Groups

- Prepare students for their visit
- Arrive on time (program leaders may not be available to groups arriving after 10:30am)
- Apply classroom rules
- Do not carry extra hand-outs or supplies; extra materials can be distracting and lead to litter

Remind students to:

- Stay on the trail
- Leave rocks, pinecones, leaves, etc.
- Keep voices low
- Walk slowly
- Keep hands and shoes out of the water for health and safety purposes
- Allow Program Leader to lead at all times
- Dress properly for variable weather conditions; cool temperatures, high wind, rain and snow are possible in October
- Visitors with bee allergies should be prepared; Yellow Jacket nests can be common in the area
- Dress in red (*optional*)

Lunch

- Please leave food and drinks in vehicles during programs and trail use
- Picnic tables are available at the Taylor Creek Visitor Center
- Other places to eat lunch include the Tallac Historic Site and Kiva Beach
- *Do not feed wildlife: a fed animal is a dead animal*

Please remember to treat the site with respect. Leave natural materials where you found them. Clean up after yourselves. Protect wildlife by not feeding or touching them. Leave the grass standing, the leaves and branches on the trees and the bark unmarked.

Special Instructions for Chaperones

Teachers, please make a copy of this sheet for each chaperone prior to the trip.

Chaperones play a very important role on fieldtrips. To ensure students have a safe and enjoyable time, please follow these instructions.

What to Bring

- Bagged lunch & water, left in vehicles during programs and trail use
- Appropriate clothing to be outside for 3 hours
 - Sturdy, closed toed shoes, *NO sandals*
 - Long pants
 - Appropriate layers, such as a lightweight jacket or sweatshirt
 - Hat or visor
 - Backpack
- Sunscreen

What Not to Bring

- Leave other children and pets at home

Your Role as a Chaperone

- Help the teacher and program leaders keep the group together
- Encourage students to listen and stay attentive
- Allow students to answer the program leaders' questions
- Follow all rules observed by students
- Set a good example for students:
 - Listen to directions and follow the leaders
 - Walk
 - Use quiet voices
 - Leave sticks, pinecones, and other natural items alone
 - Respect nature, including plants, animals and natural places
- Avoid talking with others during the presentation
- Do not smoke

Students, teachers and program leaders appreciate your time and energy contributed to the quality of the *Kokanee Salmon* fieldtrip. Taylor Creek Visitor Center (530) 543-2674

THANK YOU!!

Instrucciones especiales para acompañantes

Maestros por favor hagan una copia de esta hoja para cada acompañante antes del viaje.

Para asegurar que los estudiantes tengan un tiempo seguro y agradable, los chaperones juegan un papel muy importante. Por favor sigan estas instrucciones.

Lo que deben traer

- Comida y agua empaquetada; durante las presentaciones y para usamos del rastro, dejamos comida y agua empaquetada en los coches, por favor
- La ropa adecuada para estar fuera durante tres horas
 - o zapatos estables y con punta cerrada, no sandalias
 - o pantalones largos
 - o vístanse en capas apropiadas, como una chaqueta ligera o sudadera
 - o sombrero o cachucha
 - o Mochila
- Protector solar

Lo que no se debe traer

- Deje los otros niños y sus mascotas en casa

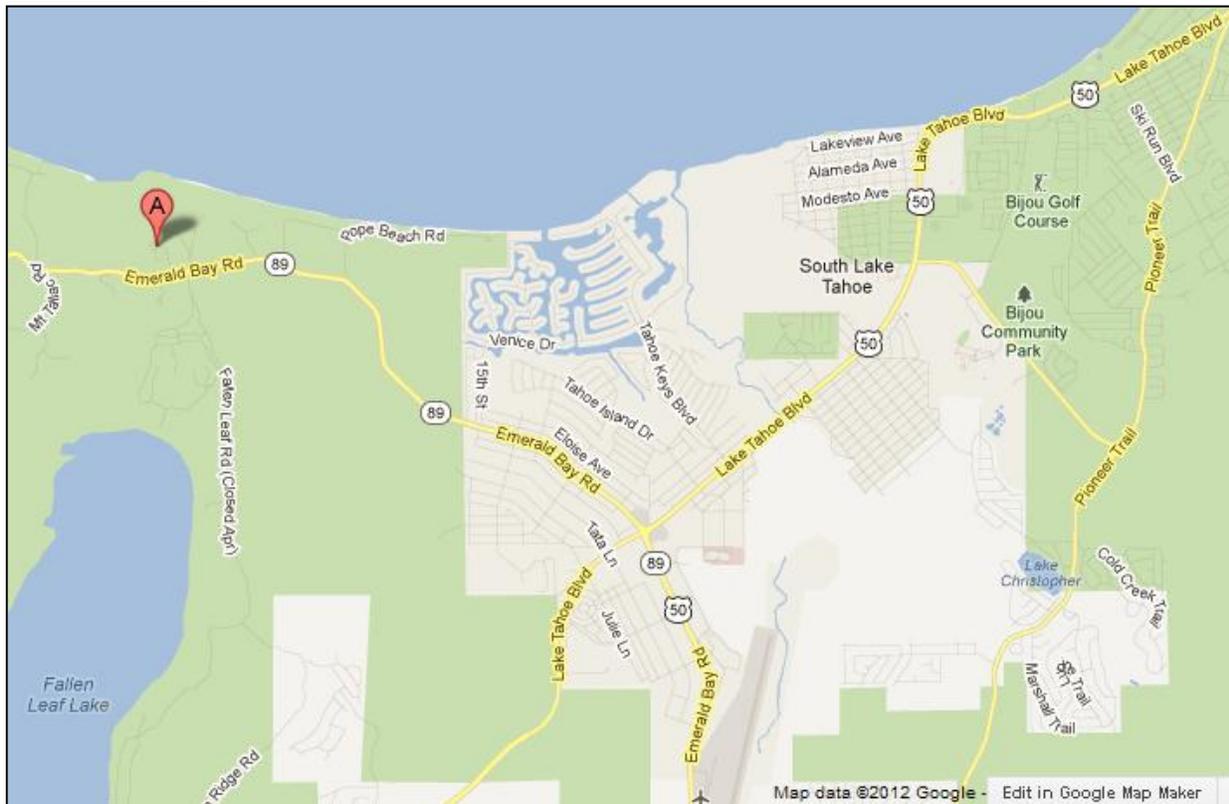
Su papel como acompañante

- Ayudar a los maestros y líderes del programa en mantener el grupo unido
- Animar a los estudiantes a escuchar y estar atentos
- Permitir a los estudiantes que respondan a las preguntas de los líderes del programa '
- Siga todas las reglas para los estudiantes
- Dé un buen ejemplo para los estudiantes:
 - o Escuche las instrucciones y sigan a los líderes
 - o Caminar
 - o Usar voz baja
 - o Dejen palos, piñas y otros elementos naturales en paz
 - o Respeten a la naturaleza, incluyendo plantas, animales y lugares naturales
- Eviten hablar con otras personas durante la presentación
- No fume

Los estudiantes, maestros y líderes del programa agradecen su tiempo y energía en contribuir a la calidad de la excursión "Kokanee Salmon." Taylor Creek Visitor Center (530) 543-2674

GRACIAS!

Directions: Teachers, please make a copy of this sheet for each driver prior to the trip.



From Sacramento:

- Take HWY 50 east to South Lake Tahoe
- At the first major intersection in South Lake Tahoe, go straight through the stoplight. This becomes HWY 89 north (Emerald Bay Rd) toward Tahoe city
- Continue three miles north on HWY 89 (Emerald Bay Rd)
- Taylor Creek Visitor Center is the third driveway on the right past Camp Richardson
- Please note the entrance sign reads: Lake Tahoe Visitor Center, US Forest Service Visitor Center and Stream Profile Chamber

From Carson City:

- Take HWY 50 west to South Lake Tahoe
- Go five miles past the California/Nevada State line to the Hwy 50 & 89 junction
- Merge right onto 89 North (Emerald Bay Rd) toward Tahoe City
- Continue three miles north on HWY 89 (Emerald Bay Rd)
- Taylor Creek Visitor Center is the third driveway on the right past Camp Richardson
- Please note the entrance sign reads: Lake Tahoe Visitor Center, US Forest Service Visitor Center and Stream Profile Chamber

From Tahoe City:

- Take Hwy 89 South toward South Lake Tahoe
- Six miles past Emerald Bay take a left into the Taylor Creek Visitor Center driveway. This is one driveway past Baldwin Beach before Camp Richardson.
- Please note the entrance sign reads: Lake Tahoe Visitor Center, US Forest Service Visitor Center and Stream Profile Chamber

Contact the Taylor Creek Visitor Center at: (530) 543-2674

Information to Cover Before the Fieldtrip

- The lifecycle of the Kokanee Salmon
 1. *Eggs* that are laid in October hatch 100 days later. After they hatch the Kokanee stay in Taylor Creek for about 2 months.
 2. *Egg-sac fry* or *alevin*, live in the gravel. They eat the nutrients provided by their egg sac for 2-3 weeks. In this stage the Kokanee absorb the smells of Taylor creek.
 3. *Fry* emerge from gravel and learn to eat by sampling resources in the stream current. This stage lasts 2-3 weeks.
 4. *Fingerlings* migrate out into Lake Tahoe (2-4 weeks).
 5. *Non-spawning adult Kokanee* (also known as *Silvers*) live in Lake Tahoe for 2-4years. They are silver with a blue stripe.
 6. *Spawning adults* return to Taylor Creek. They use their sense of smell to return to where they were born.
 7. The mature spawning Kokanee go through biological changes. The **female** turns pinkish-red with a green face, fins and stripe. The **male** turns brilliant red with a green face and fins. The **male** also develops a humpback and a kype (hooked nose) which he uses to fight other males to protect his territory.
- Kokanee lifecycle color guide
 1. Eggs: bright orange
 2. Egg-sac-fry (alevin): translucent (clear) body with an orange stripe and egg sac
 3. Fry: silver/gray
 4. Fingerling: silver/blue with dark blotches (par marks) on their sides
 5. Non spawning adult or Silvers: Silver with blue sides
 6. Spawning female: pinkish-red with a green face, fins and stripes down her sides
 7. Spawning male: turns brilliant red with a green face and fins
 8. Spawning salmon no longer have the protective slimy layer on their bodies. Their skin begins to break down, showing white decaying flesh
 9. Dead salmon are white
- A visit to Taylor Creek is more effective when students are well prepared for what they may see in site.

KOKANEE SALMON INFORMATION

The enclosed Kokanee "Cycle" Club coloring book details the Kokanee's lifecycle. It is a great tool to send home or read with the students to get them ready for their field trip to Taylor Creek.

DIAGRAMS

A diagram of the Kokanee Salmon's lifecycle is included in the pre-visit packet.

Games and Activities

The games and activities below are provided as a learning aid for the students.

Materials included (can be photocopied for education use)

- Matching Activity
- Word Search
- Life Cycle Coloring Page
- Life Cycle Cards Sorting Game
- Kokanee Bingo

Other Ideas:

Art Projects

- Create a class mural about the Kokanee Salmon and information students have learned and seen at Taylor Creek
- Create a mobile of the Kokanee Salmon's lifecycle
- Have an interactive play depicting the Kokanee Salmon lifecycle
- Create Kokanee masks
- Use a shoe box, paper and clay to create a Kokanee in its habitat

Music

- Sing the Kokanee Lifecycle Song (to the tune of "Doe a Deer a Female Deer...")

First an egg, a hidden egg,
Then an infant alevin,
Next a fry, a tiny fry,
Then fingerlings swim out to the lake,
Three years of lake life go by,
Eating lots of zooplankton,
Till it swims home to Taylor Creek,
Where it will turn red spawn and
Die, die, die, die

Games

Hooks and Ladders: Set up an obstacle course depicting all of the challenges a fish must overcome in order to grow into a spawning adult salmon. The object of this game is to show how difficult it is for salmon to survive

- Have two students turning a jump rope at the beginning. Have other students run through it to show how much energy it takes for the salmon to dodge predators.
- Choose one or two students to be predators or fishermen, give them a small area to tag other students who are fish. To give the fish more of a chance give the predators a limiting movement they have to use when chasing the others such as hopping or pivoting on one foot
- Set up cones for obstacles encountered while swimming
- Lay out tokens that represent food
- Have something for the children to jump over to simulate water falls or beaver dams when they go back up stream
- Use your imagination

- Have all students start at the same time. The student that make it to the end without getting hit by the jump rope, tagged or knocking anything over and collect a food token successfully made it through an entire lifecycle. The students who did not make it through successfully sit on the side lines until the next round

Scent Game: This game has students use their sense of smell to locate “home”

- Choose one student to blind fold
- Select another student to hold or wear something with a strong odor
- Make a circle with the blind folded student in the center
- See how long it takes the student to find the scent (“home”)

Oh Fish!: This game shows the interconnectedness of nature and carrying capacity.

- Choose 1/3 of the class to be fish
- Divide the rest up into food, shelter and water
- The students that are food hold their hands over their stomachs
- The students that are shelter hold their hands over their heads in a tent shape
- The students that are water, cup their hands
- Have the fish on one side and the “needs” on the other
- Have the two groups turn their backs to each other
- Have the fish make the sign of either food shelter or water
- When they turn back around and face each other the fish must run or “swim” to find the “need” they signed (one fish per student who symbolizes a need)
- If a fish does not find the “need” it signed than it must sit out
- Each round more fish sit out freeing up resources. This new availability of resources allows the fish to reproduce. Choose students to rejoin the game

Reading, Writing and Discussion

- Read a story about salmon and encourage students to write or draw a picture about what they learned
- Write a story about their field trip, and illustrate the favorite thing they saw or learned
- Discuss ways that people can help ensure success and survival of the salmon

Information on the Kokanee Salmon Life Cycle

Kokanee Salmon are a land-locked form of the Sockeye Salmon that are native to the marine and fresh waters of the Pacific Northwest. The American Indians living along the Fraser River in Canada gave the Kokanee its name. Kokanee means “red fish.” They are non-anadromous salmon meaning that they live their entire lives in fresh water. Kokanee are much smaller than ocean going salmon due to limited sources of food in fresh water lakes. The average size of an adult is 14 inches. They primarily eat zooplankton.

Kokanee do well in high alpine lakes because they can only survive in water temperatures below 50 degrees Fahrenheit, summer temperatures get too high in lowland lakes. Kokanee can be found in several California lakes including: Lake Shasta, Fallen Leaf Lake, Twin Lakes near Bridgeport, Echo Lake, Donner Lake, Strawberry Lake and Salt Springs Reservoir. They are also found in Idaho, Oregon, Washington Montana and Western Canada. These are all self-sustaining populations.

Kokanee were “accidentally” introduced into **Lake Tahoe** in 1944 from holding ponds that overflowed at the old Tahoe City Fish Hatchery. Three years after their accidental introduction the salmon returned to Tahoe City to spawn. Knowing that the Kokanee would survive in Lake Tahoe, it was decided that the hatchery would do a yearly planting of fingerlings in the tributary streams. These plantings began in 1949. Today, California Department of Fish and Game continues to plant fingerlings in Taylor Creek to maintain a healthy population.

Taylor Creek is only one of 63 tributary streams that flow into Lake Tahoe. However, probably 99% of all of the Kokanee Salmon that live in Lake Tahoe spawn in Taylor Creek. The dam at Fallen Leaf Lake allows the water to be regulated to optimize water during the spawning time. Taylor Creek also has optimal conditions for eggs. The water is clean with no silt. The gravel is marble size enabling the Kokanee to dig redds (nests) 4 to 6 inches deep. The gravel size allows the circulation of oxygen-rich water around eggs in the redd. Spawning is triggered in the fall with the cooler water temperatures and the increased water flow from the dam that stirs up the “smells” of Taylor Creek.

Weirs (fish barriers or nets) installed by the California Department of Fish and Game (DFG) are used to trap spawning fish near the mouth of Taylor Creek as well as upstream from the Highway 89 bridge. DFG and Project Kokanee (a non profit organization that works in cooperation with DFG raising funds and manpower to help the Kokanee Salmon) come out periodically to collect the eggs from the excess fish. They remove the eggs from the female and fertilize them with the males’ milt. The fertilized eggs are raised in a hatchery until they are fingerlings. As fingerlings they are released within California into foothill and mountain lakes and streams including Taylor Creek. This process ensures that the proper number of fish use the creek. The spawning gravel can support a limited number of fish. Otherwise, too many spawning adults would dig up each others’ nests and kill previously laid eggs. If left alone, the salmon would overpopulate the lake leading to a sick, diseased and generally unhealthy population.

Fishing for Kokanee in Lake Tahoe varies according to the season. They can be caught with flies, bait or lures. They are located in open water during the warm summer months at depths of 50-100 feet. In the fall during spawning season they return to the surface, and in the winter months, they can be found at depths of 10 feet. The Kokanee require cool water temperatures below 50 degrees Fahrenheit.

Predicting the **number of fish per spawning season** is very difficult because there are so many variables that affect the success of the run. It depends on the number of predators that eat the eggs, fry, fingerlings and adults, and the temperatures over the winter or flooding during egg incubation. The following are estimates for the number of fish that spawned in Taylor Creek from 2003 -2006.

Year:	Number of Kokanee that spawned in Taylor Creek
◆ 2003	◆ 50,000 Kokanee
◆ 2004	◆ 20,000
◆ 2005	◆ 70,000-80,000
◆ 2006	◆ 20,000

Kokanee Salmon Lifecycle

Eggs require clean, oxygen-rich cold water in gravel to develop into fry. The eggs are laid in October and hatch three-five months (100+days) later depending on the water temperature and clarity.

Egg-sac fry or **alevin** emerge from eggs after 100 days with their egg-sac still attached. They live on the nutrients provided by the egg-sac for two to three weeks. The “homing instinct” is developed during the egg-sac fry stage. The young fish learns the “smells” or absorbs the scent of Taylor Creek. This process guides them back to Taylor Creek when they are mature adults ready to spawn. The ability to find home is a learned trait, it is not genetically inherited.

Once the young fish has used up all of the nutrients provided in the egg-sac, they emerge from the gravel as a **fry** to live in Taylor Creek for the next two to three weeks. The fry learn how to eat by facing upstream and sampling food particles that float past them on the current and hit them in the face.

The fry mature into **fingerlings** and begin to migrate into Lake Tahoe with the smells of the creek deeply implanted. The stages in the creek go from egg-sac fry to fry to fingerling. The whole process takes about two months from February to April.

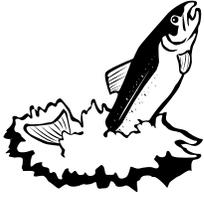
Immature Kokanee or **Silvers** in Lake Tahoe are silver fish with bright blue sides. They are plankton feeders. Their average size is 14 inches and about one and a half to two pounds (1 ½ to 2 lbs). They like deep cooler water. The time they spend in the lake is pretty much a mystery. It is not known how large the schools are or how deep they feed. They swim closer to the surface during the cold winter months and deeper in the summer to escape the heat. Sometimes immature adults (one year olds) known as “Jacks” get confused and swim up Taylor Creek with spawning mature fish. It is easy to distinguish these silver fish from the red spawning adults.

Mature Kokanee go through a biological (not a hormonal) change. When they are between two and four years old they change from a silver/blue fish to a red/green fish. The female turns reddish-pink with a green stripe on the sides and green face and fins. She is also physically ready to deposit her eggs. The male’s body turns a brilliant red and his face and fins turn a dark green. The males also develop a pronounced hooked jaw with sharp teeth called a *kype* and a large muscular hump back which he uses to protect his territory. After the biological change is complete, the salmon stop eating and their flesh almost immediately starts to deteriorate. After they spawn, the outer slimy protective layer starts to noticeably breakdown and deteriorate. White decaying flesh soon becomes apparent.

Kokanee generally begin **Spawning** in Taylor Creek the first week of October and continue for four to six weeks. During spawning the male stands guard while the female fans gravel with her tail to make a four to six inch deep depression called a redd. This is where she will deposit her eggs. After the eggs are laid the male fertilizes them with milt, the male and female fan gravel over the eggs to bury and protect them. Adequate aeration through the gravel is needed for the eggs to survive (silt or mud will suffocate the eggs). The spawning process can be repeated several times during the season, but when they are finished both fish die. The female lives only a few days while the male can live for up to 14 days. Females can deposit between 400 and 1200 eggs depending on age. A two year old averages 400 eggs, a three year old 800 and a four year old 1200. All Pacific Salmon die after spawning including Kokanee. Trout which are in the same family can spawn several times over multiple years.

After the salmon die, their bodies start to decompose and **scavengers** begin to feast. Raccoons and eagles are the primary scavengers. Crawdads, herons, gulls and ravens also take advantage of the abundant source of food. Mallards pick at the dead fish but they are mainly predators of the eggs. Black Bears rarely eat the Kokanee Salmon. When the fry hatch they will also live on the nutrients that remain in the creek from their dead parents.

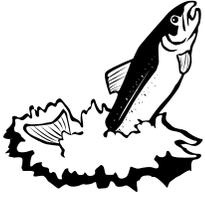
During spawning season several **predators** eat the Kokanee and their eggs. Common Mergansers (a diving duck) are the main predators of the spawning Kokanee. They will chase a salmon catch it and swallow it alive and whole. The eggs are preyed upon by Mallards, Crawdads, Bull Frogs, Raccoons and other fish. The fry are preyed upon by adult trout (Rainbow, Brown, Mackinaw or lake trout) and exotic species of fish like bass.



MATCHING

Match the word with the correct definition

- | | |
|--------------------------|---|
| _____ 1. Egg: | A. When fish deposit and fertilize eggs |
| _____ 2. Egg Sac Fry: | B. The different life stages from birth to death |
| _____ 3. Fingerling: | C. To emerge from an egg |
| _____ 4. Fry: | D. To move from one place to another |
| _____ 5. Hatch: | E. The underground rocky nest of the salmon |
| _____ 6. Humpback: | F. When fish collect in large groups |
| _____ 7. Kokanee: | G. Most Kokanee in Lake Tahoe spawn here |
| _____ 8. Kype: | H. The hooked jaw of the male Kokanee |
| _____ 9. Life Cycle: | I. An animal that eats dead animals |
| _____ 10. Migrate: | J. The area that an animal lives in and protects |
| _____ 11. Milt: | K. An animal that hunts in order to eat |
| _____ 12. Predator: | L. The third stage of a salmon's life cycle |
| _____ 13. Rainbow Trail: | M. The shape of the large muscle on the male's back |
| _____ 14. Redd: | N. The first stage of a salmon's life cycle |
| _____ 15. Scavenger: | O. The second stage of a salmon's life cycle |
| _____ 16. School: | P. What the female deposits |
| _____ 17. Spawn: | Q. What the male uses to fertilize the eggs |
| _____ 18. Taylor Creek: | R. Native American word meaning "red fish" |
| _____ 19. Territory: | S. Fish and Game nets used to collect extra fish for hatcheries |
| _____ 20. Weirs: | T. The best walk in Tahoe to see spawning Kokanee |



KOKANEE SALMON WORDSEARCH

Circle the hidden words. The words can be diagonal, forwards and backwards

R N T U R R W E H Y T M F V Q B N O V N
 Q A R A L F Q K R K H I Y Y E J S Y T W
 R R I O H L Y F Y G N G L O O H C S A A
 W E W N D O C P R B D R M I E Q R C Y P
 H L G D B A E C E H C A T L I M G X L S
 Q N Z N S O C C C K F T Z I V W U P O R
 L E J G E K W T N I X E Y U G D X Z R E
 F D G G G V A T N E L C Y C E F I L C D
 L E G Y N H A G R D Q F S L O I C K R D
 Y L G R N E E C G A P R E D A T O R E C
 M R E O H R Y K S J I P U J C Q J S E C
 C A F T L U A R C D Q L F L A B X O K B
 K E G I Y E M K W O Z L K N W E I R S O
 L V N R C W V P V G H O V D D G Q K N R
 S G I R N R A A B Q K J Z T P E V O N R
 T D I E B L N W R A N D N X N W F F S I
 Z T W T S N K G N G C X J T X C K B T H
 W V I J K B E E H N K K J M E A D Q R Z
 B N W V I K E N M C G V F J Q M Y Y O V
 A W S Z V Q Y V Z H X R R C B K C F W Z

EGG

EGGSACFRY

FINGERLING

FRY

GRAVEL

HATCH

HUMPBACK

KOKANEE

KYPE

LIFECYCLE

MIGRATE

MILT

PREDATOR

RAINBOWTRAIL

REDD

SCAVENGER

SCHOOL

SPAWN

TAHOE

TAYLORCREEK

TERRITORY

WEIRS

MATCHING ANSWER KEY: 1P, 2N, 3L, 4O, 5C, 6M, 7R, 8H, 9B, 10D, 11Q, 12K, 13T, 14E, 15I, 16F, 17A, 18G, 19J, 20S