



A Rare Snail Lives in Paradise Lake

By Edward J. Johannes, Deixis Consultants

You may be familiar with many of the species living in the Bear Creek drainage, including a unionid clam (*Margaritifera falcata*). However, you may not know that quietly living in the depths of Paradise Lake, in this drainage, is another unique mollusk, the Pleistocene glacial relict snail Washington valvata (*Valvata* n. sp.).

Walter J. Eyerdam, an early Seattle naturalist, first collected this *Valvata* in the 1940s at Paradise Lake. After seeing Eyerdam's specimens at the Academy of Natural Sciences of Philadelphia collection, Terrence Frest (Deixis Consultants, Seattle) recognized that it was an unusual *Valvata*. We collected from Paradise Lake in the early 1990s, confirming that it still lived there. Initially, we thought it was the rams-horn valvata (*Valvata mergella*), a rare species found in Alaska and Russian Far East. However, after examining photos of the type specimens of *mergella*, it was determined that the Paradise Lake *Valvata* is a new



Shell of Washington valvata from Paradise Lake.

species. During a 2010 survey for the introduced New Zealand mudsnail (*Potamopyrgus antipodarum*), a second site for the Washington valvata was found in Pattison Lake in Lacey, co-occurring with another glacial relict snail, the lake amnicola (*Amnicola* n. sp. 1).

The Washington valvata occurs in low to moderate elevation cold kettle lakes, with streams both flowing in and out of them. Presence of oxygenated soft substrate and aquatic macrophyte beds seems to be necessary. Autumn and winter months find it burrowing and feeding in the mud substrate. In spring and early summer it creeps on aquatic

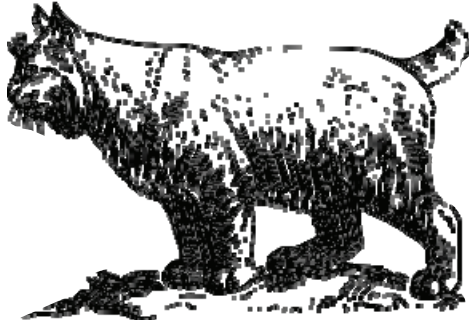
(Rare Snail continued on page 8)

Animal Encounters

By Dick Schaetzel

Evaluating the fitness of our local watersheds is most frequently accomplished by looking at the quality of the water and the number of salmon returning each autumn. King County Land Resources Department and the Washington Department of Ecology have done numerous water quality studies in the Bear Creek Watershed with follow-up recommendations for improving the ecosystem.

But, there are other means to assess the health of a watershed. In a healthy environment



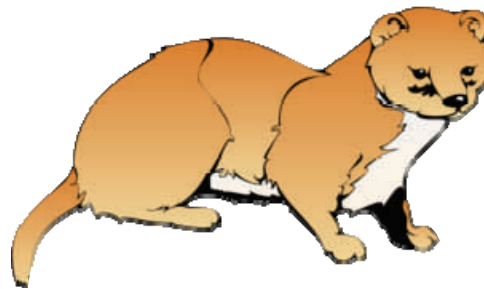
normal historical relationships between fauna are essential but not typically studied in detail on a small scale, such as in our watershed. Anecdotally, I have three stories about animal interactions showing that wildlife in our watershed seem to be faring reasonably well. Hopefully, this is an indication that the concerns about our environment and the cooperative efforts by residents, private organizations such as Water Tenders and King County are paying off.

Beware that the following stories are about the life and death struggles our fauna face every day. It is not something we think about when we see a creature scurry by, but it is a part of their life. The stories illustrate that some ecological mechanisms are working here in the “Big Bear”. And please, forgive me for the anthropomorphisms’ that may offend your scientific sensibilities.

Some time ago I was out for a walk with my dog. As we were passing a dense stand of underbrush we heard quite a commotion emanating from within. We stopped, knowing that some animal was running through the brush. The next moment we saw a grey squirrel run up

an alder tree, followed closely by a bobcat. Ten feet up the tree, the bobcat caught its prey. It then splayed itself out along a horizontal branch, squirrel in mouth to watch what my dog and I would do. We slowly walked away to let the bobcat have its meal undisturbed.

Up ahead, rolling across the road was what looked like a furry ball. Grey, brown, grey, brown.... What in the world was I seeing? As I drove closer, slowing down, I could not comprehend what this strange phenomenon was. Now ten feet away I stopped. And so did the ball. Untangling from the ball was a weasel that stood erect, now trying to figure out what I was and what I planned to do. Both of us froze with anticipation. Finally, the weasel went back to its newly caught meal and started dragging the rabbit (prey being much bigger than predator) across Mink Road with a motion likened to an inch worm making its way across a picnic table. Pull, stretch out, pulling the rabbit towards itself, stretching its hind legs out as far as it will go and pulling the rabbit towards itself again. It stopped this rhythm once in the middle of the road to see if I had moved, then went back to its retreat to the other side of the road. Fortunately, the road was empty of cars so there was no need for me to play traffic cop. A short time later the weasel reached



the far shoulder, slipped down the embankment and disappeared into the woods to enjoy its meal.

What an amazing sight.

On a beautiful and rare sunny afternoon I was in the yard doing the normal hated chore of pulling weeds. This idyllic and tranquil setting where one could hear a few

(Animals continued on page 4)

New Bear Creek Acquisitions

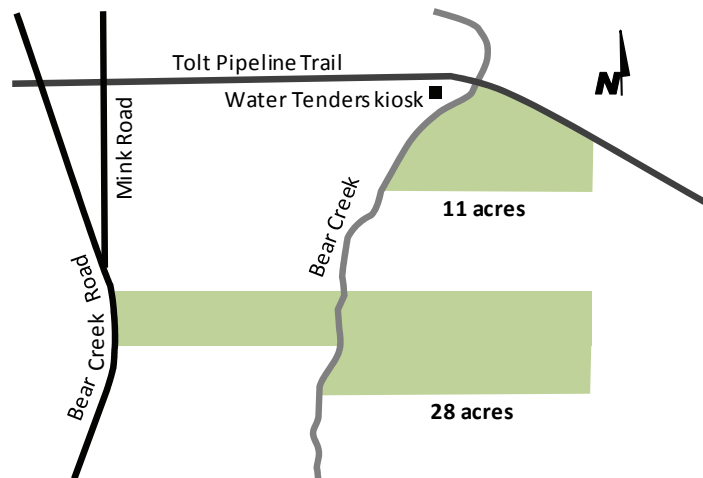
By Terry Lavender

Publically owned and protected property in the Bear Creek Basin has grown by 28 acres. King County recently completed the purchase of some beautifully forested property south of the Tolt Pipeline Trail. It adds to eleven acres already in public ownership directly adjacent to the trail. This is one of the largest, fully forested pieces in the upper area of Bear Creek.

King County requests no public access until current residents have moved and all structures have been removed. The property will remain a natural area and the public will have future access for walking, bird watching and other informal

activities. No formal trails or park facilities are planned. This is located in one of the main spawning areas of Bear Creek and the forest cover is important to both the stream and numerous birds and wildlife.

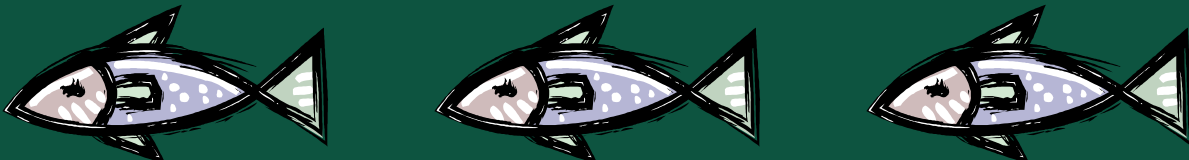
Please respect the no access while King County completes their work. We are grateful to the Conservation Futures fund and King County Parks Expansion Levy for funding this acquisition.



If you have specific questions, you can call Terry Lavender, Water Tender, at 425-788-2304 or Tom Beavers, King County Basin Steward at 206-205-5620.

Water Tenders' Mission

"The purpose of Water Tenders is to protect, preserve and enhance the Bear Creek Watershed through education, conservation, restoration and community involvement."



birds in the trees and the gurgling of Bear Creek was soon to change. From down near the creek came the loudest squawking sound imaginable. What bird is this? Not a great blue heron, not a hawk or an eagle that I have ever heard before. It rather sounded like a bird, but it must be a species I have never seen along the creek before. I ran over to the creek to catch a view of this new visitor, as did my wife who heard the noise from inside the house. A bird it was not. In the middle of the creek a coyote had just attacked a fawn. That fearful, awful, unsettling sound was coming from the fawn in the clutches of the coyote's fangs. I will never forget that awful sound of pain and anguish. It was horrible. The coyote dragged the fawn into the woods where I could not see either of them, but I could see salmonberry and nine-bark branches violently moving back and forth. Foliage movement and painful screeches went on for way too long. I could only hope

that the coyote would soon put an end to the fawn's misery. Was I ever shocked when the deer suddenly popped out of the woods and into the stream. The coyote was gone and the fawn walked down stream for some ways, appearing not to be hurt externally, before it wandered back into the woods. I can only hope it lived. How did the fawn manage to get away and where was the fawn's

mother? I never saw her. All is a mystery, which can make life in our watershed, sometimes not for the faint of heart, but interesting nonetheless.

These episodes lead me to believe that life goes on in our watershed. Problems do exist, things need to be fixed or done better to make this a rich viable ecosystem, but there is wildlife in this domain that is interacting within the norm. The Bear

Creek watershed will not be lost as long as we continue to have caring, thoughtful people living within its environs, as we now do.



Electronic Newsletter

Water Tenders is always looking for ways to reduce our impact on our planet and at the same time save costs.

If you are interested in receiving our newsletter

via e-mail versus hardcopy, let us know.

Just send us a note saying you want future newsletters

e-mailed to you and we will gladly fulfill your request.

Contact us at administration@watertenders.org.

Book Report by Ed Schein

The Big Thirst: The Secret Life and Turbulent Future of Water

By Charles Fishman

We are Water Tenders. But do we really understand the water we tend? For instance, water is never destroyed. It is 4 billion years old. Water is not just liquid, ice or vapor, it is also "molecular water," fused into rock 400 miles deep, where most of the planet's water is found.

Charles Fishman makes us realize we have strong feelings about water and how we relate to it, but we really don't understand what is involved in providing us 24/7 water. Throughout human history, water has always been hard to understand. Even Plato mentions this.

Water can be very complex. Did you know that IBM makes chips, pathways that electrons follow to deliver our text messages, by using water that has been made so clean it would suck all the chemicals out of your mouth if you tried to drink it. It is the "supersolvent."

- Water has little value attached to it as a commodity. We don't pay for the value of water: we pay for the cost of delivering it to us. And even that cost is way too cheap for us to appreciate its importance to us.
- In India, half the population has no access to water in their homes, and most who do only have that access for only about 90 minutes a day when water lines are full. Otherwise they are empty, allowing pollutants, even sewage to contaminate them.
- In Australia a 10 year drought has caused dramatic changes in how water is provided.
- Las Vegas is paying people to rip out their lawns. Water features and irrigation water is treated wastewater. And Lake Mead behind Hoover Dam is being replumbed so that water can be drawn out of the bottom of the lake rather than from pipes just a hundred or two hundred feet below the surface, because the lake level is dropping.

A water economist, Mike Young, who is shaping Australia's water policy, says we should think of a water system like a glass of water with three layers. The lowest layer is "maintenance water," necessary to maintain the environment, to maintain the system. Without water for the system, there is no water for anyone. The next layer is almost as important as the "maintenance layer," called "critical human needs," drinking water, critical city and industrial water operated on very tight water-use restrictions. These two layers must be set aside before the final, fattest layer of water can be used. This final "sharing" layer is divided into "high security" water and "low security" water. People must pay a premium for the "high security" water and get it before the "low security" folks, who pay less, get any. Every water utility has to decide ahead of any water emergency the percentages of these water layers and how to educate people to these values.

Finally, we all need to realize how much water is present in everything about our daily lives. Water is a shared pleasure, and each of us is responsible to make sure we use each drop wisely. This book helps us to change the way we think about water, for we live near the Cascades, named for that ever precious resource.



Please Pay Your Annual Dues

**Water Tenders will no longer send reminders to members
when it is time to pay your annual dues.**

Consider this your reminder!

Get Out: Twin Falls

By Guy Baltzelle

My wife and I were going stir-crazy—we needed to get out somewhere, but there was one problem: it was the middle of February. All of our favorite hiking trails were buried under multiple feet of snow. So, we went out to our favorite low-level hike. An easy short trail follows the Snoqualmie River through old-growth forest into a gorge in which two dramatic waterfalls flow, both with beautifully constructed viewpoints and bridges for viewing.

I am referring to Twin Falls in Olallie State Park. This three-mile long park stretches along the South Fork of the Snoqualmie River Parallel to Interstate 90 just east of North Bend. It contains popular trails that offer an accessible wilderness experience to the denizens of Seattle. There is always a diverse set of hikers, especially with children, enjoying the trails, even in January.

Twin Falls never stop running—the area around North Bend receives more than 90 inches of rain each year compared to Bear Creek’s typical 50 inches. The South Fork Snoqualmie River takes rain and squeezes it through a gorgeous, rocky tree-lined gorge. First, the river tumbles over a very impressive stairstep waterfall. Then, it plunges over a 150-foot rock wall, creating the stunning cascade of the Lower Twin Falls.



The Stairsteps in the snow.

The first half-mile of the trail passes through moss-laden forest along the banks of the South Fork Snoqualmie River. This flat mile provides kids plenty of opportunity to explore massive old nurse logs and other interesting forest formations. Given the bounty of rain and the lush forest growth, this area almost feels like visiting an Olympic Peninsula rain forest —just without the massive cedars and hemlocks.

After this long, flat run, the trail climbs a series of long switchbacks. About one mile out, you'll find a short spur trail on the right—this leads to a fantastic overlook of the lower falls, the mighty 150-foot cascade. Back on the main trail, you'll continue to climb another half-smile or so to a bridge that takes you over the river gorge, directly between two of the stairstep falls.

Directions:

From Seattle, drive east on I-90 to exit 34, just east of North Bend. Turn south on 468th Avenue SE and proceed about 0.5 mile.

Immediately before the South Fork Snoqualmie River bridge, turn left (east) on SE 159th Street and drive 0.5 mile to the trailhead parking lot at the road's end. The Washington State Discover Pass is required when using the parking lot.

Olallie State Park website: <http://www.parks.wa.gov/parks/?selectedpark=Olallie&subject=all>

Sammamish Kokanee not protected

By Frank Lill

With overwhelming sadness and disappointment, Save Lake Sammamish (SLS) reports the US Fish and Wildlife Service (USFWS) finally made a decision on our Kokanee petition. USFWS decided the wild native Lake Sammamish Kokanee are undeserving of protection under the Endangered Species Act (ESA). Even though the Lake Sammamish Kokanee is genetically unique it "does not meet the definitions of a listable entity under the agency's Distinct Population Segment Policy."

The extinction of the wild native Lake Sammamish Kokanee summer-run in 2003 was a bitter blow! In 2000 Save Lake Sammamish, along with a coalition of other conservation groups, filed for protection under ESA of the Kokanee. Despite statutory time requirements, USFWS did not respond to that petition until four years after the run had been declared extinct. The middle-run of Kokanee, concentrated in the Bear Creek basin, has also disappeared. Now the winter-run is teetering on the brink of extinction in Lewis, Ebright and a couple of other tributary streams at the south end of Lake Sammamish. For survival Kokanee need clean water and healthy streams, so they inform us of the health of Lake Sammamish.

The best efforts of a few dedicated scientists from various agencies and jurisdictions, a handful of politicians, and volunteers from conservation groups are unlikely to be sufficient to protect and save this remarkable species, which was a major food source for local Native Americans for eons. It is to our collective shame that by our careless behavior, thoughtless use of land in the Sammamish watershed, and political dithering, we are driving the earliest inhabitants of Lake Sammamish off the face of the earth.

Go to the following web pages to see details published by USFWS:

News release: <http://www.scn.org/earth/savelake/newsrelease.pdf>

Q and A: <http://www.scn.org/earth/savelake/qanda.pdf>

Frank Lill - Vice President

Save Lake Sammamish --- and we all win!

info@savelakesamm.org



(Rare Snail continued from page 1)

macrophytes and deposits egg capsules, or fastens them on solid objects, even shells of unionids. The snail grazes on detritus, diatoms, desmids (kind of green algae), and may rasp filamentous algae. This species occurs in about 4 feet or deeper water. Compared to surrounding lakes, Paradise and Pattison Lakes have a diverse mollusk fauna.

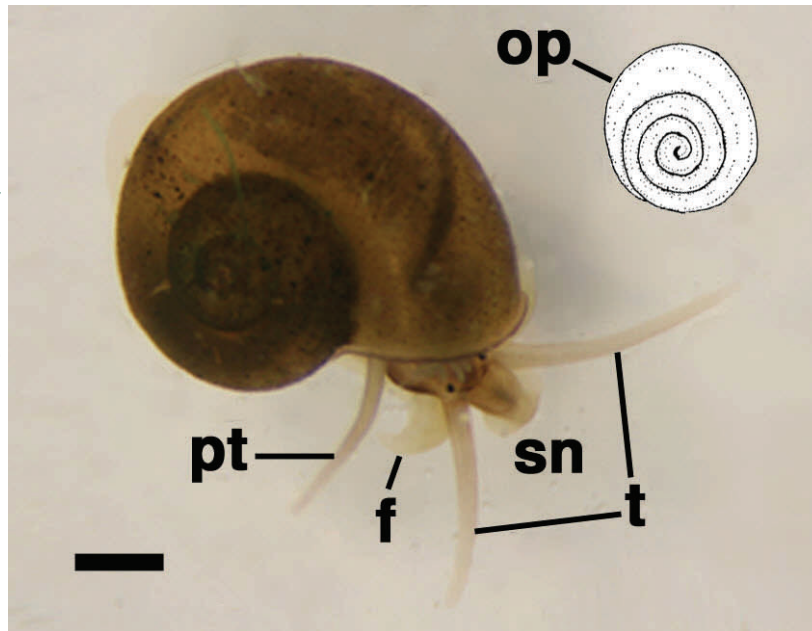
Valvata has long been considered unusual by being hermaphroditic (sometimes viviparous) and having a unique respiratory system (bipectinate or feather like gill on the left side of its head). Unlike most local lake snails, the presence of an operculum (corneous trap door which seals the aperture) and Washington *valvata*'s depressed shell (adult diameter ca. 5-7 mm), which is pale green in this species, makes identification easier.

This snail requires a well-oxygenated environment and has not been found in lakes that are strongly eutrophied or have anoxic substrates. It is also sensitive to pollution or siltation caused by grazing, human development, or activity. The Washington *valvata* is not found in lakes, which have been Rotenoned to kill native fish or had extensive herbicide treatment (especially copper-based). Our surveys have found very few western Washington lower elevation lakes retaining a complete native mollusk fauna. Since lakes are considered prime waterfront locations for residential development, many in the area of this species occurrence have developed shorelines, including housing with inadequate provisions for nutrient runoff management.

Paradise Lake has a relatively undeveloped shoreline

and is the more pristine of the two lakes in which this species is currently known to occur. The outlet of Paradise Lake, Bear Creek, has an active salmon run and one of the few populations of the western pearlshell (*Margaritifera falcata*) present in the eastern Puget Sound region. The more developed Pattison Lake is in a rapidly growing urban area (City of Lacey) in the southern Puget Sound region.

A possible new threat that could out-compete the



Live Washington *valvata* from Pattison Lake. f = foot; op = drawing of multispiral operculum; pt = pallial tentacle; sn = snout; t = tentacles. Measurement line = 1 mm

Washington *valvata* is the extremely invasive New Zealand mudsnail, recently introduced into Capitol Lake, Olympia and Thornton Creek, Seattle. Presently, Paradise Lake has no introduced mollusks but does have an introduced iris growing along the edges of the lake.

This species is considered a glacial relict because it lives in kettle lakes, which fill depressions created by large blocks of stagnant glacial ice left by the receding

Puget Lobe of the Cordilleran Ice Sheet. The lakes it lives in are situated within the south and east margin of the area covered by glacial ice during the Pleistocene.

The north migration of the Washington *valvata* was possible due to the unique geomorphology of the Puget Lowland, which resulted in the formation of several large proglacial freshwater lakes in the Puget Sound basin (e.g., Glacial Lakes Russell or Snohomish) connected by a complex system of ice-marginal channels on the southern and eastern side of the Puget Sound cut along the front of the Cascade foothills during the recession of the Puget Lobe. These channels occur from south of the Deschutes River, Thurston County to as far north as the Nooksack River, Whatcom County, and cut across existing drainage divides. During the maximum extent of the Puget Lobe,

mountain glaciers in the Cascades had already retreated up their valleys. This left a narrow, north-south elongated ice-free corridor along the eastern margin of the Puget Lobe where the majority of the ice-marginal channels formed. This may have allowed a rapid migration of freshwater snails, including the *Valvata*, across drainage divides into newly formed lakes and streams during the late Pleistocene retreat of the Puget Lobe. Pattison Lake sits in a glacial channel and is just east of the outlet channel of Glacial Lake Russell. Paradise Lake is straddled by several such channels, which served as consecutively lower outlets (uncovered during recession of the Puget Lobe) for Glacial Lake Snohomish, which formerly occupied the Snoqualmie River valley. This glacial lake initially emptied via the upper Cedar River drainage, which had a temporary connection with the Green River drainage through the Covington Channel (Big Soos Creek drainage). This connected with channels and lakes to the south that may have eventually drained through or near the Pattison Lake channel.

In addition to the *Valvata*, evidence of this migration route is supported by the presence of disjunct populations of two stream snails (*Juga n. sp* and *Juga silicula* (glass juga)) and the spring snail pristine pyrg (*Pristinicola hemphilli*) found in or near the Covington Channel. It is also further supported by the occurrence of three disjunct populations of a glacial relict fish, Olympic mudminnow (*Novumbra hubbsi*), with two sites in eastern tributaries of the Snoqualmie River, just east and northeast of Paradise Lake,

and another in East Fork Issaquah Creek, a former outlet channel for Glacial Lake Snohomish. Most populations of the snails (with exception of *Juga n. sp.*) and the Olympic mudminnow are found hugging the glacial margin in southern Puget Sound and in the western Olympic Peninsula.

It is a mystery where the Washington *valvata* lived during the Pleistocene glaciation, since it has not been found in lakes south of the glacial margin, and lakes it now occupy did not exist until the Puget Lobe receded to the north (beginning approximately 12,000 years ago). Most likely temporary proglacial lakes at the foot of the Puget Lobe, south of Olympia, provided refugia for this species. The formation of numerous kettle lakes in the Puget Sound region was a fortuitous event for the Washington *valvata*, allowing its continued survival after the ice receded.

However, with the exception of a few ancient lakes, most lakes, especially kettle lakes exist for a geologically short time and soon will fill with sediment (> 1,000,000 year span). It would seem that the existence of this species would be short lived as well, but it is very likely that the Washington *valvata* has survived through several cycles of glaciations, which presumably formed and destroyed kettle lakes over and over. It is up to us to preserve this snail's habitat so it can go on quietly living until the end of this interglacial period, beginning with the next glacial cycle, which will result in the formation of new kettle lakes for it to reoccupy.

Who are Water Tenders?

Water Tenders is a group of people who care about the wetlands and streams in the Bear Creek area and King County. We are your neighbors and we are all willing to put a little of our time into preserving, protecting, and restoring the wonderful natural heritage we are privileged to steward. Water Tenders has been in existence since 1989 and is proud of the many accomplishments of the volunteers. You may wish to attend one of our meetings and make suggestions and share your ideas. Please feel free to contact any of the following Water Tenders volunteers:

Secretary	Jonathan Morrison	425-788-8087	jonathanmorrison@hotmail.com
Treasurer	Dick Schaetzel	425-788-5083	dickandmary1@yahoo.com
Editor	Guy Baltzelle	206-369-0270	jan-guy@hotmail.com

The Signal Crayfish: widespread denizen of the Bear Creek Watershed

By John Reinke

The only species of crayfish native to Washington state is the signal crayfish (*Pacifastacus leniusculus*). It is common throughout Washington and plays an important part in the aquatic food web. As an omnivorous consumer of plant and animal matter as well as detritus, it fills a keystone role in the freshwater environment, serving as an important link between these energy sources and the aquatic and terrestrial animals that prey upon it.

The signal crayfish (or crawfish or crawdad) is easily identified by its generally reddish brown coloration, with a white or light coloration at the claw joint. Additionally, the surface of the claws and carapace (head and back) is smooth and not

bumpy. (These characteristics can be seen in the accompanying photograph.)

It reaches legal harvest size of 3 1/4 inches in about three years, but can often grow to 6 inches or more in 5 or 6 years. Signal crayfish mate in the fall, and the females produce 100-400 eggs soon thereafter. The eggs remain attached to the mother's abdomen and hatch in the late spring. The young travel with the mother for several more weeks, molting two or three times before striking out on their own.

Juveniles prefer shallow, weedy areas where they can find protection from predators, and from each other, since they are cannibalistic. Adults pre-



A signal crayfish found in the Sammamish River underneath the Leary Way bridge.

Dorsal view.

fer deeper areas, possibly to avoid birds and land mammals.

An invasive species known as the Louisiana red swamp crayfish (*Procambarus clarkii*) was discovered in 2000 in Pine Lake, in the city of Sammamish. It has proven to be very aggressive against signal crayfish and is now thought to be established around the lower Sammamish basin. So far, there is no record of it being found in the Bear Creek watershed or the Sammamish River. A few other American invasive species have been found in other parts of the state.

Ironically, the signal crayfish has been a very successful invasive species in other parts of the world. It has largely taken over from the native crayfish in 25 countries in Europe and England. It is immune to a deadly virus that has killed off the native

crayfish there. The signal crayfish has also been very successful in Japan, where it was imported as a possible food source for the local population in the early 20th century. However, the populace did not develop a taste for it, although the signal crayfish and the red swamp crayfish have largely displaced the native species.

Washington State does not require a license to catch signal crayfish. The season runs from the first Monday in May through the end of October. There is a daily limit of 10 pounds live weight, and all crayfish must be 3.25 inches in length. Any invasive species which are caught must be killed before removal from the capture site. A few licenses are issued annually for commercial harvest of signal crayfish from Lake Washington.

Ventral view.





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Water Tenders is a citizen volunteer group with a focus on stream protection in the Bear Creek watershed. For \$20 per year, you can help support Water Tenders, this newsletter and its important message of salmon protection and wise use of water resources in the Bear Creek Basin. Your donation supports this work and confirms that you believe our message is worthwhile.

Yes, I want to join Water Tenders. Enclosed are my membership dues. Two newsletters will be sent to members each year.

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