

Rotary District 5390 matching grant application from the Bozeman Sunrise Rotary Club

**Educational Trails System for the Glen Lake Rotary Park**

Project for Rotary FY 2021-2022

Rotary District 5390 Matching Grant Application

Grant Application Level: \$5,000 (\$2,500 of district fund / \$2,500 club match)

Contact: Steve Hample SteveH59718@gmail.com 406-599-9181

**Purposes of the Project**

- To provide a free, outdoor, interesting, STEM oriented educational trail system for young students, plus everyone else in a setting that can easily be Covid19 compliant
- To have a relatively simple, low cost and "hands on" club project that can be Covid compliant - such as planning via the internet and later having small volunteer teams install the signs in the open fresh air of the Park.
- To raise public awareness of our Rotary work in the Park (and thus perhaps later attract donations).
- To work cooperatively with other organizations and to continue to build good relationships.

Strategy of the Project:

Trail systems which employ internet based QR codes to send information to the viewer's smartphone have already been successful in other trail applications. This project is to take that type of success to a higher level, via a design that embodies STEM teaching and *a goal not of just giving recorded information, but rather stimulating curiosity and thus lifelong learning.*

This project will be an enjoyable tool toward that end. (STEM = Science, Technology, Engineering, Mathematics in an integrated educational approach. These are areas in which the USA has fallen quite behind compared to other modern countries.)

## **District Grant Application Narrative**

This grant application is to create a pilot program / demonstration project for an educational trail system on almost 90 acres at Glen Lake Rotary Park which contains a spring fed lake, a small stream, a marsh area, a river, and a large open grassland with wildlife. However, probably 80% of the visitors only use the lake area and do not think about the nature aspects of that or the rest of the park.

QR codes (similar to barcodes scanned when purchasing items) can deliver a voice message to the smartphone used to scan them. We expand on that normal use by instead using larger signs to ask a theme question(s) and include an additional thought provoking question at the end of the recorded message. This project will be groundbreaking; as far as we know it's the first of its kind to ask questions rather than just provide information. (Also,we'll have to dig holes in the ground to install large sign posts..)

The emphasis will be on educating young people in an interesting outdoor environment and fostering a desire for lifelong learning and adults will also likely enjoy using the system.

We are aware that younger and other trail visitors might not have a smartphone. We envision creating a document version that can be accessed on line - which can also serve people who cannot easily access the trail, but thus could do so virtually. The document version could be scanned and run through an online translation for people whose native language is not English. Having a dual language system is beyond the scope of this project, though it might be possible in some future year system renovation.

The project will raise awareness of Rotary and perhaps encourage donations and additional partnerships. QR signposts / totems will have a Rotary emblem. Additionally the main information sign will mention how Rotary has done much of the development of the park.

**This project fits these funding areas of Rotary District Grants**

**Basic Education & Literacy** - by assisting the work of local STEM and other educators

"STEM is a curriculum (K through 12) based on the idea of educating students in four specific disciplines — science, technology, engineering and mathematics — in an interdisciplinary and applied approach. Rather than teach the four disciplines as separate and discrete subjects, STEM integrates them into a cohesive learning paradigm based on real-world

applications. ... The goal is to get American students from the middle of the pack in science and math to the top of the pack in the international arena."

<https://www.livescience.com/43296-what-is-stem-education.html>

Please also see Rotarian Katie Capp's appended contribution on this point.

## **Disease Prevention & Treatment** - by creating an *outdoor* program for learning

In this era of Covid-19 and perhaps future viruses, a general recommendation is to meet in only small groups and to engage in outdoor activities with appropriate distancing rather than in crowded indoor gatherings. This project helps to create self guided educational "field trips" which can be used at any time by parents taking their younger children on self guided family educational hikes through the Park or perhaps as a homework assignment from a teacher. Of course, everyone will be able to view the project's free educational sign trails on a healthy outdoor walk.

## **Supporting the Environment**

This project is very supportive of the environment via on site thought provoking questions and information for children and adults regarding the environment and the engineering done to create the Park.

Here's a video of about  $\frac{1}{3}$  of the area; the trails go through the grasslands to the river and across it into wooded areas.

<https://vimeo.com/413747263> (Note the osprey nest near the end)

After this video was made, the drainage ditch in the area between the new road and the existing houses has been partly reclaimed and converted from a ditch into a meandering stream. The next half of that restoration project will include a child wading / exploration pond. This Pilot Project grant application does *not* ask for money for doing that work; it's mentioned as an example of future educational trail expansion - when seeding and planting is established and the area can be opened to the public. There is strong potential for expansion of this pilot project into that area.

## **Project Team Leaders**

Katie Capp, Bozeman Sunrise Rotary Club (BSRC) member, has agreed to be a co-organizer of this project and guide the educational aspects. Katie is a STEM science teacher in Belgrade who is working on her doctorate in education. (Her note on the importance of a Science Technology, Engineering and Mathematics approach to education is attached.)

Steve Hample, BSRC member, will be the co-organizer for day to day matters and general planning. Steve has been involved in developing the Park for 35 years and is a charter member of the Club. Steve has a doctorate in education and has been the major advisor for graduate students in education and has experience in administering grants. He's now retired and is driving other people nuts with ideas for projects.

Vance Paulson, BSRC member, quickly volunteered to help. Vance has great experience in woodworking and he designed the structure of the large beautiful sign mounted on the Park's building which was constructed by BSRC.

Amy Falcione, BSRC member, will serve this project as the Digital Content Coordinator. Her impressive background in marketing and enthusiasm for this project is a great fit. She looks forward to helping teachers and students come up with creative questions to post on the signs on the trails.

Julia Beck is Vice President of Networks for Project WET (Water Education Today). Julia visited the site in 2019 with Steve and attended an early discussion meeting where she was the person who suggested using QR codes. (see also below re Project WET)

John Parker had a career in supervising trail construction and use in Yellowstone Park and is excited to be part of this project and will advise us. We heard of John through his very active role in the local Sacajawea Audubon Society which is a major user of the Park and we welcome Audubon members to join us in this project.

## Partnering for Effectiveness and Efficiency

The lake area of the park is owned by the State, the grasslands and river area by the City and the Bozeman Sunrise Rotary has provided the vast majority of development cost and labor, following early work by an initial task force. Also, the **Bozeman Noon Rotary Club** recently installed a large artistic steel picnic shelter with a display of the history of Rotary in Bozeman.

**City of Bozeman Parks & Recreation Department** and the Bozeman Sunrise Rotary Club have had a long and productive relationship of working together to improve the Park. Mitch Overton, Director City of Bozeman Parks and Recreation Department, responded quickly: "Nice project Steve.... A really cool addition to the park. Thank You!" Staff member Addi Jadin has attended our Park planning committee meetings and has given good suggestions and feedback.

**Montana State Parks** leaders have been very encouraging and helpful regarding Glen Lake Rotary Park. The lake portion of the Park is owned by the state and in 2019 was leased to the City of Bozeman for 50 years. It was originally a gravel pit owned by the Hash and Beyl families who sold the property to the State at below market price so it could someday be turned into a park.

**Bozeman Rotaract Club** - "Bozeman Rotaract Club can volunteer to host and/or assist with uploading content to existing sites <http://www.bozemanrotaract.org/> or <https://bozemansunriserotary.org/> in support of this project. Each nature site could link to a web page with a unique URL containing a sound file, graphic, or other media pertaining to each nature site and accessed via QR code generated at no cost." - Rotaract Board January 2021

**Project WET** is an international non profit organization with this mission statement: *We envision a world in which action-oriented education enables every child to understand and value water, ensuring a sustainable future.* Through Project WET this effort could become a demonstration project & available to other Rotary clubs.

**Montana Science Center** is an expanded and broadened successor to the Children's Museum. Abby Turner, Executive Director & Rotarian wrote: "Thank you for forwarding! We're in - how can we help?" and "That's awesome, It's almost exactly our mission statement...just not specifically nature."

**Montana Outdoor Science School** - "Hi Steve, Wow, this is such a timely idea that will be relevant both during and post-pandemic! MOSS is definitely on board - the goals of the project align exactly with our mission to get families outside sparking

curiosity about what's literally in their "backyard." During the pandemic, we've been pivoting to giving area families easy ways to get outside with kiddos since we can't necessarily offer our in-person programming as usual - this is a great way to do that."  
- Jess Haas *Executive Director*

Contact Person: Steve Hample at [SteveH59718@gmail.com](mailto:SteveH59718@gmail.com)

## Appendix 1 QR Codes and their use with trails

### Normal use of QR codes

QR codes can be thought of as a modern version of the barcodes scanned at check out lines in grocery stores and other stores for many years. Virtually all recent generation smart phones can take a photo of a QR code and automatically connect via the internet to a specific voice file in a specific website and play the voice recording on the speaker of the person's smartphone.



This system has been used to give information to visitors on historic or other trails and in parks:

<https://scanova.io/blog/qrbatch/qr-codes-on-nature-trails/>

<https://www.nationalband.com/how-to-use-a-qr-code-for-educational-walking-trails/>

## Appendix 2

Specific STEM Education Theme: (Science, Technology, Engineering, Mathematics)

Students in the USA rank lower on science and math scores than students in many other countries: 24th in Science and 39th in Mathematics, based on tests of 15 year olds reviewed in this article (from February 2017):

<https://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/>

Doctoral candidate & club member Katie Capp, who teaches STEM based science classes in the Belgrade high school, will coordinate educational content for this project.

Other trails systems provide information; *ours will ask questions*. Instead of "At this site in 1877, the first ..." our format will be:

"What bird lives in the nest on top of that pole and why in this location?" or "With all this water, why don't you see any frogs in this park?" or "If you were to plan how to improve this park, how could you mathematically estimate the number of people who will be using the park five years from now?"

The QR recording will answer the question(s) on the sign, but then will ask another question and suggest a way to find an answer. It's a way to make STEM learning fun. *The goal is to stimulate curiosity and lifelong learning.*

During this Covid19 epidemic, many schools are shuttered and students must rely on what teaching can be done over the internet. Hopefully this epidemic will end by the time this project is completed, but if not, the project will help with distant learning plus for general learning in years to come.

Ideally the website for the QR code recordings can be linked to or within the BSRC club website.

Part of the reason is to drive traffic to our site so the general public learns that Rotary is the main force in developing the Park. That might attract donations and perhaps attract new members.

The content of the questions etc. will be solicited from teachers, bird watchers, local biologists, engineers ... anyone who can think of interesting questions that would be fun for ages of about 4th grade to senior high and of course everyone young at heart. We anticipate that a professional DJ or announcer will be willing to read the content into the voice files in the QR website. (Note: Perhaps some of the recordings should have female voices.)

While this project is based on QR codes, we will also have text copies of the content on our website. This is for people who do not have access to a smartphone or who cannot physically walk through the Park. We could include a photo of each sign just before the text. (People whose native language is not English could copy the text and run it through an online translating program. Possibly we could later add a parallel system in Spanish if we have sufficient demand and resources.)

## Appendix 3

### Timeline - Budget - Physical Aspects

#### Timeline

The trail system will be built in phases over several years.

There are roughly 5 sections of the park: The Lake area, the Grasslands area (former landfill), the River Trails area (with GVLТ bridge and trails), the new Two Acre Parcel / Meandering Stream area and the undeveloped "North 6 acre parcel".

Summer 2021 - Establish the internet system and the "pilot project" of 2 to 6 posts in the Lake area plus one large descriptive sign. Rationale: This is the heaviest use area and will generate the most interest and possible offers of donations or collaboration. Digging in the ground (installing posts by volunteer hands) should be relatively easy in this location - below the topsoil should be mostly gravel. A goal will be to keep costs low and not interfere with road and parking projects.

Summer 2022 - Expand into the Grasslands area and a bit of the River Trails - 4 totem posts? Note that landfill debris under the Grasslands imported topsoil might be a challenge for digging. Also the River Trails area would have a lot of tree roots and might be very damp soil that could rot posts so perhaps use an anchoring system with a sack of concrete mixed in a wheelbarrow and rebar similar to what Steve has done on a small scale with old rotting fencing at his house.

Summer 2022 or 2023 - Expand into the new "Meandering Stream" / 2 acre parcel after the planting of grass and bushes and trees will allow visitor traffic. This would be focused on younger explorers. Some empty posts may have been planted in 2021 and if so, then placing signs on the posts would be relatively easy and inexpensive.

Future year - If permissions can be obtained and if Gallatin Valley Land Trust can be the main force to put trails in the North 6 acre parcel, install 3 or 4 totem posts there as the final part of the system.

"Nothing succeeds like success" - If the project looks successful after the first year, we might possibly attract other organizations or businesses or people outside our club to "sponsor" an educational post, perhaps at a cost of \$250 per post which might be a one time permanent donation or for a 5 year \$50 per year sort of sponsorship (which starting in year 6 could provide maintenance money). There's no assurance, but future costs might be quite low.

## Physical Aspects

Eight foot long posts (probably redwood or cedar) posts with custom signage will be the main visible features of the project. Also a large general information sign.

The posts are intended to be similar to the GVLT signposts already in the park. Our "totems" will be slightly larger to accommodate signage that will be 8" wide and probably 12" long. The length of the rot resistant timbers will be 8' of which 2.5' will be in the ground, with gravel on the bottom for drainage.

The signs will be vandalism resistant by being printed on special vinyl which is then mounted onto thin metal plates. If a vandal spray paints a sign, the paint can be wiped off with a cleaning solution; if the thin metal blank is damaged it can be replaced. After a few years a sign's colors may fade, but the sign can easily be replaced by a newly printed copy.

We can provide our own volunteer labor and likely GVLT and/or the Audubon group might add some people and some nearby residents might participate.

The cost of lumber skyrocketed during 2020. Prices indicated are as of November 2020. Included are extra timbers in case we have surplus volunteers and the opportunity to demonstrate more aspects. Sign blanks are likely purchased in quantities, like printer paper. Part of our plan is to print extra copies of the signs to have on hand to quickly replace any that become vandalized or damaged. While professional graphic design is often billed by the hour and sometimes requires revisions, we are working with a Rotarian in the sign business and have had very good results on another project so these budget estimates should be reasonably reliable.

<b>Glen Lake Rotary Park Educational Trail Sign Budget for Rotary FY 2021-2022</b>			
<b>TOTEM SIGNS</b>	<b>Quantity</b>	<b>Each</b>	<b>Extended</b>
10" x 10" x 8' Rough-Sawn Timbers	8	\$266.25	\$2,130.00
8" x 12" x 100 Aluminum Sign Blanks	100	\$1.25	\$125.00
Graphics for Sign Blanks	8	100	\$800.00
#8 x 1.5" Screws (box)	4	\$7.00	\$28.00

		<b>Sub-Total</b>	<b>\$3,083.00</b>
<b>ONE TRAIL ENTRY SIGN</b>	<b>Quantity</b>	<b>Each</b>	<b>Extended</b>
4" x 4" x 8' Redwood	3	\$24.98	\$74.94
2" x 12" x 8' Redwood	1	\$41.49	\$41.49
1" x 6" x 10' Cedar T&G	3	\$19.99	\$59.97
3/4" AC Plywood	1	\$49.79	\$49.79
1" x 4" x 8' Cedar	6	\$7.69	\$46.14
Cedar Shakes (25 sqft/box)	1	\$85.00	\$85.00
Post Bases	2	\$25.00	\$50.00
Concrete Mix	8	\$3.99	\$31.92
Lag Screws	16	\$1.00	\$16.00
Fasteners (misc.)	1	\$25.00	\$25.00
36"W x 32"H x .080 Alum. Sign Blanks	2	\$35.00	\$70.00
Graphics for Sign Blanks (two sided)	2	200	\$400.00
		<b>Sub-Total</b>	<b>\$950.25</b>
Internet QR system (labor by Rotaract)	1	200	\$200.00
Professional recording / studio time	3	150	\$450.00
Reserve for price increases / unexpected			\$500.00
			<b>\$1,150.00</b>
		<b>TOTAL</b>	<b>\$5,583.25</b>

Note: The invisible part of the project is the significant internet system which is the driving force behind the project; our Bozeman Rotaract club has agreed to provide labor for that important role.

Appendix 3 Photos of existing signs in the Park, a map and a mockup sample information sign (see following pages)



MAIN STREET  
to the  
MOUNTAINS

GLEN LAKE ROTARY PARK

East Gallatin  
River Bridge

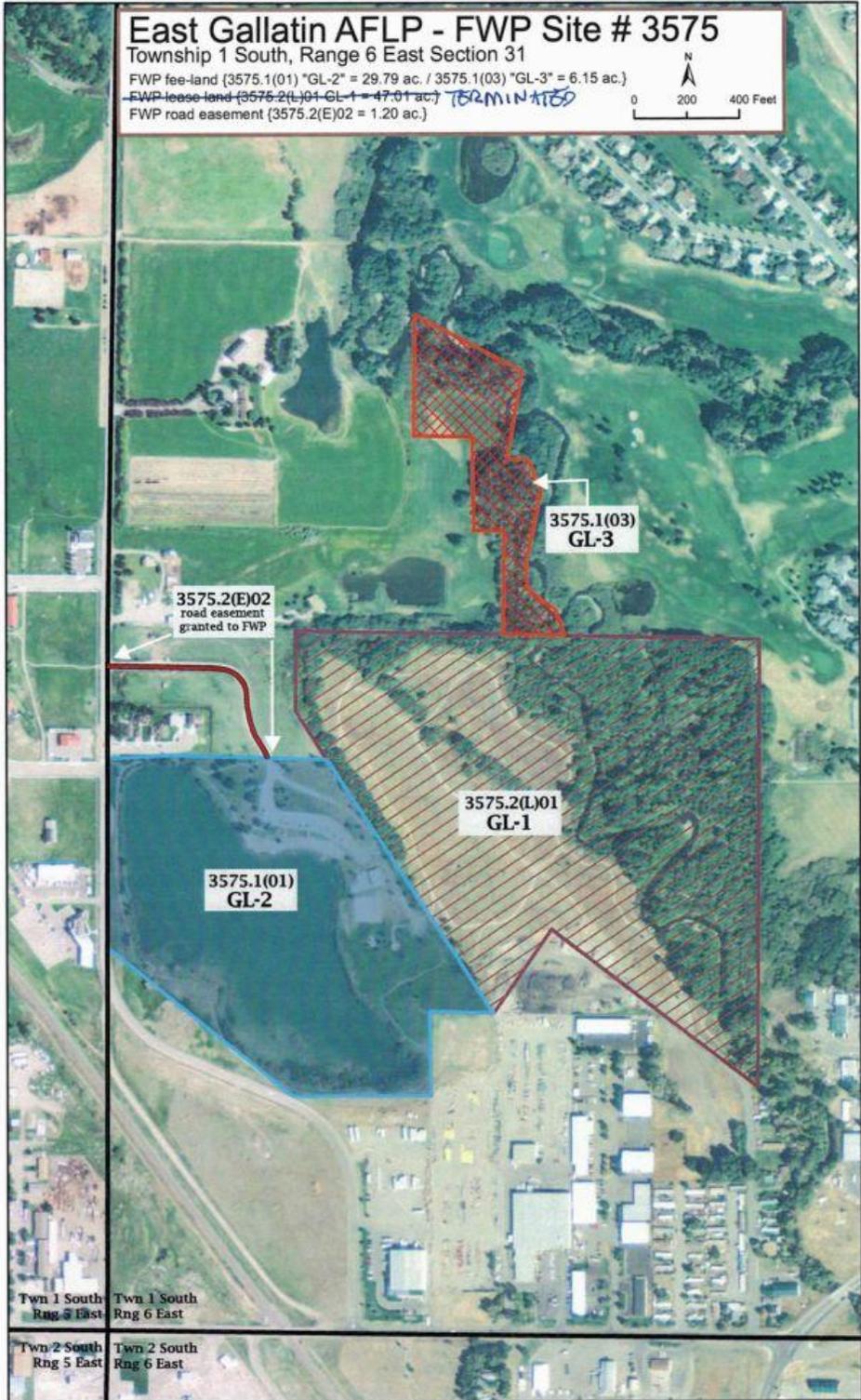
Boylan Road .3 mi

CREATED & MAINTAINED BY

GALLATIN VALLEY  
LAND TRUST  
www.gvlt.org

BOZEMAN  
PRESERVATION  
www.bozeman.net





See also Certificate of Survey No 1221

What birds live on the tall pole?

Why do they like this particular park?

Who created the pole for them?

Where do they live in the Winter?



Scan this with a smartphone to get answers and a bit more information:

If you don't have a smartphone, when you are near a computer go the site of **Bozeman Sunrise Rotary Club** and look for the Trails button. If you are a student, perhaps ask a teacher. Also look for the Sacajawea Audubon Society on the internet.



This educational trails information system was created by volunteers in the Bozeman Sunrise Rotary Club and their friends for use by the public. Many of the trails were built by Gallatin Valley Land Trust. Other groups also helped create this park, starting in 1983. The City of Bozeman maintains the park while the Rotary clubs continue to develop it.

## Appendix 4 Evidence of Educational Value - STEM science education

### Glen Lake Rotary Park Grant

Katie Capp

Through this grant, children, families, and community members will be able to engage in STEM and community-based outdoor education that provides meaningful STEM learning experiences that ignites questioning and sensemaking, as well as, offers the health benefits of being physically active outdoors.

Children have a natural tendency to enjoy observing and thinking about nature (Eshach & Fried, 2005), this proposed project capitalizes on children's motivation to explore the world around them. Research has shown that with guidance, educators, and parents involved in park-based informal education programs, children can reframe their view of the outdoors as a place of play to a place with ample learning opportunities all around them (Flouri, Midouhas, & Joshi 2014). By encouraging and directing natural curiosity, this project can help children begin to make sense of the natural world around them and spark the minds of life-long learners. It has been proven that early engagement in STEM experiences provides a solid foundation for subsequent development of scientific concepts that children will encounter throughout their lives (Eshach & Fried, 2005).

An important attribute of this project is that it not only provides children opportunities to develop and practice STEM, it is placed in a local outdoor environment. The outdoors is an optimal context for learning and the promotion of physical activity. A longitudinal study found that children that participated actively in the outdoors were significantly more likely to participate in physical activity into adulthood (Smith, Gardner, Aggio, & Hamer, 2015). In these unprecedented times where learning has gone remote, it is imperative for children to have an opportunity to engage both their minds and their bodies in a safe, local, outdoor environment.

This grant will create physical waypoints that pose STEM-based questions and provide QR code accessible information for self-guided outdoor exploration that children, families, and community members can access throughout Glen Lake Rotary Park (Bozeman, MT).

### References

- Eshach, H., & Fried M. N. (2005). Should science be taught in early childhood? *Journal of Science Education and Technology*, 14(3), 315-336.
- Flouri, E., Midouhas, E., & Joshi, H. (2014). The role of urban neighbourhood green space in children's emotional and behavioural resilience. *Journal of Environmental Psychology*, 40, 179–186.
- Smith, L., Gardner, B., Aggio, D., & Hamer, M. (2015). Association between participation in outdoor play and sport at 10 years old with physical activity in adulthood. *Preventive Medicine*, 74, 31-35.

## Here's a fun experiment by Teri Lumsden following our Dec 4 discussion

Hi Steve,

I asked three 7<sup>th</sup> grade girls (12-13 years old) to ask any curiosity questions that popped into their heads and I wrote them down.

We parked next to the porta potties and walked a loop to the east as I brought my dog. The following is their list of questions. My plant identification is better than a novice but I'm not an expert. I've inserted the plant names. We spent a lot of time at the creek.

- Why is there a hill? (bank from the parking area)
- Why is there a pile of old wood (wood fence posts)?
- Is this an old farm?
- Why don't willows grow there? (the break between the main park and walking trails)

Steve's sample answer (in a recorded voice) : Willows likely grew here before the area was used as a garbage dump and before volunteers in Bozeman helped cover the garbage and make this area into a large grassland. It's now fairly tall grass. Where else is there a large grassland near the city? *(start drumbeats)* This area between Bozeman and Three Forks was called the Valley of Flowers by the Native Americans. *(taper drumbeats)* Do you think some native flowers should be here? Which would survive? Could you help control bad invasive plants? Discuss with your teacher and / or visit the nearby Bozeman Parks and Recreation office. You can go to their office ... website ... Thanks for your question!

- What is that vine thing (clematis) growing through the bushes? Is the fluffy part seeds?
- Why are there so many bird houses? Who put them there? What bird lives in them? Can bigger birds get to the babies?
- Why is some of the trail muddy, some icy, some snowy and some dry?
- Why are there so many fallen trees (old popular species)? Did wind blow them over?
- Why are there so many little trails (wildlife trails) off the main trail?
- Why does the weeping willow tree grow so weird?
- Why do some of the trees still have dead leaves on them still?
- Why does Dandy (my dog) pee so much? Why does Dandy choose to sniff some stuff and not other stuff? Why does Dandy like some little trails and not others?
- Why does the creek have more ice in some parts and less in other parts?

- Why does some of the ice break easier than other ice?
- Why can't I find rocks to throw at the ice? J
- What are the old concrete blocks, railroad ties and rusty metal from? (The debris was under the bridge as they were looking for rocks. My guess is leftover from original bridge.)
- Why does some of the ice look like crystals? (It was a north facing section of the creek and my guess is there was a little breeze when the ice formed.)
- Why do Alder cones look like that? (They didn't ask about maple flat seeds but I saw them.)
- Why is the underbrush so thick in places?
- How does a bird choose where to build a nest? Some are high up, others buried in shrubbery.
- What animals live in the thick underbrush?
- Why all the dips in the trail? (asked when off the main trail at a bend in the creek. My guess is an old path for spring water overflow and the river has since adjusted to a new overflow path.)
- Why are there so many bridges? Some don't have creeks under them. (trail wet spots)
- What are those tracks in the snow? (deer, dog, rabbit and a small bird)
- Why do I keep getting dirt and sticks in my shoe? J
- Why do I see green plants in the creek and ice? (watercress, maybe...not certain)
- Why do the Aspen trees have gray spots?
- Why are the old Aspen dead but still standing?
- Why do some of the trees have mushrooms growing on them (I saw conches as well.)?
- Who cuts the trees off the trail?
- Can kids make forts in here?
- How long does it take the leaves to decay?
- Why are rose hips red? Can you eat them?
- Is that mold, lichens or moss on the trees?
- Is that mistletoe on the branches or homes for bugs? (I think it was diseased wood from bugs.)
- What is that pipe for? (culvert under trail)
- Why do some trees have brands? (carved items on the Aspen)
- Why do we sometimes see an old piece of a fence?
- Why are some of the logs hollow?

Since we didn't walk around the lake, I asked them what they remembered seeing from past excursions. Their answers were: the beavers, otters, turtles, the wet springy area, the pipe that leaks water (south side), and the sand.

I hope this helps. Teri

Is it true that Monarch butterflies are dying because they like milkweed and here they do not have enough food or places to live?

There are 5 Milkweeds that are native to Montana. Some are known as Mimulus or Asclepias. Common names for these are Yellow Monkey Flower, Lewis Monkey Flower, Thin-leafed Owl Clover, Showy Milkweed, and Whorled Milkweed. Most grow along streams and in disturbed soil areas so it would seem that they would be suited to the stream bank of the new stream alignment. I would have to do some research to find sources of seed as well as if any of these would attract Monarch butterflies. Maybe a mixture of these would be fun to try. By the way, the 'Lewis Monkey Flower' is interesting in that it was collected in 1806 by Meriwether Lewis and named for him. *Could be an interesting "Factoid" for your Educational Trail system. I will look into the new seed catalogs after the 1<sup>st</sup> of the year as to Milkweed availability.* Bob F.