

The Helical Flow Effect



**How do gold placer
deposits form?**

Prospector Jess

Hunting4Gold.com

The Helical Flow Effect

(How do gold placer deposits form?)

Prospector Jess - Hunting4Gold.com

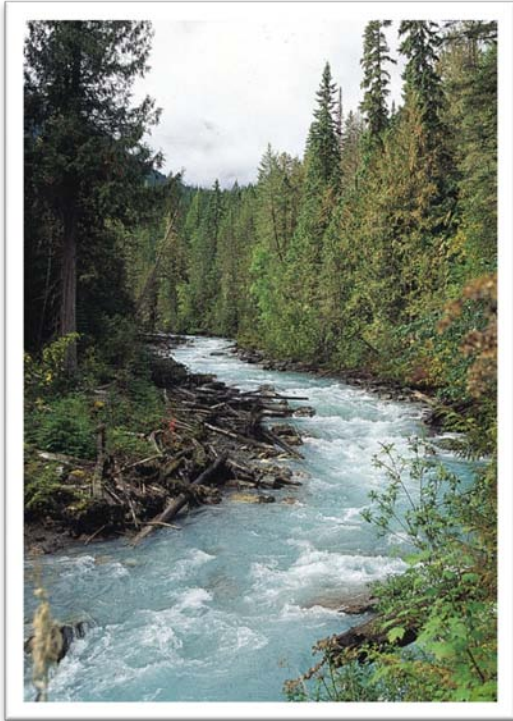


Raging floods quickly erode soil and rocks that contain gold. As the soil and rocks are eroded, they combine with other debris and begin to flow rapidly down the slope. This makes a kind of dense mixed slurry, much like concrete in a cement mixer. As a flood accelerates this massive load of water, mud and rocks together. All the heavy objects in its path will get caught up into the flow. This debris flow is building up a huge amount of energy as the stream accumulates mass and motion together. Quickly sinking to the bottom-most levels will be gold.

One important thing to keep in mind is that any heavy dense material will always be at the bottom of this rushing bed-load, not floating up toward the surface like some people draw it. Gold is one of the heavy dense elements that will tend to follow along the bedrock or lowest part of the bed flow and stay there. That's part of what makes gold concentrate, and that's also why you must go to bedrock when you sample!

Lode gold and ancient alluvial placers are picked up and carried along for the ride. This mixed slurry of material contains rocks with quartz gold lode along with any ancient placer gold that was trapped deep in the hillsides that are now being ripped apart by the torrent of flowing mud and debris. I will show you later how you can discover more about gold site clues to look for.

The Helical Flow Effect



Placer gold deposits form when the debris flow slows sufficiently to drop the gold out of the moving slurry, even in desert (flash floods.)

It isn't until the flow starts to slow down that it begins to drop its payload of gold.

Specifically, the torrential flow will drop the gold at the earliest point possible depending upon the size of the gold and its density.

Dropping gold will also depend on whether or not it's trapped inside of something lighter in density such as quartz in the form of gold lode float. It's not unusual for gold float to continue traveling on downstream, with its

gold payload still embedded, until it finally breaks out of the quartz it's trapped in.

What Kinds of Water Flow Impact Gold Deposits?

Swift moving - high energy flood flows will impact the depositing of gold. These flows need larger water volume and steeper slopes to have enough energy to move gold and the streambed overburden covering it.

It takes a very swift high energy flow to entrain gold and push hard enough on the gold and stream bed overburden to move the gold bearing slurry downstream. This is because gold is much denser than anything else in the stream bed and tends to travel on the bottommost layer of material that is flowing down the stream along with other very heavy large or dense objects.



The Helical Flow Effect

That means, to move significant gold, we're talking about super high raging flood waters- think extreme flood condition; hundred-year plus floods. Of course lighter gold particles will re-concentrate every year in seasonal floods hence the name flood gold. Coarser and denser pockets of gold such as nuggets are going to need something really big to move the gold and the boulders that they tend to be trapped under.

To move gold the flood must have enough energy to move dense and heavy objects and keep them moving. Energy is the key to understanding flood flow and whatever it drives downstream. That means that this flood water is moving deep and steep, steep enough to generate swift currents downstream.

This torrential flow moves gold downstream but does not always concentrate it in a line. When a flow strikes against gold or the things gold is being carried along with, it tends to move in a line straight downstream unless acted upon by some current or force that would steer it in another direction. We'll discuss what forces would do that in a moment, because there is something really important to pay attention to, as it will steer gold into a direction you care about.

How Helical Flow Affects Gold

Helical flow is needed to make a line or pay streak. Helical flow has the ability to steer gold perpendicular to the stream direction. In other words, it can cause gold to move sideways along the stream bed. Of course it's not going to move directly sideways across the current; instead it will move in a diagonal direction.

The important thing to note here is that all of the gold is going to be moving along this diagonal and at some point along the diagonal the gold combined with the slowing velocity of flow will strike a balance and the gold will drop out. In fact, under these conditions, gold will tend to drop out in such a way to form a line or a paystreak based on the average size of the gold particles sorting heaviest first, to lightest last, when you move toward the inside of the flow.

The Helical Flow Effect

What Is A Helical Flow?

Think of a cork screw or vortex spinning on its side. A helix is shaped like a spring or a corkscrew. As the flow moves downstream it also spins in a sideways rotational sense. What this means is that the flow begins to behave somewhat like the brush on a street sweeper, moving the gold into a nice neat line angling across the stream bed at bedrock until just enough energy is dispersed as the radial flow slows down and the gold stops moving or as the material that the gold is hiding under stops moving. At that point a gold line begins to form!

The sideways spin of the vortex will tend to form along the length of the flow. This vortex axis always takes place parallel to the flow of the stream. The spinning vortex itself rotates perpendicular to the stream flow. Just remember that spinning action when you're looking at the stream because it's hard to envision that gold pay-streak sweeping motion without it. Try to think of it like a street sweeper or a bottle brush, with the length of the brush running downstream but the rotation spinning sideways, sweeping gold to the side at all times especially in high flow.

A twin opposing-spin helix pair will tend to form on straight sections. This twin opposing rotation will cause gold to sweep to the center of the stream flow. One of the unique things about helical flow is that it will form in pairs on a straight uniform water channel.

Rotation of the twin helical flows is such that the two sides sweep gold traveling on the stream bottom, toward the middle of the stream. At that point each helix counter-rotates back upward toward the top of the flow and back around over the top dropping the gold in the center along the mid-line. You will see evidence of this flow pattern on a steady moving glassy stream as the counterrotating flow of water boils up in the centerline of the stream as it rises to the surface.

One helix will get damped out as the flow turns a bend - sweeping gold to the inside edge of the bends. Around the bend, the outside helix wins and the inside helix gets damped out causing all material to sweep to the inside of the bend on the

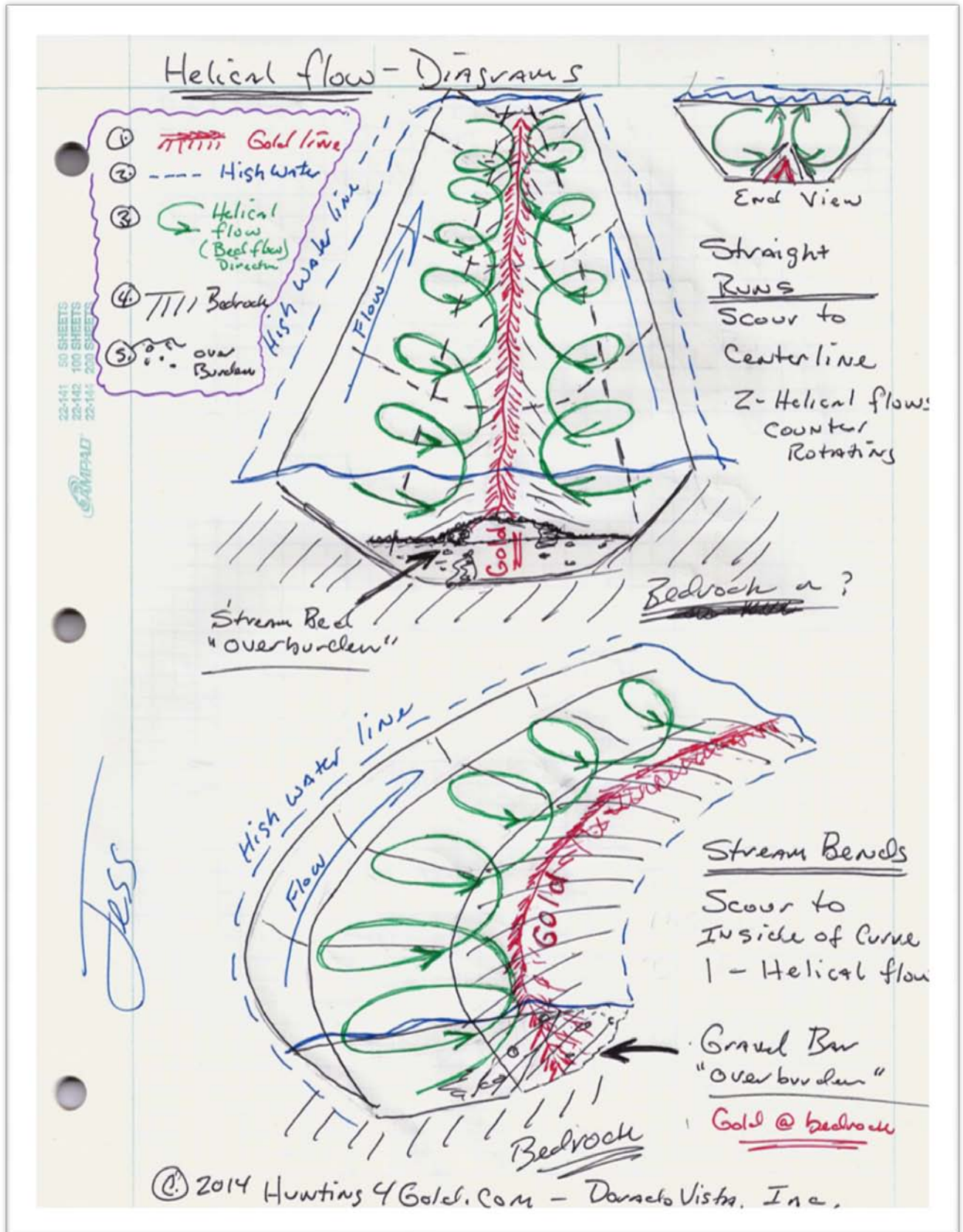
The Helical Flow Effect

shore line.

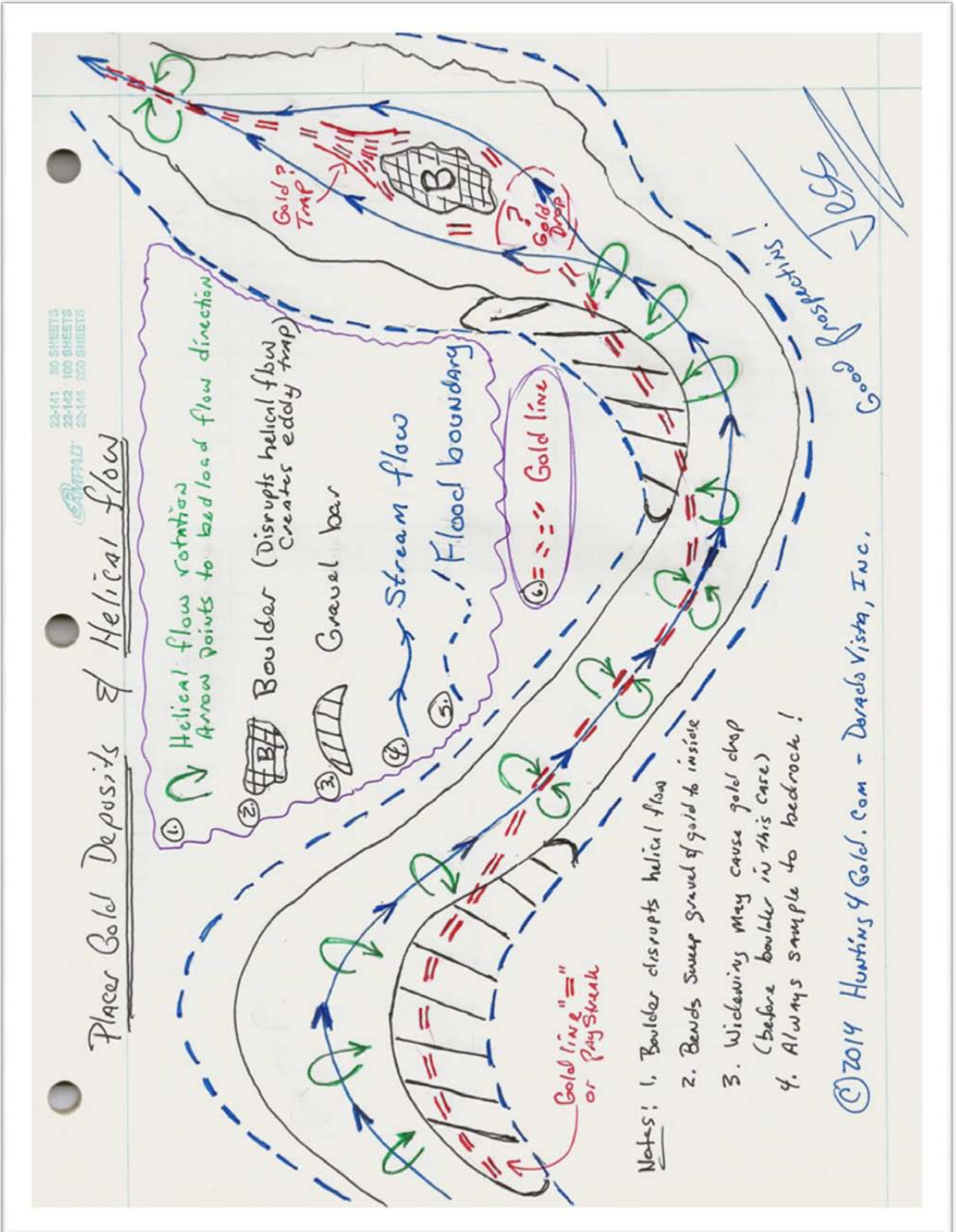
On the inside edge of this bend, first the heavy rocks and boulders settle to the bottom, and then finer sand and silt materials, as you go further and further toward the inside of the bend. This coarse-to-fine material grading of rocks goes along with the trapping of heavy gold nuggets all the way to fine flour gold, as you go further inside the curve. Of course the volume of each grade of gold will depend on what volume of each type of gold that is in the stream to start with.



The Helical Flow Effect



The Helical Flow Effect



The Helical Flow Effect

What Clues Do You Look For?

So a few important clues to look for when you're considering placer deposits and specifically identifying where helical flow may have swept gold into lines and pay streaks are covered in this next section.



You can learn more about gold site clues in my 20/20 Prospecting PDF report. You can learn more about that report with this link.

[Check out my 20/20 Prospecting PDF report here](#)

High flow lines are identified by looking at trash, river cuts and debris along the edge and height of the high water line, as well as high water trash trapped in trees, branches and bushes well above the low seasonal flow region.

What you're looking for may not even be quite visible up close if it's been quite a while since a serious flood event, like a hundred year or 50 year event.

This is why it's so important to go up slope and get a bird's eye view of your site, maybe hundreds of yards away. Look down upon your site to see indicators of; gross land movement, erosion and large trash objects like boulders, logs, trees stumps, large heavy steel, and other heavy large objects that took a lot of waterpower to move up high. Take photos and videos with GPS info if you can.

That hidden line on each side of the stream course is your high water line. Map it and pick a few landmarks to work from, when you return to stream level.

The Helical Flow Effect



Sweeping Turns Along High Flow Areas

While looking down upon your site, map out the gross sweeping turns and clear landmarks that you can use once you get down on the Creek to determine where the edges of the high flow bend are.

Map where the bends start and where they stop, marking each bend in sequence. Also, make sure that you identify any unique river cut benches, boulders and gravel bars that need investigating in addition to what you see for the turns in the flow.

Inside Turns - Gravel, Sand and Cobble Bars

Once you've identified your sand and gravel bars and where the turns are located on your map you can begin to analyze where the storm driven helical flow would've taken place and what direction it would've pushed the gold. This direction points to where the lines of gold may have formed by helical flow deposition.

These are places that you should investigate with your prospecting samples. These aren't necessarily where you should spend all your time but they are definitely places that you should start sampling. If you start seeing where paystreaks are, it'll save you a lot of hassle and a whole lot of time by focusing your efforts there.

The Helical Flow Effect

What Impacts Helical Flow?

Now precisely understanding helical flow itself, like so many things concerning hydrodynamics is not so much science for given creek bed as it is art. It's the art of spotting where the average flow would've taken the gold including all the obvious natural flow variations that impact the flow and where it deposits your gold.

Below I list some things that will impact the accuracy of your helical flow estimation:

Turning flow - Of course, as I mentioned earlier helical flow will change based on turns and the type of turn. For example the vortex flow formation depends on how sharp and even the turn is and how deep the creek bed is, along with boulders or other obstacles in the flow.

Straight flow - As the turn begins to straighten out helical flow will sweep things into the centerline. Of course between turning and straight that line is going to cross to mid stream in a kind of S-curve from the side where the curve is bent to the middle as the stream flow straightens.

Notice the gold line doesn't go immediately to the center line, instead it sweeps slowly from the outside to the middle and then as the turn bends the other direction it will trail over to the other side. This pattern is typically shown is an S-curve across the centerline and down the middle if the stream is straight for a sufficient distance. Of course what is sufficient depends on the speed and uniformity of the flow through that region.

Notice how often things about flow and gold deposits get qualified with a qualitative "it depends" factor. It's important to note that the science of understanding water flow is by definition approximate at its best.

In a real world setting, this often means you're better off just getting a feeling for what the flow may do and then use that understanding to form your hypothesis for where to take your gold samples. Then use the samples to prove that your hypothesis is true or false by measuring the gold in your samples.

The Helical Flow Effect

Key objective: What does the gold sample predict about where to sample next?

Start by sampling in the areas that your flow based hypothesis or educated guess predicts the gold will concentrate. This hypothesis is based on your best guess using a bit of art, science and a whole lot of experience. You'll get this experience and ability when you have tested enough samples. You'll learn this stuff best by prospecting more and taking more samples.

Large obstacles - Objects such as boulders, cliffs and bedrock obstacles that jut out into the creek and other flow disruptions of sufficient size will definitely affect helical flow and the formation of helical flow which in turn affects where gold will tend to concentrate. In fact obstacles and their flow disturbing turbulence will impact whether a pay streak will form at all.

Keep that in mind if there's a big disturbance in the high water flow. That disturbance may easily alter where your helical flow would tend to deposit gold. For example a large boulder will tend to form a great big trap or sweeping eddy current and break up the helical flow at the same time. A big trap like that will tend to trump the S-curve and the linear gold placer paystreak rules given earlier. At that point you're looking for a big placer pocket or down stream gold trap.

Stream speed drops - As the stream-flow slows down the gold will tend to drop out of the flood flow at the point where the flood speed starts to decrease. These will also disturb the existing vortex flows if any exist. Look for sudden widening or deep pooling areas. Anywhere a fish would like to feed as food drops out of the flow. This is also where cobbles and gravel tend to collect in flood conditions. Avoid smooth bowls as your gold will tend to blow out of those in a rushing flood.

Why Do Helical Flows Sweep Gold?

The vortex formed in helical flow contains energy. Helical flow energy takes the form of the rotating and moving mass of water and debris. Much like the prop wash of a boats propeller, this dynamic rotating water power energy will move things that it pushes against. When a stream of water and bedload entrained in it moves, it's actually moving a fair amount of mass per unit volume. That flow

The Helical Flow Effect

contains energy in the form of mass and speed. This energy, when restricted to the creek bed, will tend to take on certain flow patterns based on friction and flow restrictions. One of these patterns is the formation of a helical-flow; of course there are other jet patterns and turbulent eddies that can take place as well, especially when flow-disturbance and turbulence are involved.

I won't go any deeper into this subject of turbulent flow, because it's a rather difficult topic to engage with and explain, and it isn't needed when you're just looking at the basics of paystreak formation.

For helical flow the energy is contained in the downstream movement of mass and in the sideways rotation of the complete stream bedload and water mass. It's a rather complicated thing but just knowing that it behaves like a massive corkscrew is good enough for what we do here.

The sweep of bedload material containing your gold is both along the flow (in a line downstream) and partly sideways to flow (rotating perpendicular-to-streamflow) that means gold will generally move diagonally until it finds a trap or lower speed drop point.

I included a diagram to show you what I mean by this rather complex corkscrew like description. Just keep in mind speed changes as the corkscrew turns based on how much volume of water must flow through a given zone along with friction.

If more water has to make it through a given amount of time the water's going to speed up, if it's less volume per time then it slows down. That slowing action is what drops the gold. As I mentioned earlier, you'll want to look for wider or deeper transition regions in the high water flow. These are places where it will slow the flow "just enough."



The Helical Flow Effect

What Are Some Other Clues To Look For?

Gravel and Sand - Gravel to sand deposits in neatly sorted sizes is often a visible indicator of the action of a helical flow and for that matter other types of flow as well, such as traps or turbulent eddies.

River Cuts - River cut terraces are often found where the edge or stair like terrace lip. This lip is much easier to see at a distance and than it is close-up. This is because of the long ridgeline that it leaves along the edge of the river canyon is usually pretty small in height but visible along its great length at a distance. It is this ridgeline that can also be left high and dry in the case of a high bench gold deposit. Look up hill too; you may see an ancient bench deposit with the same type of river cut terrace and rounded gravels.

Trash Clues - What you're looking for specifically, in the way of trash clues, is any heavy flood debris or material along the outside border forming in areas where high flows would've pushed the water to in extreme flooding conditions, up near those river cut ridges.

Bedrock Depth - It's important to note the bedrock depth through the overlying overburden material. This overburden is the rock sand and gravel above bedrock and the pay layers. You need to know the depth to bedrock because you want to get within 1 to 2 feet of bedrock in most cases to identify these pay layers where gold nuggets and coarse gold will form paystreaks. Of course clay layers and hardened rock deposits within the overburden can also act as false bedrock under the right conditions and so you will want to identify those on your map as well.

Cracks, Boulders and Other Gold Traps - Cracks, boulders, fissures in the creek bed slate beds and bedrock outcroppings can all form gold traps. Material that will disturb flow will also act to capture gold and concentrate it too.

Diversions to High Flow - Anything that acts to alter high flow conditions will also alter the direction of helical flows and even the formation of them if they form a sufficient disturbance to that flow which is almost always going to happen. One

The Helical Flow Effect

thing to watch for is large disturbances and note them on your map. Think about how those disturbances would change the flow and in which direction.

Narrowing or Widening of High Flow - Narrowing of the flow for a given depth of flow is going to speed up the stream. Widening of the flow for a given depth is going to slow it down. Anything that slows the flow will tend to drop gold out. Anything that speeds the flow up will tend to push gold downstream, that's a pretty standard rule in prospecting.

This set of placer gold prospecting clues for you to look for ought to get you going for now. There's too much additional detail to cover regarding other clues that you may need to be aware of when prospecting. That much extra material I can't cover in this quick prospector's report. My goal here is specifically to explain what helical flow does to form gold paystreaks and how you can use that knowledge.

To accelerate your prospecting success, the best place to start your gold prospecting efforts is getting good site information through detailed historical research.

If you want to find out more about locating sites for gold prospecting and finding gold, through quick off-site gold mapping research, [Click here to learn how.](#)

Good Prospecting,

Prospector Jess

