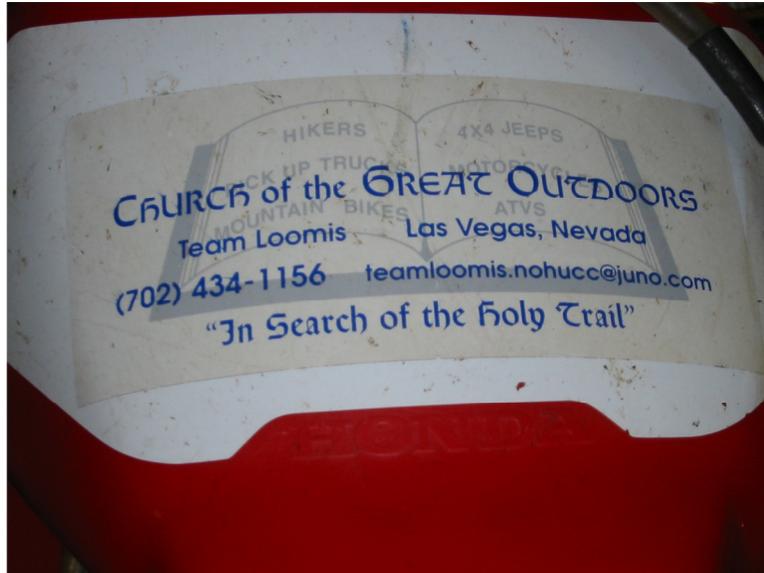


In Search of the Holy Trail



Presented by Dave Hiatt to attendees at the 11/6/2016 WOHVA Annual Meeting.

(Mention the picture above is of the front number plate on my dirt bike)

I have been looking for it ever since Ron Loomis and I were together and he told me his story. (Give brief summary of his story)

I have looked and looked for it but could not find it so I decided to try to build it. I got closer to it during my work with the Oregon Dept of Forestry but I have still not seen The Holy Trail.

What is the Holy Trail? **The Holy Trail is one that never requires maintenance and is an enjoyable experience for the primary OHV users it was built to serve.**

Creating an OHV trail that is FUN for the user and conforms to the current Best Practices for sustainability, **requires OHV enthusiast art combined with scientific knowledge and the proper equipment.**

Today I will share some great information sources for OHV Trail Best Practices along with information about some equipment that can make those best practices a reality on the ground for even true single track trails.

However, my primary objective with this presentation is to share some of my most important **Ah Hah** moments I experienced during my search for the Holy Trail with the hope that I will eventually be able to see it. Perhaps one of you will build it.

BTW, please Hold Your Questions and I will answer them at the end.

Key Elements of the Holy Trail

**FUN for the Primary User Type and Skill Level
while providing maximum seat time!**

- Trail is in the right **location**.
- Water is prevented from obtaining **volume or velocity**
- Nearby waters are protected from **tread silt runoff**.
- Trail tread is hardened with **natural materials** when necessary.
- The **entrances are the most difficult** portions of the trail.

What are the Key Elements of the Holy Trail?

FUN for the Primary User SKILL Level

OHV Tread Guidelines for Difficulty Levels

The following guidelines are adapted from the State of Wisconsin, Department of Natural Resources, 2007, "Trail Planning, Design and Development Guidelines, Trails & Waterways Division, p. 435 and adapted for West Coast USA mountain and conditions.
OHV Classifications:
Class I - Quad & 3-wheelers, Class II - Jeeps, etc., Class III - Off road motorcycle, Class IV - Side by sides

<u>ASPECT</u>	<u>EASIEST</u>	<u>MODERATE</u>	<u>DIFFICULT (Single Black Diamond)</u>
Grade (See Note 1)	10% max sustained	25% max sustained	50% max sustained
	15% short pitch (< 50' long)	50% short pitch (< 75' long)	75% short pitch (< 75' long)
	25% very short pitch (< 25' long)	75% very short pitch (< 35' long)	100% very short pitch (< 35' long)

Okay let's take a more detailed look at those Key Elements

User FUN = Basics 101;

Trail design all starts with selecting the Trail Management Objective (TMO) for a trail. This determines the primary trail user type and desired level of difficulty to meet the Primary User's criteria for FUN while incorporating best practices for sustainability.

After you identify the primary OHV user type and difficulty level, the trail must then be designed, constructed and maintained to meet that TMO so **that user** will have a FUN and sustainable trail.

Of course, the **Fall Line** is the natural course that water will take when running down a hill. It is a critical factor that **must also be considered at all times** when designing, constructing or maintaining an OHV trail.

Fun for the Primary User requires selection of the appropriate Difficulty Level Specifications considering both operator skill and machine capabilities.

This illustration is just a small piece of what the Trail Difficulty Standards for Class I (ATV) trails in the Tillamook State Forest look like.

OHV Tread Difficulty Guidelines for these combinations provide the specific criteria for proper construction of a trail to match operator skill and machine capabilities for the **Primary User**.

It is pretty unlikely that you will make a goal in this game unless you know where the goal posts are. The TMO creates those goal posts.

FUN for the PRIMARY USER



Bypass allows OHV use types in addition to the Primary Use type

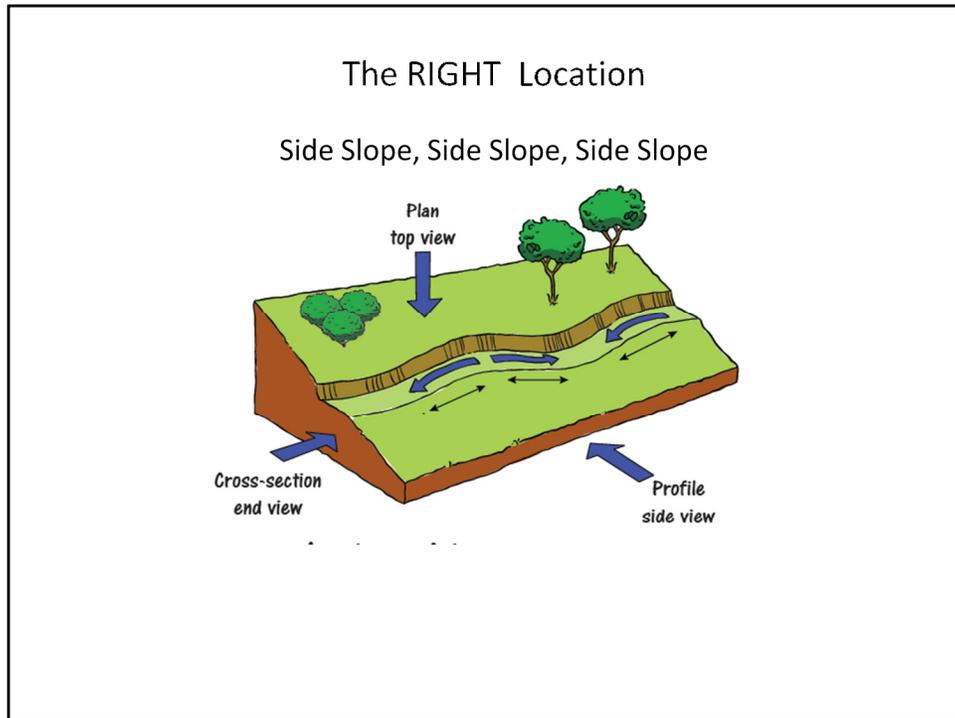
Secondary user types can usually be accommodated for OHV types narrower in width than the primary use type if the difficulty rating for the primary OHV type is Easiest or Moderate.

It is also important to remember that **seat time is more important than trail distance;**

the OHV trail experience **is the user's objective;**

OHV trails should **not be primarily about getting from point A to point B!**
That is what roads are for.

OHV users would rather use a trail providing their desired experience than create their own, i.e. over 99% of **OHV users will only create their own trail when land management has not provided the desired trail opportunity for them.**



The Right Location;

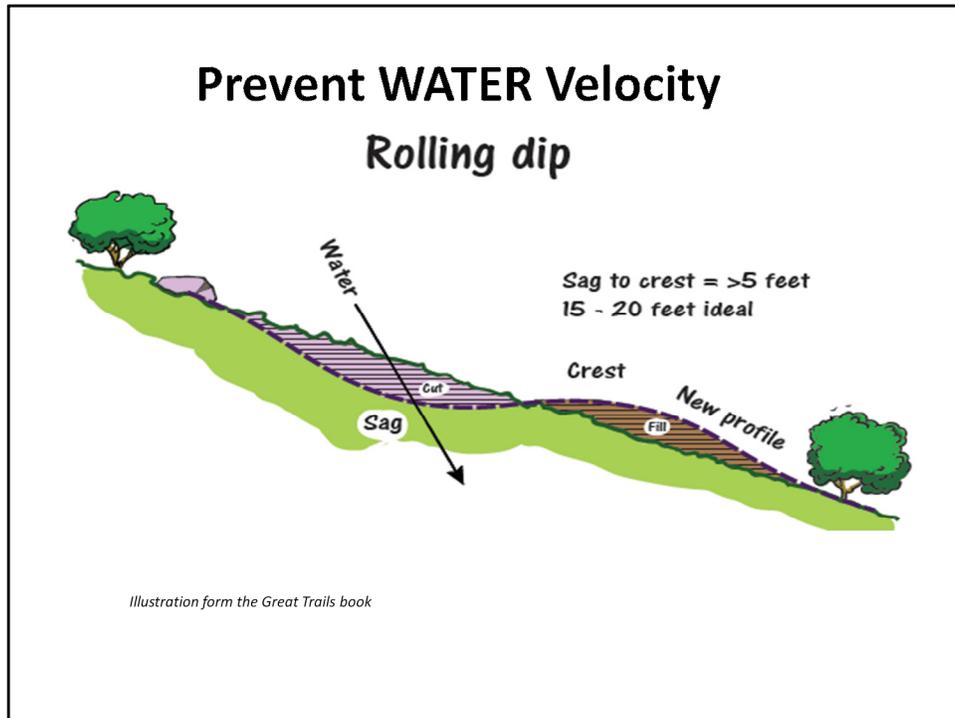
Rule of Thumb ~

if you cannot drain a well used trail tread using hand tools to create a 3 foot wide drain with an out slope of greater than 5% , with **less than 5 feet of digging outwards from the edge of the tread**, at least once every 75 feet, you have put the trail tread in the wrong location.

Think side slope traverse, side slope traverse, side slope traverse

Avoid Flat Areas like the plague!

Use crested tread construction if necessary to traverse flat areas. **Visualize a roller coaster railroad grade as the trail tread in those areas.**



I am sure most of you are familiar with rolling dips.

However simple this looks, the devil is always in the details.

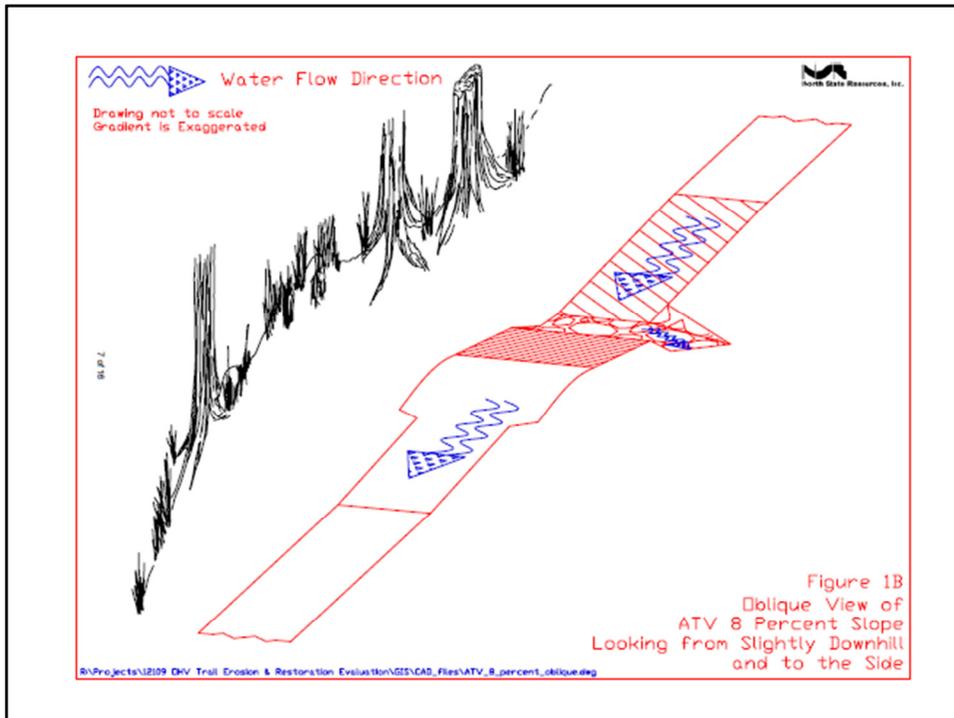
Most people constructing rolling dips do not get it right!

The Best Practices design details for OHV trail rolling dips:

http://samhoustrails.org/download/trail_work/Drain-Dips.pdf Or just search the internet for **Roger Poff rolling dips**.

The next couple of drawings are from Roger Poff.

Today I am only giving you an overview of Best Practices for Rolling Dips **so I can point out the key items where most people get it wrong**. Get the pdf file and study it to learn the details.



This is an oblique view of what a properly constructed rolling dip looks like if looking slightly downhill and to the side.

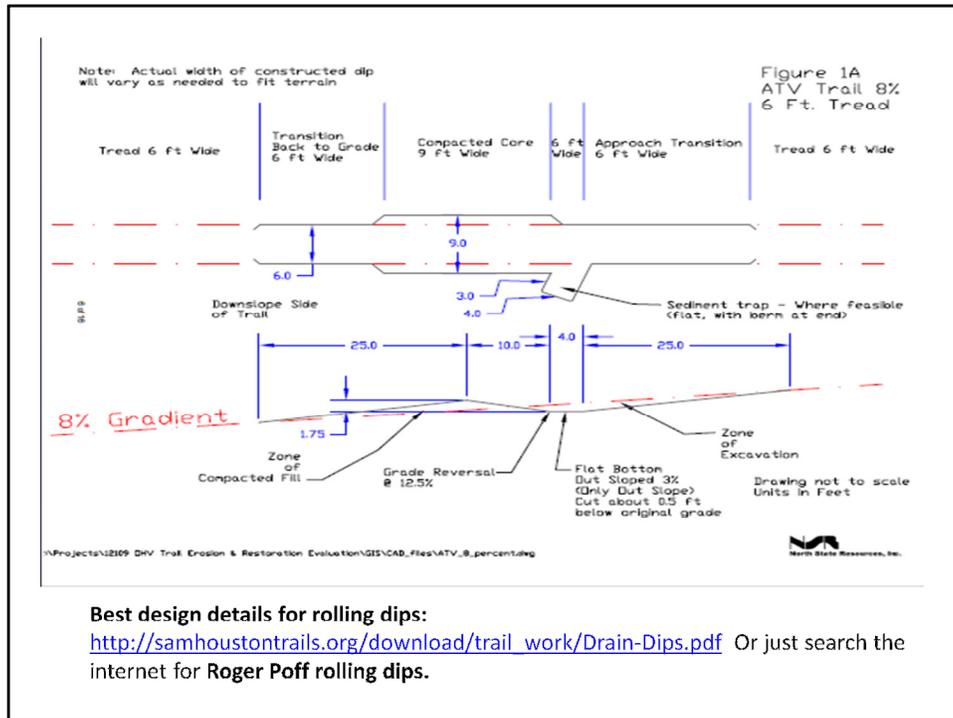
From the top you have;

the cut

the flat with drain to the side

the grade reversal

and the fill.



Here is a dimensioned drawing for an ATV rolling dip on an 8% gradient.

The Rolling Dip errors I see on most trails are:

Most fills below and cuts above the drain area are too short.

This creates a jump for uphill travel, unloads the driving wheel(s) and leads to cutting (rutting) of the lower fill that has to function as a dam.

The cut and fills will usually rise too abruptly on either side of the drain creating abrupt wheel loading that causes soil displacement.

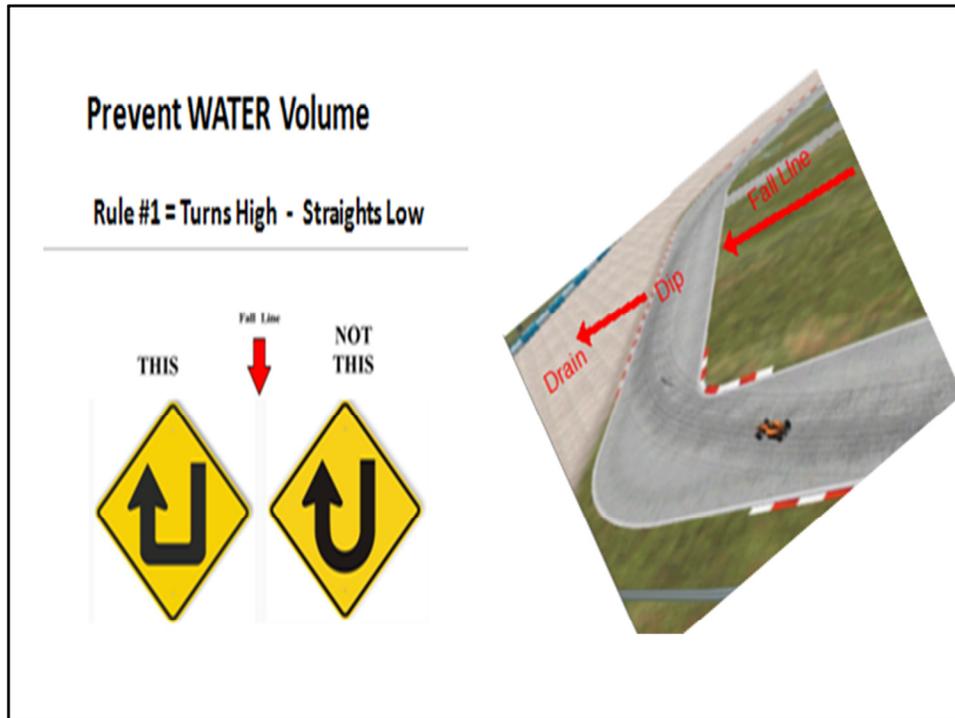
Failure to create a large flat drain section with enough side slope to drain properly.

The dimensions provided in the drawing must be increased proportionately with the increase in grade where it is installed.

Inspect your finished rolling dips by operating the OHV type(s) in an **uphill direction** at near the **highest speed** an expert user would be likely to obtain. Yes, Experts will also travel the Easiest trails and they will travel it much faster than the TMO's primary user!

The cuts and fills are too short if you feel any substantial suspension compression within the last 15 feet before the crest of the fill or any sudden suspension compression like hitting a pothole, when traversing the drain section.

Bigger is definitely better when creating rolling dips!



We are talking about the **relative elevation** when discussing the Turns High and Straights low concept.

Never make a turn the low point on an OHV trail.

Every turn must be connected to a lower straight in order to properly divert water off the trail tread.

The lower straight connecting two turns reversing grade direction travel (**going downhill and turning back uphill**) must be long enough to **eliminate all tire side force during travel through the drain area** from either direction of travel, from any OHV type allowed on the trail, i.e. **travel through the drain occurs ONLY after full completion of the prior turn and before initiating another turn.**

Look at the tire marks on the race track. Those tire marks show that race cars are making one large turn out of the two consecutive turns, i.e. **this straight is not long enough so be a straight at the speed it is being traveled.** A drain put into this straight would quickly fail as soil would be displaced to the outside of the turn and dam it up.

Let me re-emphasize that; When reversing trail direction from downhill back to uphill, create two turns connected by a dipped straight that is long enough to **prevent tire side force in the drain portion of the dipped straight** from any OHV type allowed on the trail or tire side force will quickly dam the drain point.

It is **impossible to reliably drain the outside of an OHV trail turn** as tire side force will quickly create a berm that dams the drain.

Prevent Tread Silt Runoff & Use Natural Materials



Prevent delivery of silt from the trail tread by trapping it for reuse when doing trail maintenance.

Use multiple sediment traps so several of them slow the flow and allow sediment to settle. Occasional heavy flows will overwhelm a single sediment trap at some point in time.

Insure that runoff is filtered by sufficient vegetation to forever trap the silt if proper silt traps cannot be created.

Harden the trail tread using natural materials. Excavator mined rock from trail bench cuts and other local rock sources work great as you get bony rock with fines that will compact and wear well. Local road crews can be an excellent source of rock as they regularly clear falling rock from roads and need a place to dispose of it.

RE: Illustration above – All existing road rock was mixed at random and moved to create a hardened crested trail tread, **huge sequential sediment traps were created via deep bucket munching** (digging a deep hole and piling the loose soil on the downhill side) **in the areas adjacent to the trail tread.**

You could hide that motorcycle in some of the holes. This created multiple silt traps **while anchoring OHV use to the trail tread.**

Dirt accumulating in any silt trap can be scooped out during maintenance, then be reapplied to the trail tread where needed.

Make Trail Entrances the Most Difficult portion of the trail,
i.e **Spode Filters**



Spode Filters ~ the solution to keeping inexperienced OHV users off of trails constructed for higher OHV operator skill levels.

Too many OHV users over estimate their own skill level or vehicle capability and cannot traverse difficult sections without causing damage. They create the most trail tread damage by getting stuck in some difficult section digging the proverbial “hole to China” with their wildly spinning wheel(s).

The solution is to make all trail entrances the most difficult section of the trail, i.e. Spode Filters.

Spode Filters at trail entrances create a self qualifying system as very few of inexperienced users will attempt Spode Filters above their skill level at trail entrances.

Note the rider is coming down this trail which is the preferred direction of travel due to the steep grades on this trail. The “rubber logs” are back filled on the upper side so it is relatively easy to ride over them in the downhill direction. The Spode Filter at the upper trail entrance is also much easier to navigate.

Spode Filter at work sorting out rider skill level



The unqualified who attempt to pass the Spode Filters will soon suffer the consequences and eventually realize they need to increase their skill level first.

Trail tread damage (note the spinning rear wheel which is undoubtedly digging a hole) is then limited to the Spode Filter area, which is easily accessible and repairable, if they attempt to traverse it and fail.

Another Trail Entrance Spode Filter

Approach has large rocks as pavers under the dirt for rut prevention



Lower entrance picture. **There is no Spode Filter at the upper entrance to this trail.**

Spode Filters at the lower trail entrance should be constructed to a higher difficulty level than those at the upper entrance as unskilled OHV users are more likely to damage a trail trying to climb it than go down it.

Most Common Professional Trail Builder Error



Okay, let's take a look at this picture. Do you see anything there that appears to be in conflict with any of the key things I just covered?

Look at the dark section of trail tread in the turn at the low point of the trail. It is obviously the drain area as it is wet and at the low point. This conflicts with the **Turns High – Straights Low** requirement for the Holy Trail.

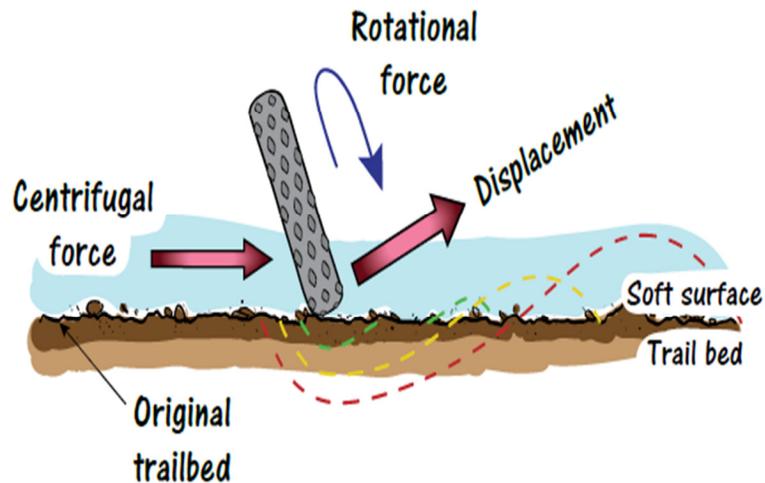
This trail should have been located to go straight through the drain area.

This drain location in a turn will undoubtedly result in the accumulation of water volume in that area as the OHV tire side force will soon dam up the drain on the outside of the turn.

This location error is in direct opposition to our goal of preventing water volume or velocity on our OHV trail tread.

Always Remember **Turns High – Straights Low**

Draining of water must be done where there is **no OHV tire side force** on the trail tread!



Here is more detail on what actually happens;

Discuss the elements displayed in order to describe what happens to the trail tread if there is side force on the tire(s) in a drain area.

Okay, I hope you will consider the key points of the Holy Trail very carefully when designing, constructing or maintaining OHV trails.

FUN

OHV users require a broad range of Challenge Sections



Always remember that **OHV trails are about fun for the user.**

Fun can require some extreme challenge to create the desired level of excitement for high skilled users!

In REVIEW

FUN for the PRIMARY User

Right **Location** for the Trail

Prevent Water **Velocity or Volume**

Protection from Tread **Silt Runoff**

Harden **Natural Materials**

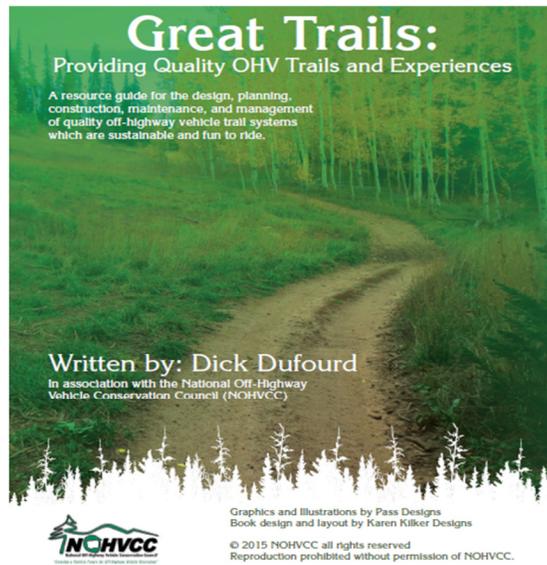
Entrances as the **Most Difficult Trail Sections**, aka
SPODE FILTERS

& FUN For the PRIMARY User

Review the points in the slide.

FUN is purposely stated twice to create more emphasis on it.

Great Book! Get One Free!



Please at least get a free PDF copy of this book and use it for reference or **give it to someone involved in OHV trail construction, maintenance or management.**

Many of us OHV trail professionals contributed to this book and it is an awesome compilation of **Best Practices for OHV trail construction and maintenance.**

In fact it is the best compilation of Best Practices for OHV Trails to date.

It includes details on **many new innovations along with illustrations of both failures and successes.**

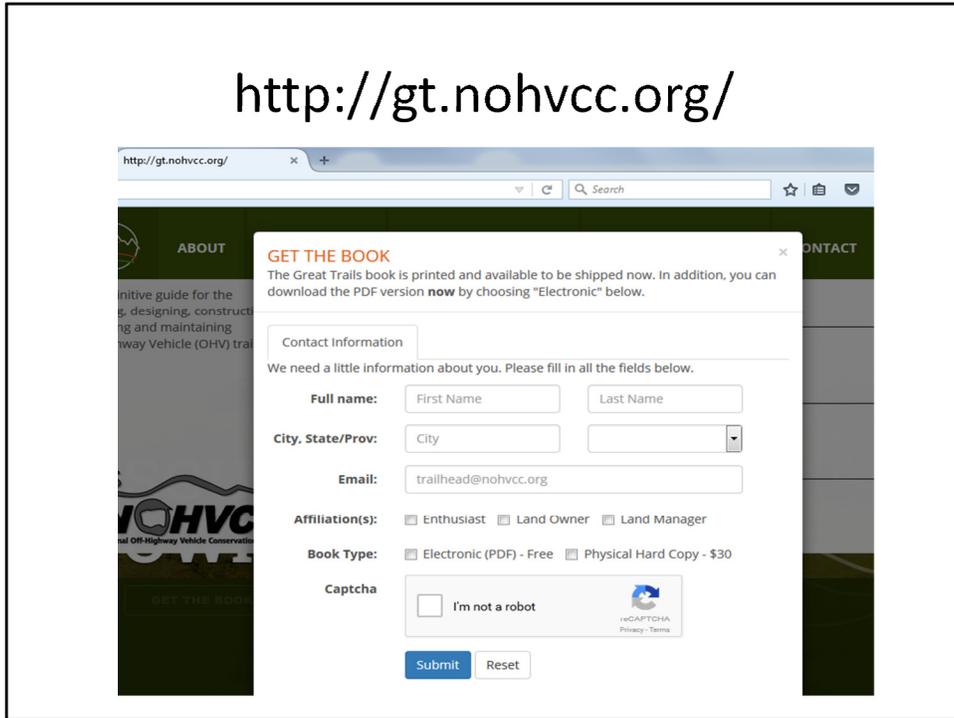
Yes, the cover picture appears to illustrate the most **common design error I see when reviewing OHV trails.**

This picture in the book is captioned, **“Good trail location. This trail follows the edge of the vegetative change and it curves with the natural curve of the tree line. Had the trail gone through the middle of the meadow, it would not fit our perception of “natural.”**”

As I contributed to this book, I never thought I would see what appears to be one of the most common OHV trail design errors displayed on the cover!

Seeing that as the cover picture just reinforced my impression that **very few trail professionals even recognize the particular problem illustrated by it** and that prompted me to put together this presentation with particular emphasis on **TURNS HIGH – STRAIGHTS LOW.**

http://gt.nohvcc.org/



Here is how you get a free copy of the Great Trails book.

Single Track Tools ST240 Excavator with 6 –way blade

Remote Controlled with 24" to 38" track width adjustable on the fly



Equipment:

(describe my experience and great results using this machine on extremely narrow trails and for maintenance on ATV & 4WD trails) I LIKE IT!

ST240 mining rock in a remote location for trail tread use



Refer to my prior remarks about mining trail tread rock on location. This location is well over a mile from the nearest road. ST240 is being used to mine the rock. The rock in the picture is exactly what is needed as it is a mix of big bony sizes, down to small fines and packs it like concrete.

The tracked rock hauler is a very small Yanmar brand used by contractors when accessing the back yards of modern homes.

The remote controls are visible in front of the operator. There are two joystick controls just like a standard excavator with a 6 way blade and hoe.

You can rent one of these machines from the NW Trail Alliance (NWTA) <http://nw-trail.org/equipment/>

Just email me if you want my assistance. My email is dhiatt07@gmail.com

Remember: Turns High – Straights Low

Let me know if you build or find the Holy Trail so we can share your success with others.

Questions?

I often volunteer to review potential new OHV trail layouts or reroutes on the ground so I can share what I have learned in my search for the Holy Trail **prior to final construction.**

It takes OHV enthusiast art, OHV trail experience and knowledge of OHV Trail Best Practices along with the proper power equipment to properly build an OHV trail.

Review the points on the slide.