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# WSU Stormwater Master Planning

## The Invert Ins-&-Outs Of Managing Municipal Stormwater

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## In the beginning . . .

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- **1948 Federal Water Pollution Control Act**: 1st **major law to address water pollution.**
  - Surgeon General in cooperation with Fed, State, & local entities – Comprehensive programs to reduce pollution to surface and ground water. Authorized Fed Works Admin to **assist constructing sewage treatment plants.**

**1972 Federal Water Pollution Control Act AKA – Clean Water Act (CWA)**

- **1972 CWA:** Purpose was to restore and maintain the chemical, physical, and biological integrity of the **nation's waters** by preventing point and non-point pollution sources.
  - Ambiguity as to what was point vs non-point. EPA declined to include urban and industrial runoff.
  - Provided research & technical assistance grants.
  - Lawsuits.
- Major Amendments:
  - Clean Water Act of 1977
  - Water Quality Act of 1987

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- **1972 CWA - An Act to amend the 1948 Federal Water Pollution Control Act**
  - **Act introduced in the Senate by Edmund Muskie (D-ME) in Oct 1971.**
  - **Passed the Senate in Nov 1971.**
  - **Passed the House in March 1972.**
  - **Joint Conference Committee – agreed to by House and Senate Oct 4, 1972.**
  - **Vetoed by President Nixon on Oct 17,1972.**
  - **Overridden by the House and became law on October 18, 1972.**

- **1972 National Pollutant Discharge Elimination System (NPDES)** Permit system initiated to regulate **point sources** of pollution.
  - Technology based standards **"Best Available Technology"** which became the **minimum regulatory requirements** for a permit.
  - Intent was to create a national water quality discharge standard without regard to the conditions of the receiving water body.

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- **1987 Water Quality Act - Courts ruled that stormwater from industrial and urban runoff must be regulated.**

- **Research and grants on water quality were provided by EPA.**
  - Permit exempted agriculture discharges.
  - Municipal stormwater permits required use of "**Best Management Practices"** (BPMs) to the "Maximum Extent Possible."

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**1990 NPDES Phase I General Permit :** Established permit requirements for **stormwater runoff** from **construction activities**

- **1990 NPDES Phase I – Large Site** :
  - Discharges from construction activities disturbing 5 acres or more of land.
- **1999 NPDES Phase II – Small Site**:
  - Discharges from sites between 1 and 5 acres.
  - City of Pullman requires **Erosion and Sediment Control Plan** for sites greater than 5,000 sf, but less than 1 acre.

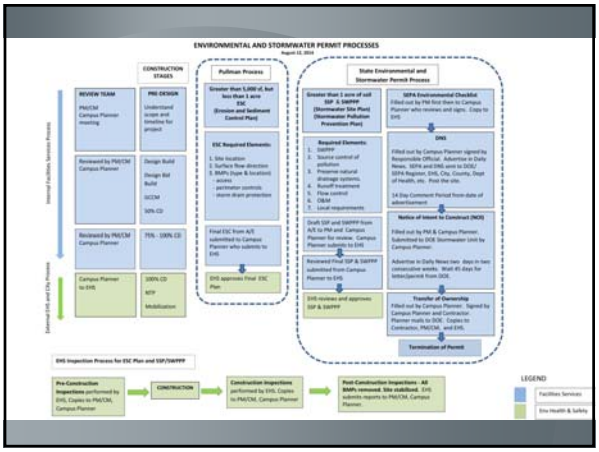
- The result has been identification of hundreds of thousands of projects requiring permits, which has put a strain on EPA and state administrative systems.
- **"Water quality improvement as a result of permit requirements remains an elusive goal."** *Claire Welty – EPA National Research Council*

## What is WSU doing?

**Washington State University Facilities Services** has taken a watershed approach to understanding its construction runoff and storm system for the Pullman campus.

- ❑ WSU is a municipality and a state agency.
- ❑ WSU follows all Federal and State regulations for stormwater on all construction projects.
- ❑ WSU was asked by EHS to track increases in non-pervious surfaces against loss of pervious surfaces.

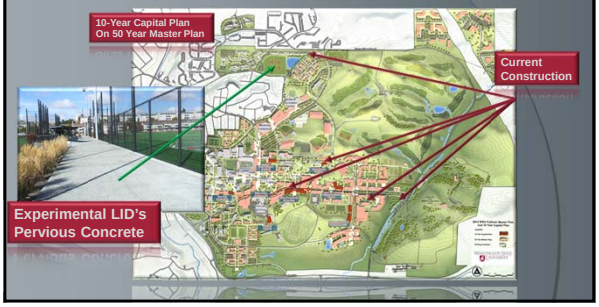
Increases in non-pervious surfaces do not directly equate with peak rates of run-off from the entire watershed.



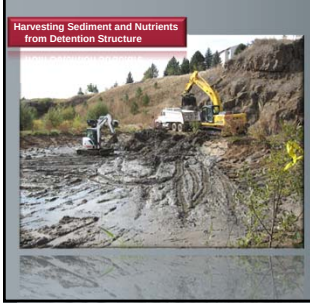

## Chasing the elusive goal of stormwater management

## Stormwater Master Plan Project Goals

- ❑ **Inform the Campus Development Plan**
  - o Manage stormwater on a watershed basis.
  - o Mitigate impacts of campus growth.
  - o Identify where LID's could be most effectively used.




- ❑ **Map & model the system.**
- ❑ **Support maintenance of the system.**
- ❑ **Coordinate stormwater management with the City of Pullman.**
- ❑ **Meet regulatory requirements.**




## Initiating the Plan: Inventory and Analysis

| What do we need to know? | What did we have? |
|---|---|
| **On the Surface** | |
| ❑ Watersheds delineated (all classes) | 40% |
| ❑ Good topographic maps showing: | |
| o Slopes & aspect | 60% |
| o Soil type, ground cover, land use | 100% |
| o Surface conveyance | 40% |
| o Surface detention structures | 50% |
| **Subsurface** | |
| ❑ Stormwater utility maps, documenting: | |
| o Pipe size and locations | 80% |
| o Pipe materials, slopes, elevations, junctions | 0% |
| o Manhole & Catch Basin locations | 80% |
| o Manholes lid elevations and invert data | 0% |
| o Subsurface detention structures | 0% |
| **Connectivity** | |
| ❑ Maps of City stormwater utility & connections with WSU | 0% |

## Name and prioritize the watersheds

## Understand the hydrology:

- Identify outfalls from campus
- Identify intercepts with city or private systems
- Identify surface and subsurface flow and catchment

## Getting started .....

❑ Establish an Intern Program to revise existing maps and collect missing data.

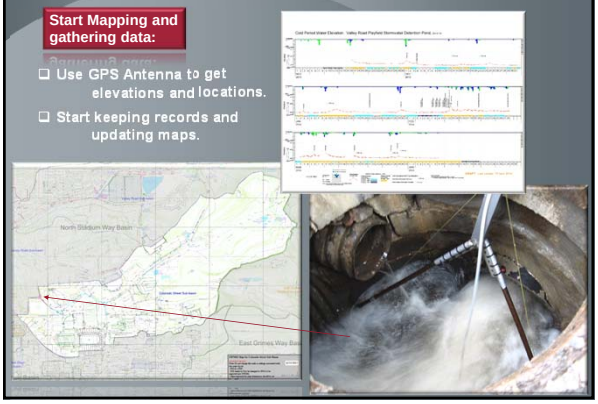
❑ Train teams.

❑ Team-up Interns with their university facilities management counterparts.

## Start Mapping and gathering data:

❑ Use GPS Antenna to get elevations and locations.

❑ Start keeping records and updating maps.

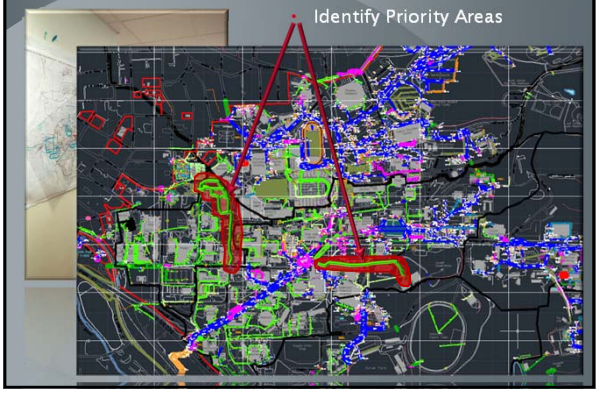


## How Interns Operate

## How do we start?

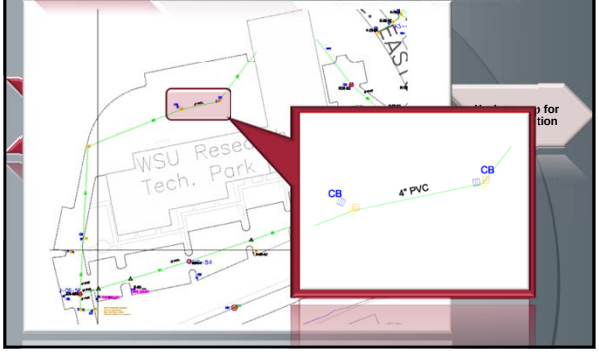
1. Go to the Map
2. Preliminary Scouting
3. Data Collection
4. Updating Map

- Look at the Map
- Identify Priority Areas



## 2. Preliminary Scouting

Process: Check As-Builts → Visually check manhole + catch basin locations → Update map for Data collection



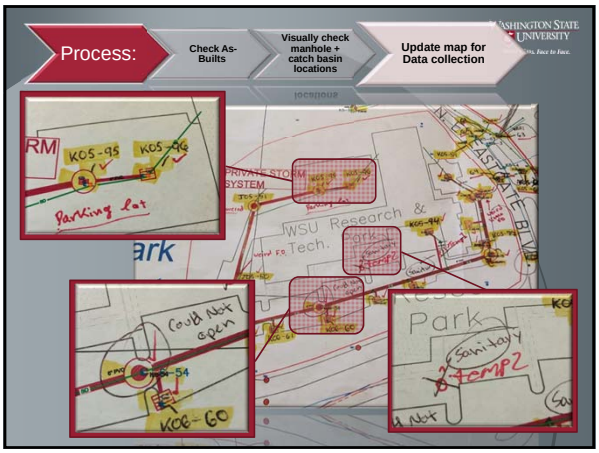

Process: Check As-Builts → Visually check manhole + catch basin locations → Update map for Data collection

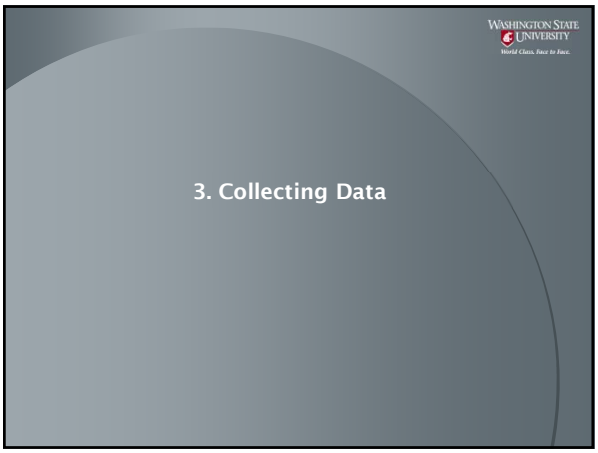
- Verify Connection By sound
- Walk the Area with map

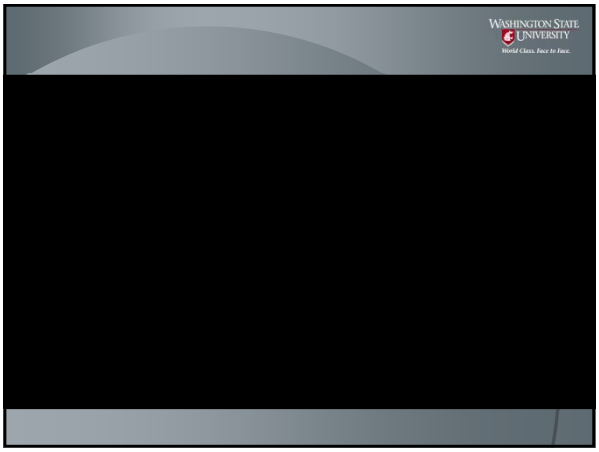
## Slide 24

**ATR3** Needs More photos:
-Sound check
Arndt, Taylor Ray, 10/1/2014

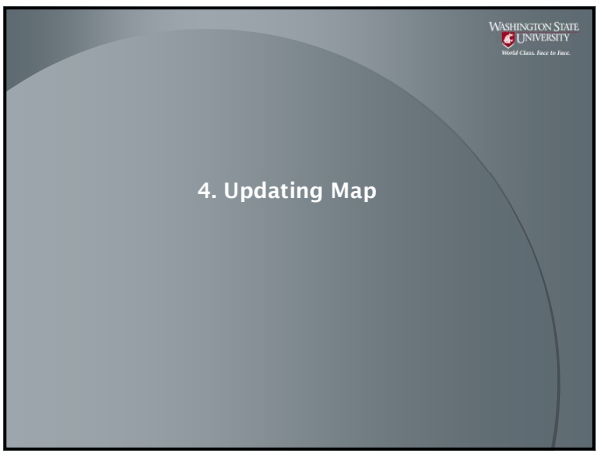
**ATR4** Also Add words of what we do
Arndt, Taylor Ray, 10/1/2014


Process:
Check As-Builts
Visually check manhole + catch basin locations
Update map for Data collection
Parking Lot
Could Not open
Park
Sanitary
Temp2

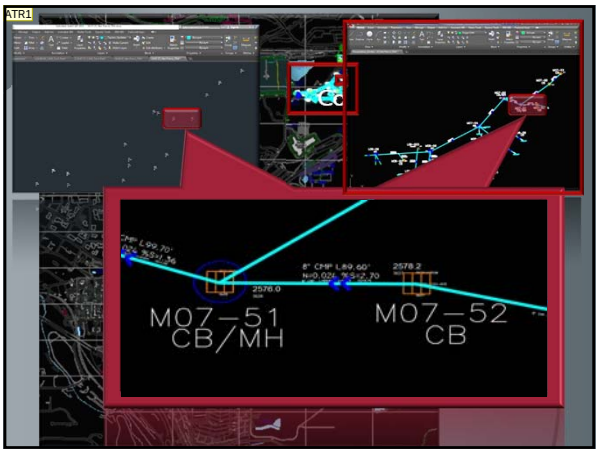

3. Collecting Data

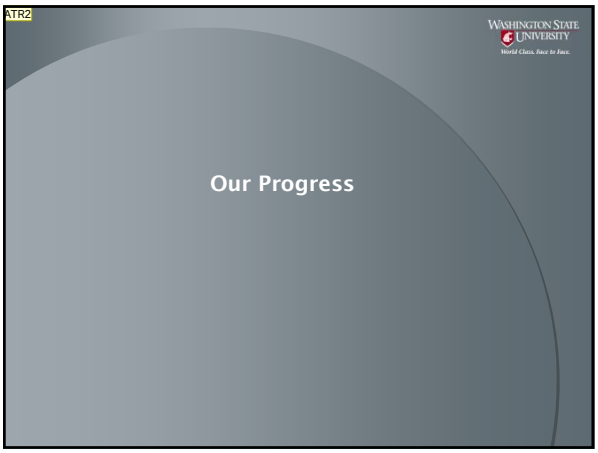


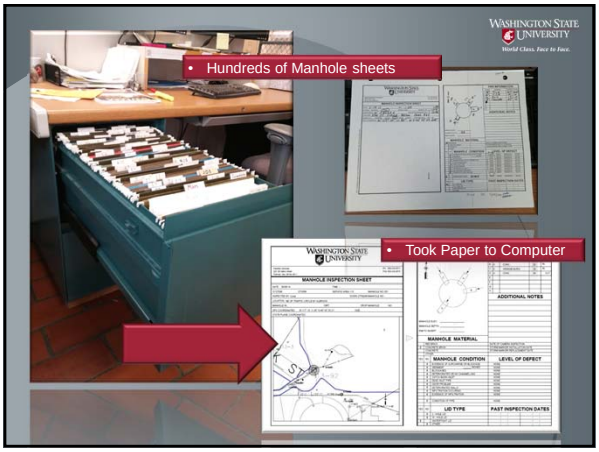

Equipment + Use
1. Light and
Its dark down there!
Spot light for measurements
3. GPS Pole
Safety guy always keeping an eye out
Drawing pipe directions and recording measurements
2. Map and Manhole
Measuring pipe diameters and invert elevations
4. Safety Equipment

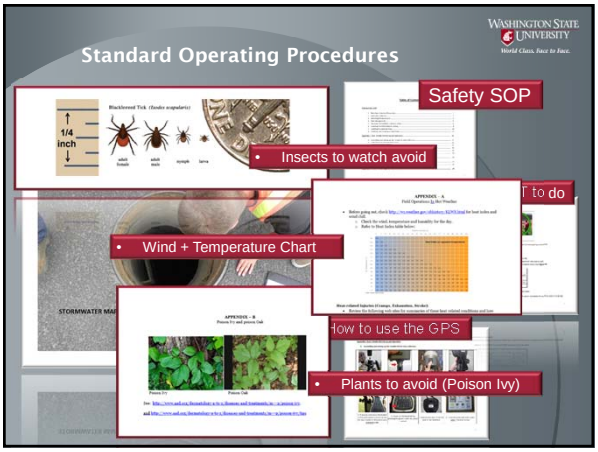

4. Updating Map

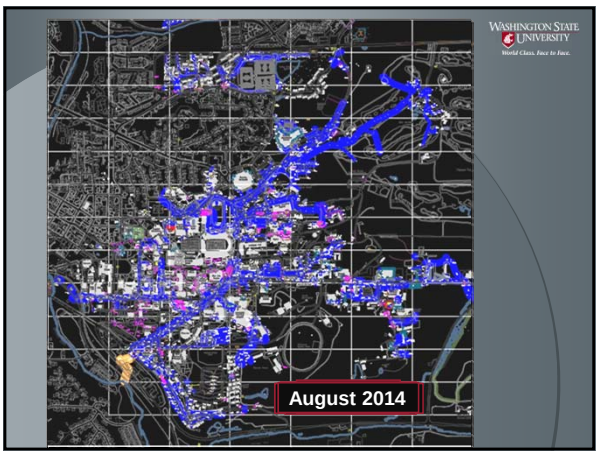

Set Up
Map
Data
Manhole Sheets
Field Map

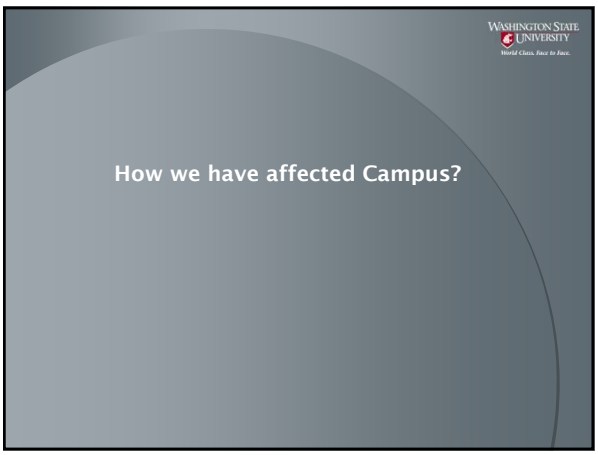

ATR1
M07-51
CB/MH
M07-52
CB


ATR2
Our Progress


Hundreds of Manhole sheets
Took Paper to Computer


Standard Operating Procedures
Safety SOP
Insects to watch avoid
Wind + Temperature Chart
Plants to avoid (Poison Ivy)


August 2014


How we have affected Campus?

## Slide 31

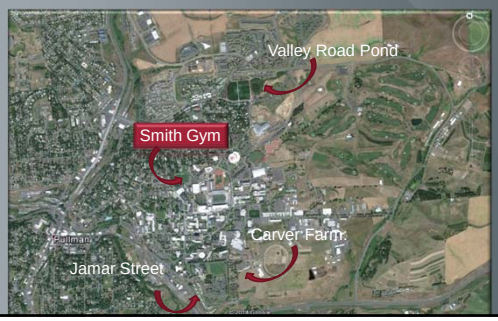
**ATR1** Add Full update Result to show what the whole update looks like
Arndt, Taylor Ray, 10/1/2014

## Slide 32

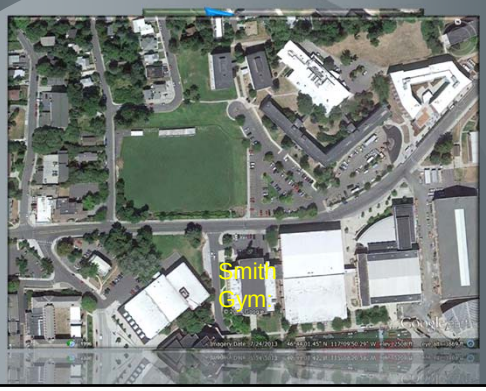
**ATR2** Show More progress slides
Arndt, Taylor Ray, 10/1/2014

## Once We Started Looking……..

Smith Gym: ***The problem of water flowing up hill.***
Jamar Street: *Why we follow alligators.*
Carver Farm: *Where the water flows, the poo goes.*
Valley Road Playfield Stormwater Detention Pond: *Not just a pretty face - why history is important.*

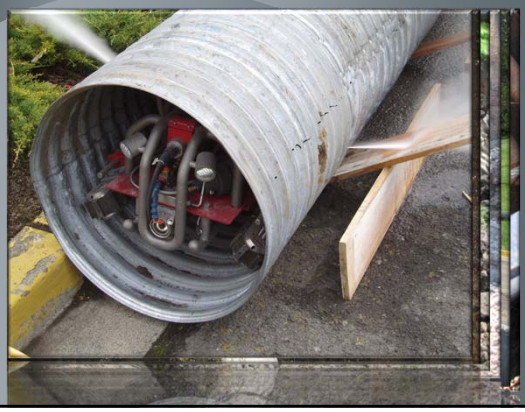



## Smith Gym: *The importance of water flowing up hill.*




## Smith Gym:

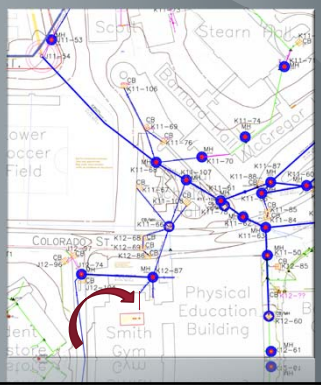
## Smith Gym: a Little Background…



## Smith Gym:

## Smith Gym:

Today: the area shown is gone and a new dormitory constructed on site.

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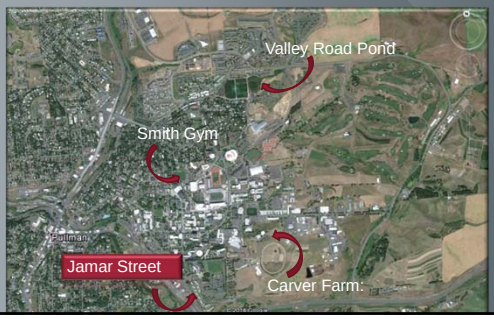


Jamar Street: *Why we follow alligators.*


Jamar Street:


Jamar Street:

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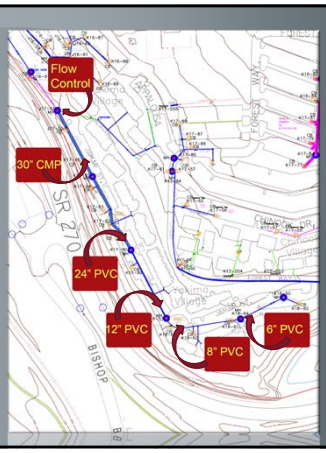

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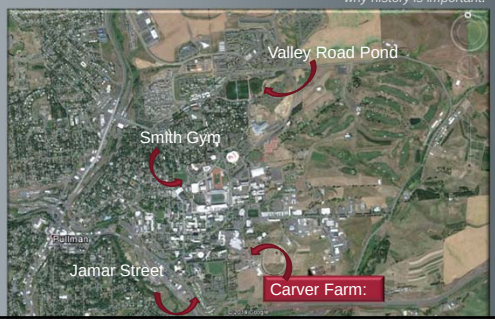


Carver Farm: *Where the water flows, the poo goes.*

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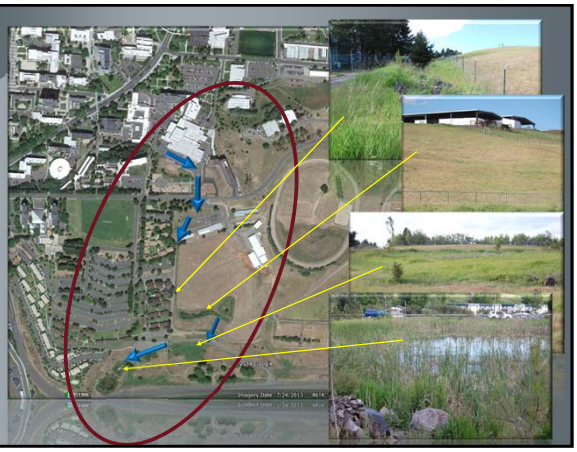

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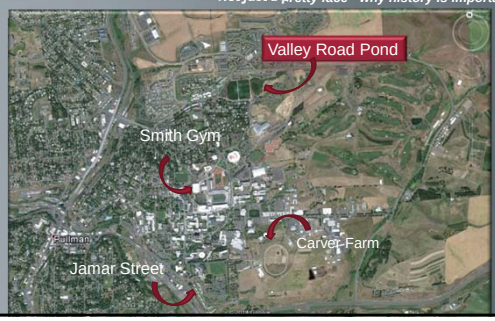


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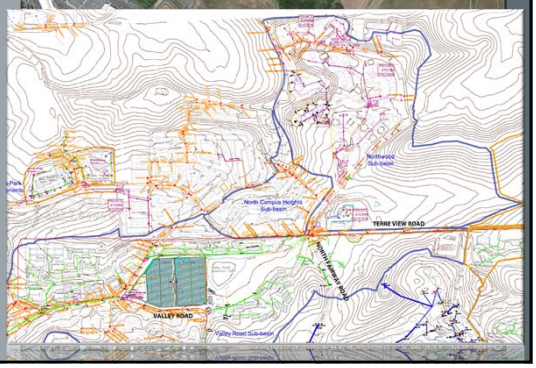

Valley Road Playfield Stormwater Detention Pond:

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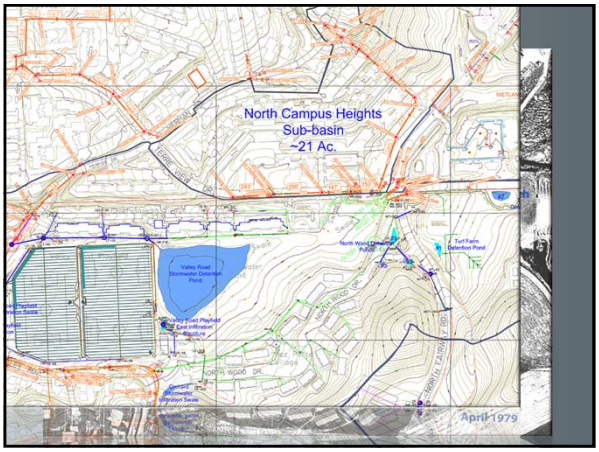


## Lessons Learned

**The Stormwater Master Plan is a new frontier.**

- Do not measure pervious vs non-pervious surfaces and expect to understand increases in stormwater. **Increases in non-pervious surfaces do not directly equate with peak rates of run-off from the entire watershed.**

**With evolving regulations . . .**

- **Plan for and document your stormwater system.**
- **Fund maintenance of the system.**
- **Archive your activities & data.**

**Inventory & Analysis should include:**

- What the water is doing on a **watershed** basis.
- **Topographic** (surface conveyance and detention) and **Structural** elements (pipes, catch basins, manholes & **invert-ins and -outs**).
- Maintenance & management **histories**.

- **Use of technology and interns can significantly reduce time and costs.**

## Case Studies

- **Some discoveries may cost money to fix:**
  *Smith Gym – The problem of water flowing up hill.*
- **Some discoveries were there all along, you just had to look closely.**
  *Jamar Street – Why we follow alligators.*
- **Some discoveries may save you money:**
  *Carver Farm – Where the water flows, the poo goes.*
- **History and Archiving are fundamental to staying out of trouble:**
  *Valley Road Detention Pond – Not just a pretty face.*

## Valley Road Playfield Stormwater Detention Pond 1992