



CE 3354 ENGINEERING HYDROLOGY

LECTURE 4: WATERSHED DELINEATION; WATERSHED METRICS



OUTLINE

- Watershed Delineation
- Watershed Metrics

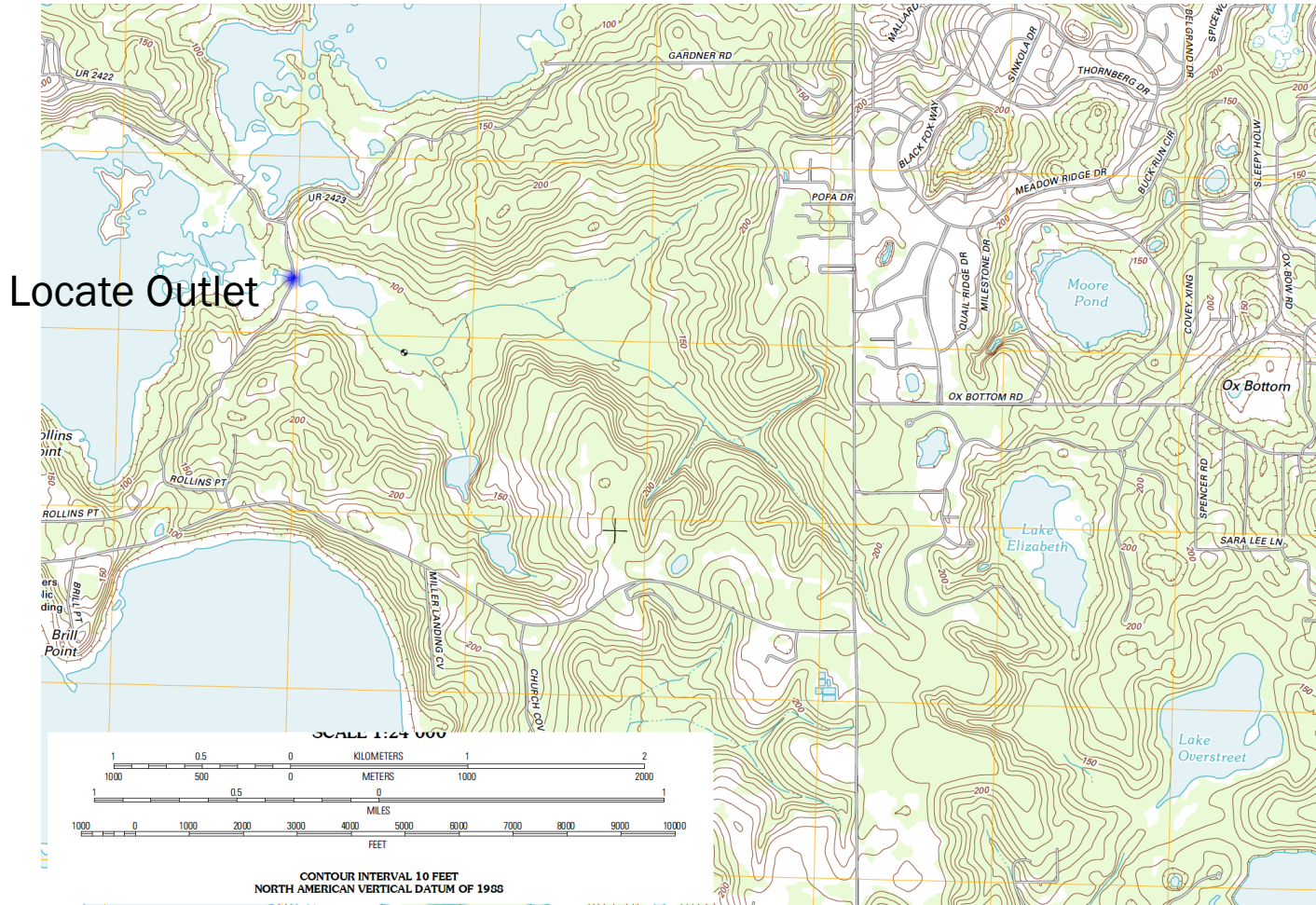
WATERSHED DELINEATION

- Identifies the boundaries of our hydrologic unit / area of study.
- Need to interpret topographic maps (or DEM/DTM) to construct the boundary

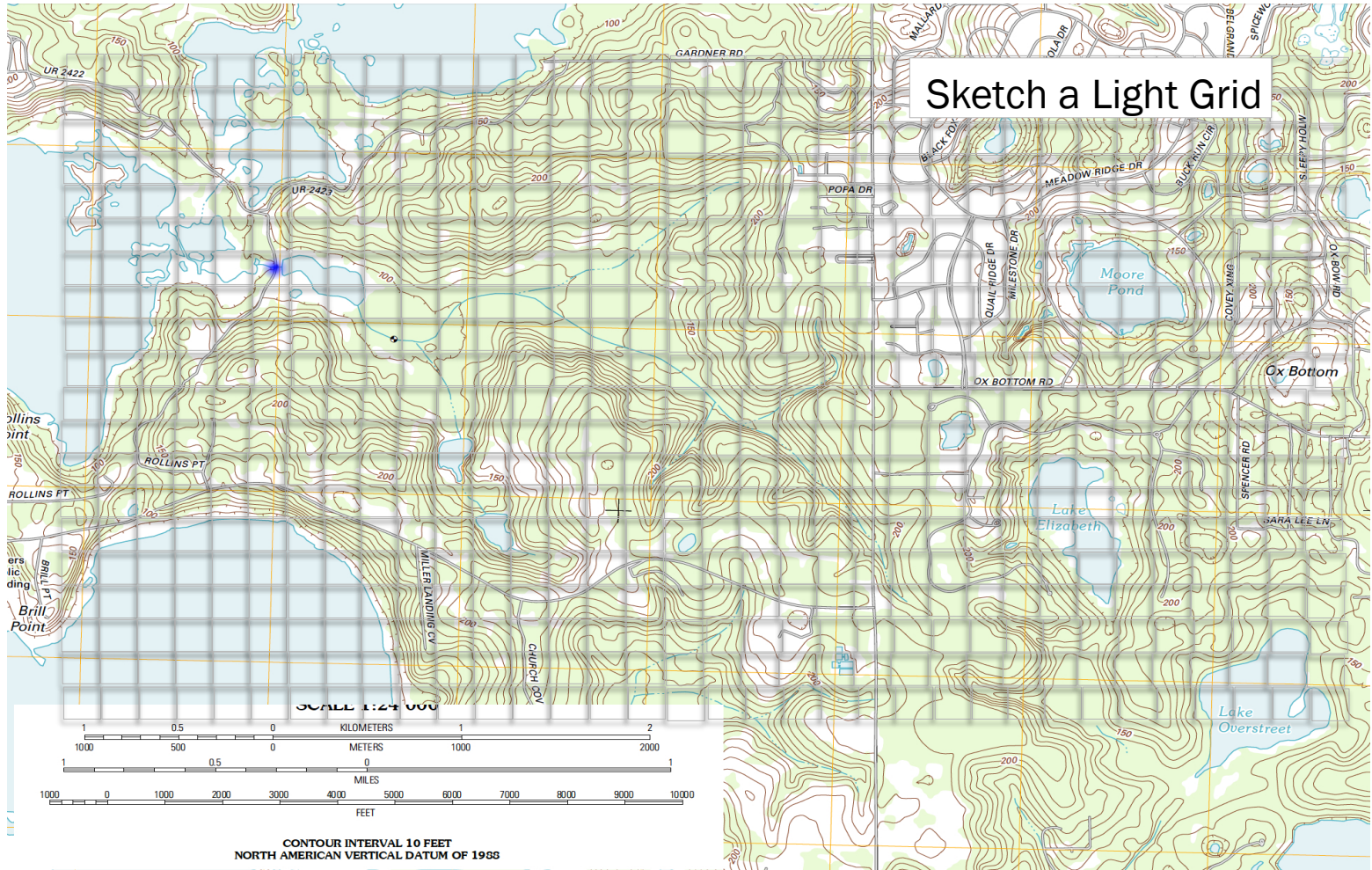
IDENTIFYING WATERSHED BOUNDARIES

- Steps to delineation
 - Superimpose a grid to estimate average elevations
 - Trace/outline the main stem of the stream that you want to examine
 - Trace all perennial or influential tributaries
 - Locate the lowest point/outlet of the main stem and work uphill

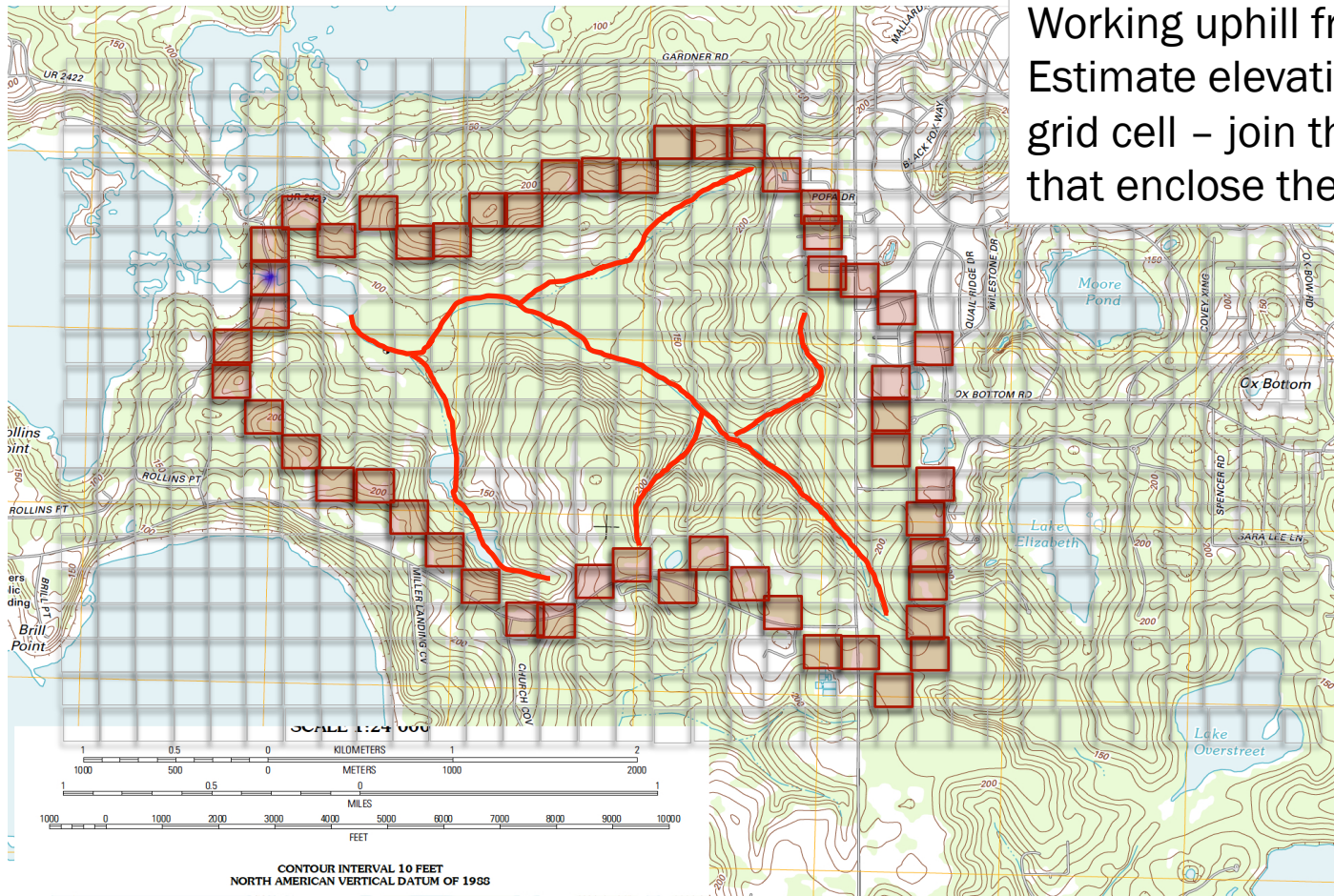
WATERSHED DELINEATION



WATERSHED DELINEATION

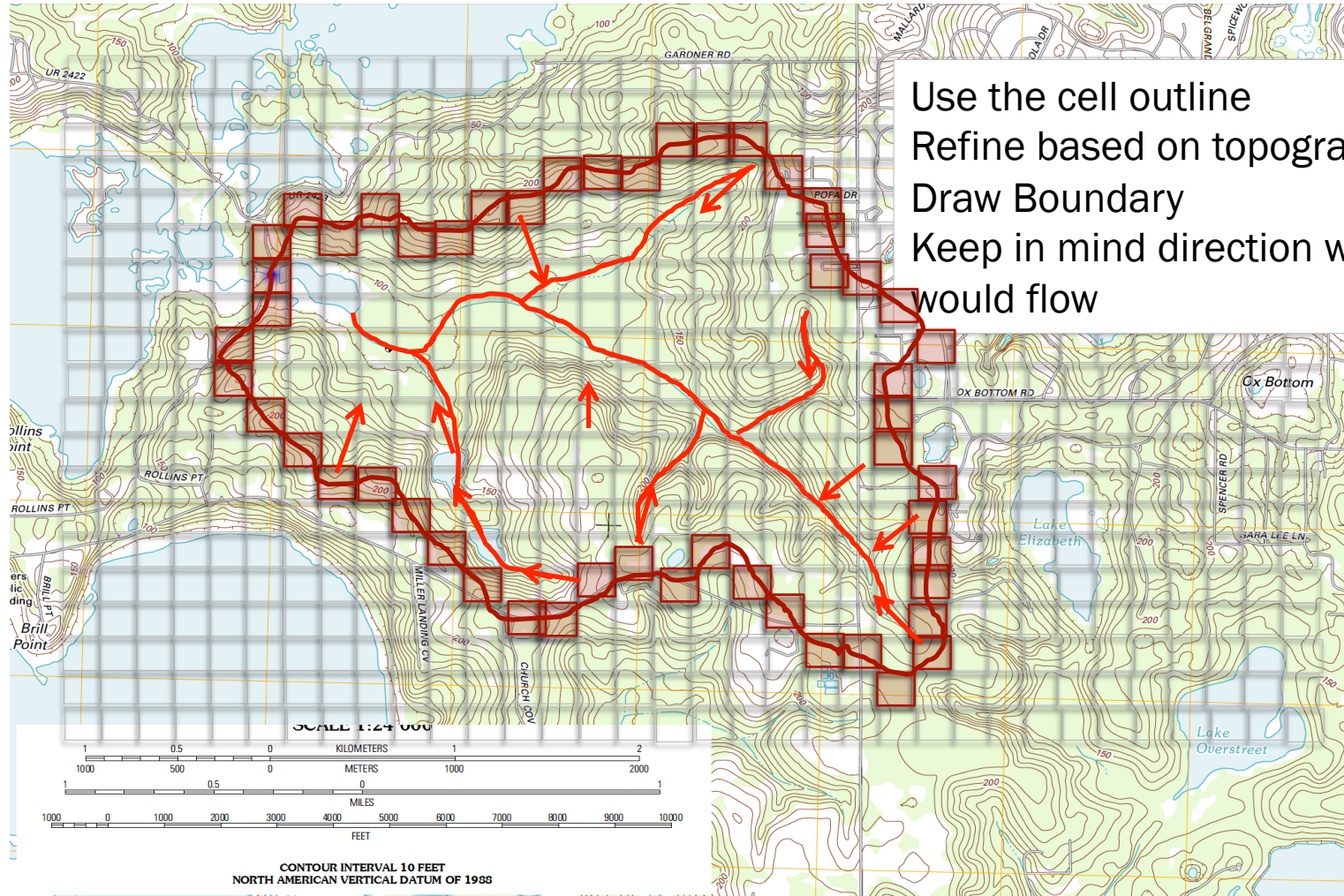


WATERSHED DELINEATION



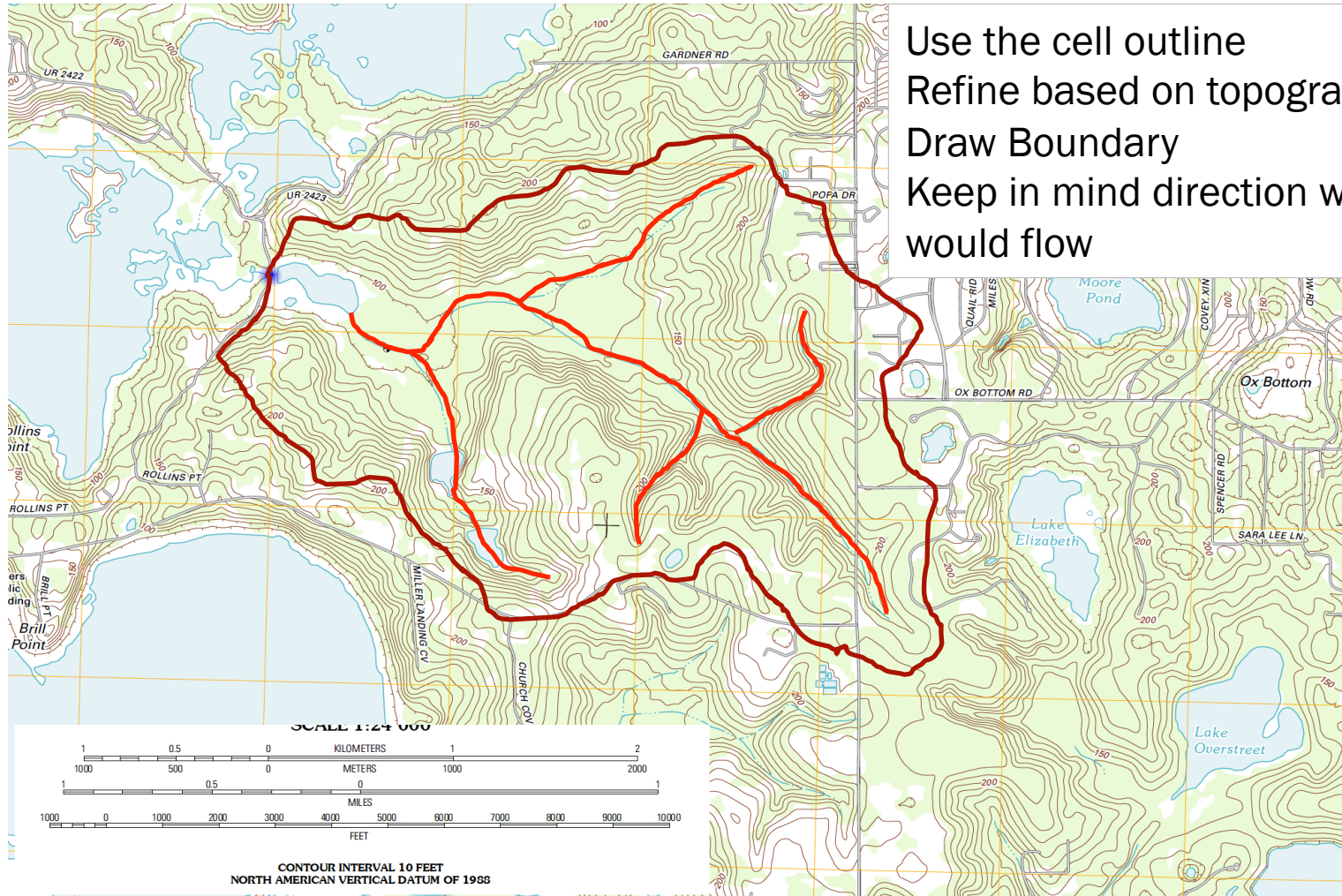
Working uphill from outlet
Estimate elevations in each
grid cell – join the high cells
that enclose the outlet

WATERSHED DELINEATION



Use the cell outline
Refine based on topography
Draw Boundary
Keep in mind direction water
would flow

WATERSHED DELINEATION



Use the cell outline
Refine based on topography
Draw Boundary
Keep in mind direction water
would flow

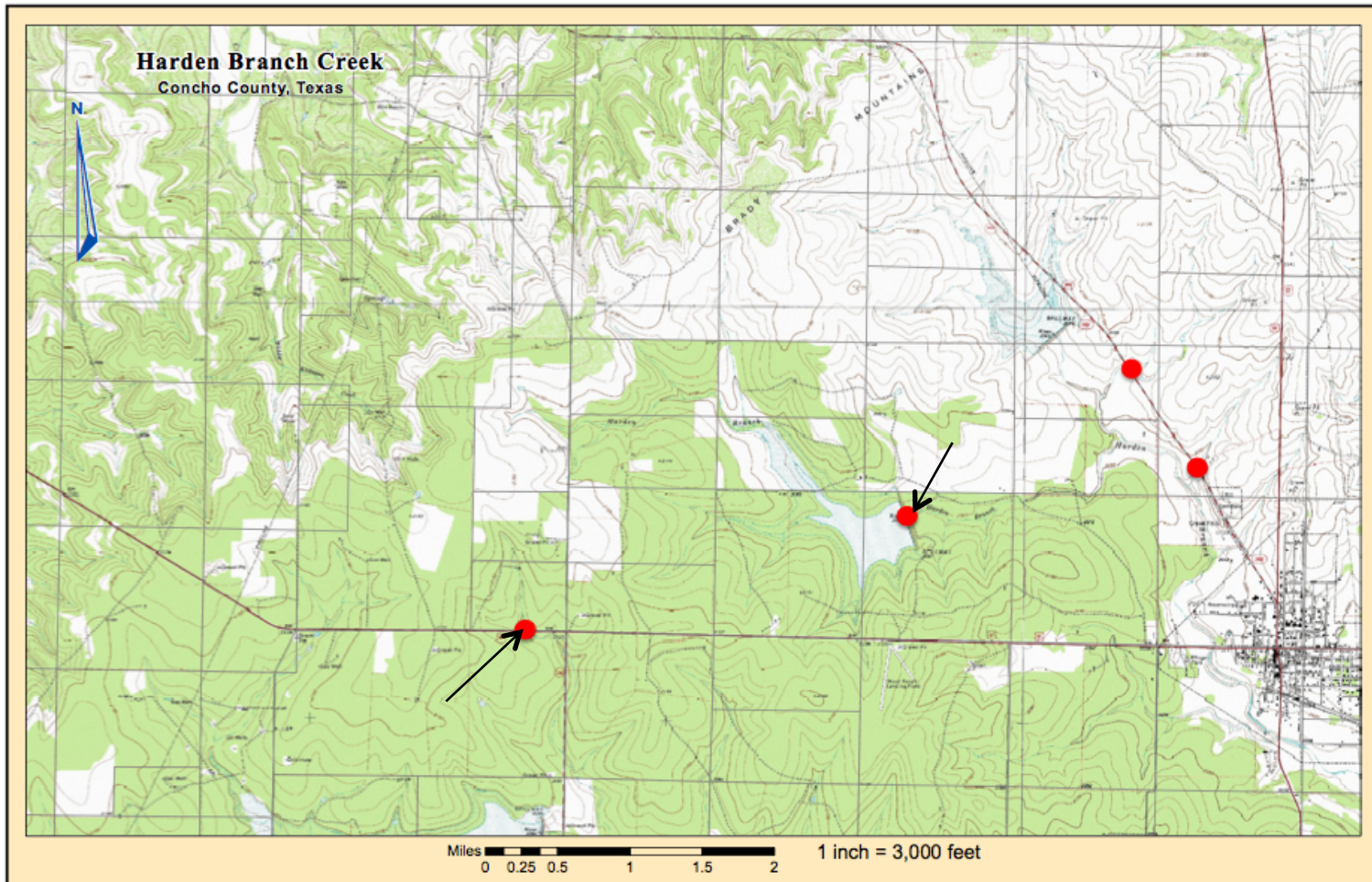
WATERSHED METRICS

- The fundamental unit in surface water hydrology is the watershed.
- A watershed is defined as the area on the surface of the earth that drains to a specific location.
- Watershed properties include:
 - Area
 - Main channel length
 - Slope (requires the specification of path),
 - Soil moisture/permeability

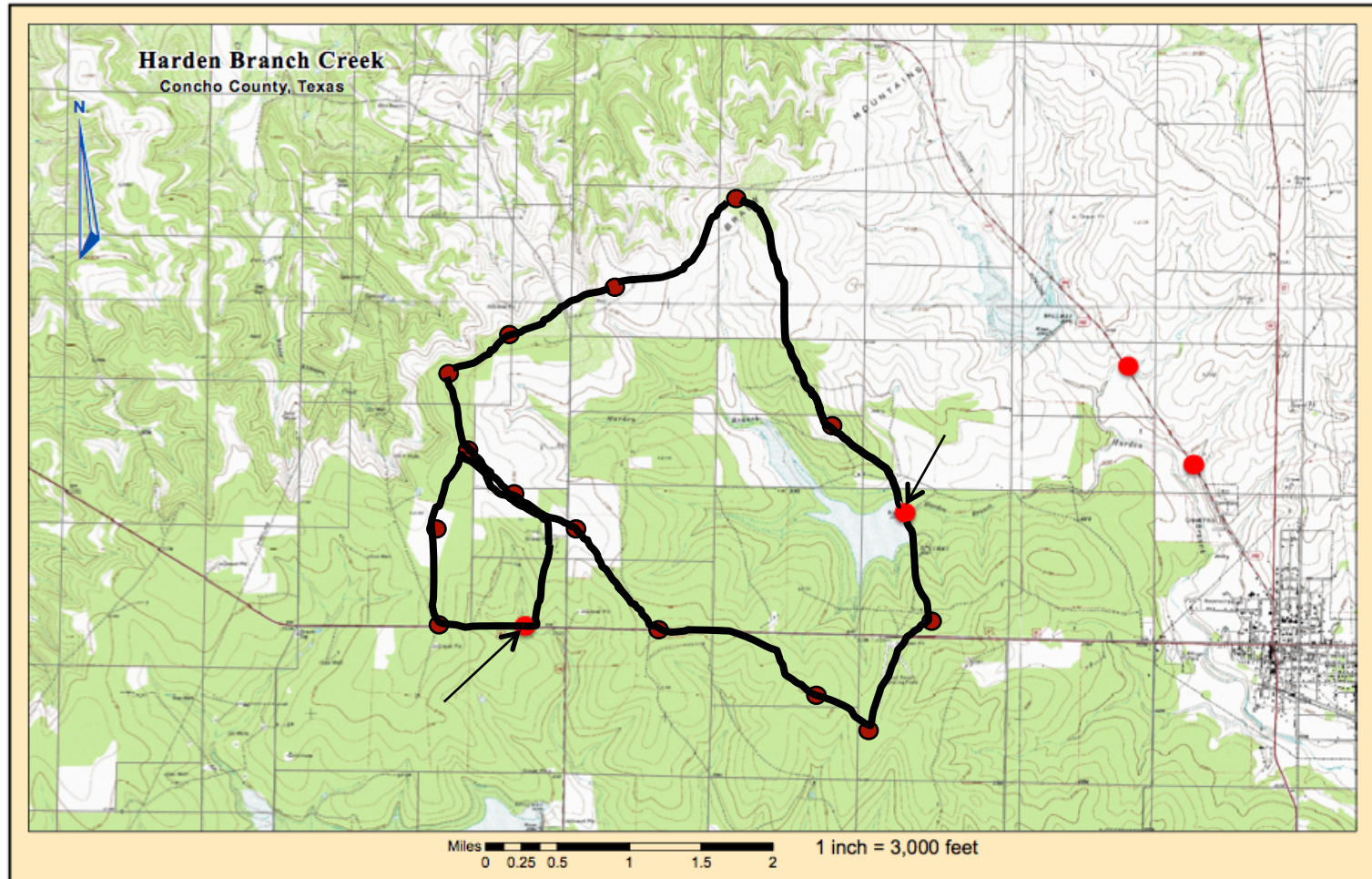
AFTER DELINEATION

- Watershed physical and descriptive characteristics determined after delineation include:
 - Areas
 - Lengths
 - Slopes (along defined paths)
 - Cover type
 - Soil properties

HARDEN BRANCH WATERSHED



HARDEN BRANCH WATERSHED



WATERSHED METRICS

- How to measure area
 - Numerical Planimetry
 - Arc GIS
 - AutoCad (Polygon Area)
 - Acrobat Pro (Measuring Tools)
 - Surfer
 - ENGAUGE
 - G3DATA+PolyArea.xls
 - Mechanical Planimetry
 - Count squares

WATERSHED METRICS

➤ How to measure lengths

- ArcGIS
- AutoCad
- Acrobat Pro
- Surfer
- ENGAUGE
- G3DATA
- By-hand

WATERSHED METRICS

➤ How to find soil properties

➤ Web Soil Survey

➤ Soil Maps

The screenshot shows the Web Soil Survey (WSS) homepage. At the top, there is a navigation bar with links for Home, About Soils, Help, and Contact Us. Below this is a search bar and a list of links to browse by subject, including Soils Home, National Cooperative Soil Survey (NCSS), Archived Soil Surveys, Status Maps, Official Soil Series Descriptions (OSD), Soil Series Extent Mapping Tool, and Geospatial Data Gateway. The main content area features a large banner with the text "Web Soil Survey" and a "START WSS" button. Below the banner, there is a section titled "Welcome to Web Soil Survey (WSS)" with a photograph of people working in a field and a paragraph of text describing the service. To the right of this section is a "I Want To..." box with a list of links for starting the survey, knowing requirements, finding information by topic, and knowing the SSURGO data structure. At the bottom right, there is an "Announcements/Events" box with a link to "Web Soil Survey 3.1 has been released! View".

websoilsurvey.sc.egov.usda.gov/App/HomePage.h

USDA United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

Home About Soils Help Contact Us

You are here: Web Soil Survey Home

Search

Enter Keywords

All NRCS Sites

Browse by Subject

- ▶ Soils Home
- ▶ National Cooperative Soil Survey (NCSS)
- ▶ Archived Soil Surveys
- ▶ Status Maps
- ▶ Official Soil Series Descriptions (OSD)
- ▶ Soil Series Extent Mapping Tool
- ▶ Geospatial Data Gateway

The simple yet powerful way to access and use soil data.

START WSS

Welcome to Web Soil Survey (WSS)

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

I Want To...

- [Start Web Soil Survey \(WSS\)](#)
- [Know the requirements for running Web Soil Survey — will Web Soil Survey work in my web browser?](#)
- [Know the Web Soil Survey hours of operation](#)
- [Find what areas of the U.S. have soil data](#)
- [Find information by topic](#)
- [Know how to hyperlink from other documents to Web Soil Survey](#)
- [Know the SSURGO data structure](#)

Announcements/Events

- [Web Soil Survey 3.1 has been released! View](#)

WATERSHED METRICS

➤ How to find soil properties

➤ Web Soil Survey

➤ Soil Maps

The screenshot shows the USDA Web Soil Survey homepage. At the top, there is a navigation bar with links for Home, About Soils, Help, and Contact Us. Below this is a search bar and a "Browse by Subject" menu. The main content area features a large banner with the text "Web Soil Survey" and a "START WSS" button. To the right, there is a "I Want To..." section with a list of links for starting the survey, knowing requirements, and finding information. At the bottom, there is an "Announcements/Events" section with a link for the release of Web Soil Survey 3.1.

USDA United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

Home About Soils Help Contact Us

You are here: Web Soil Survey Home

Search

Enter Keywords

All NRCS Sites

Browse by Subject

- ▶ Soils Home
- ▶ National Cooperative Soil Survey (NCSS)
- ▶ Archived Soil Surveys
- ▶ Status Maps
- ▶ Official Soil Series Descriptions (OSD)
- ▶ Soil Series Extent Mapping Tool
- ▶ Geospatial Data Gateway

The simple yet powerful way to access and use soil data.

START WSS

Welcome to Web Soil Survey (WSS)

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

I Want To...

- [Start Web Soil Survey \(WSS\)](#)
- [Know the requirements for running Web Soil Survey — will Web Soil Survey work in my web browser?](#)
- [Know the Web Soil Survey hours of operation](#)
- [Find what areas of the U.S. have soil data](#)
- [Find information by topic](#)
- [Know how to hyperlink from other documents to Web Soil Survey](#)
- [Know the SSURGO data structure](#)

Announcements/Events

- [Web Soil Survey 3.1 has been released! View](#)

WATERSHED METRICS

- How to estimate %-impervious/developed
 - Google Earth
 - Find area of interest
 - Select a viewing height (needs to be same if have to scroll)
 - Put a grid on the screen (physical grid on see-thru plastic)
 - Count concrete vs not concrete – relative ratio is a useable estimate of the %-impervious

MINIMAL WATERSHED DESCRIPTION

- Watershed boundary on a map
 - Area that drains to the outlet (AREA)
 - Main Channel Length (MCL)
 - Slope(s)
 - Soil Properties (Permeability)
 - %-Impervious

NEXT TIME

➤ Discrete Data Preparation