National Biological Assessment and Criteria Workshop

Advancing State and Tribal Programs

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Reference Condition Approach and Site Selection:
An Oregon Case Study

Presented by

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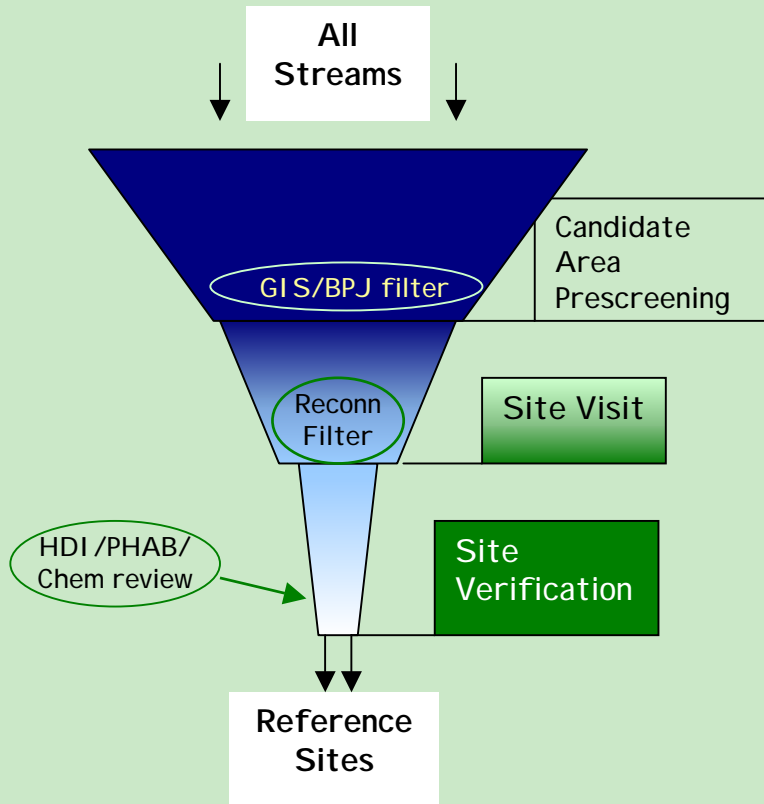drake.doug@deq.state.or.us

Also contributed

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Overview

- **1992 to present - Identified more than 220 reference sites**

- **Wadeable streams (1st- 4th order) representing 84-92% of total streams miles**

- **Use in Biocriteria, 303d, stressor identification, TMDL/permitting support**

Site Selection Process

- **Candidate area prescreening**
  - Select region/natural gradients, use GIS and BPJ to map candidate areas
- **Site visit (Field reconnaissance & Sampling)**
  - Site reach assessment of human disturbance ranks candidates (for sampling)
- **Site verification**
  - Use site specific landscape, reach & sample data to verify and grade sites
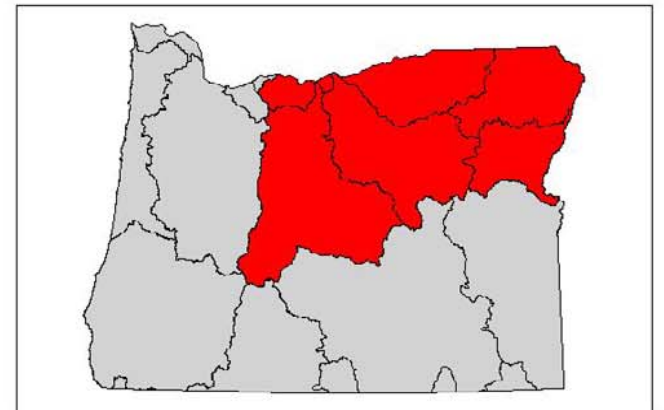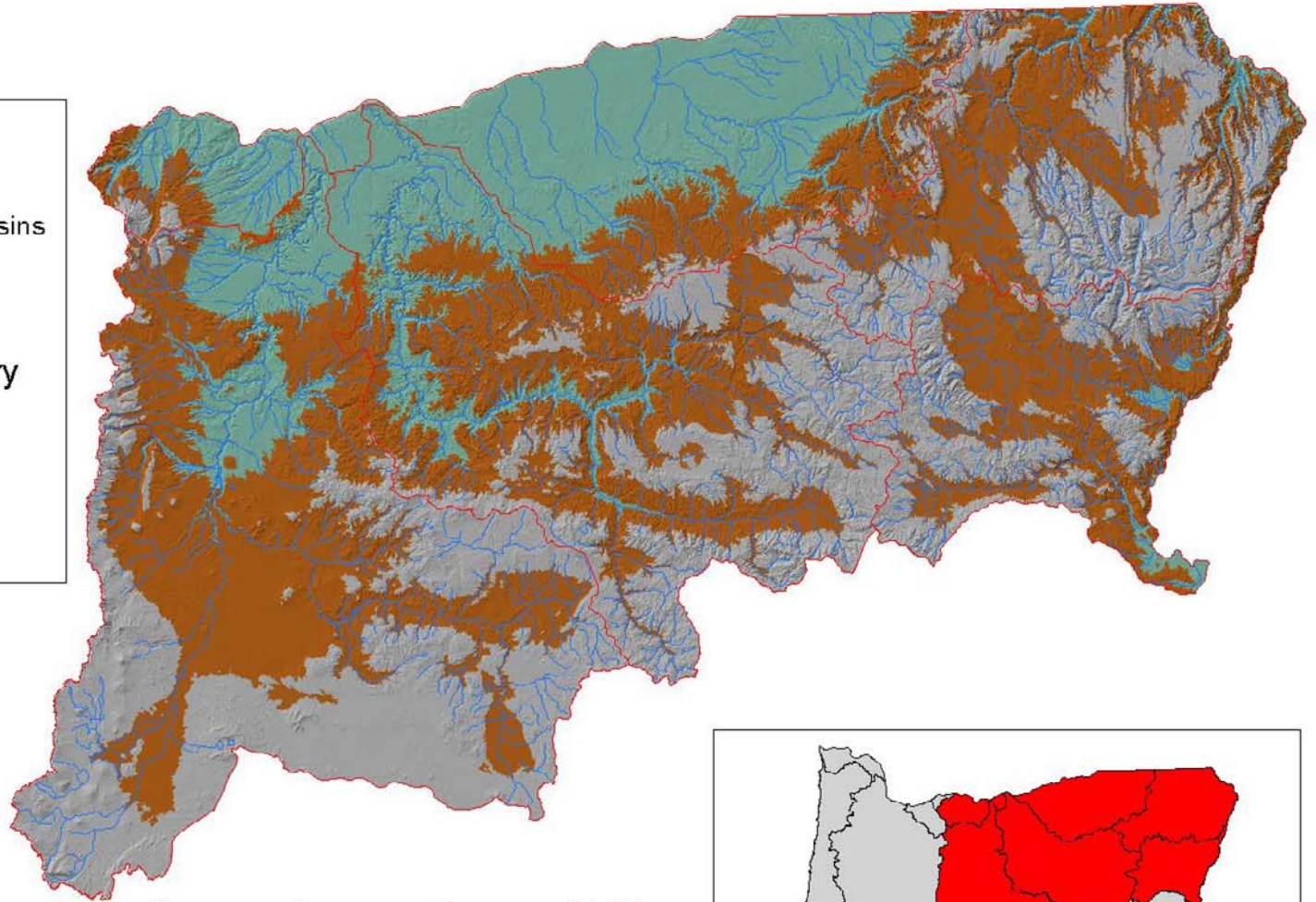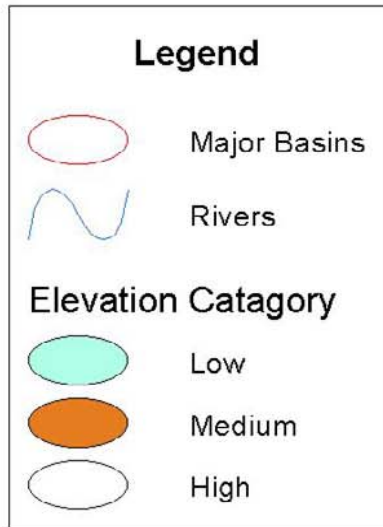
Candidate area prescreening

Three Examples:

- 2000 - NE Oregon

- 2001-2002 - Willamette Valley

- 2002+ - John Day Basin

NE Oregon Prescreening

- NE basins (Blue Mt. ecoregion) broken into 5th field watersheds, Strata: 2-4 order, 3 elevation classes

- Five GIS coverages used

- BPJ survey of resource managers

- GIS & BPJ folded together, EPA selected random sites

Reference Site Study Area

Legend

- Major Basins
- Rivers

Elevation Catagory

- Low
- Medium
- High

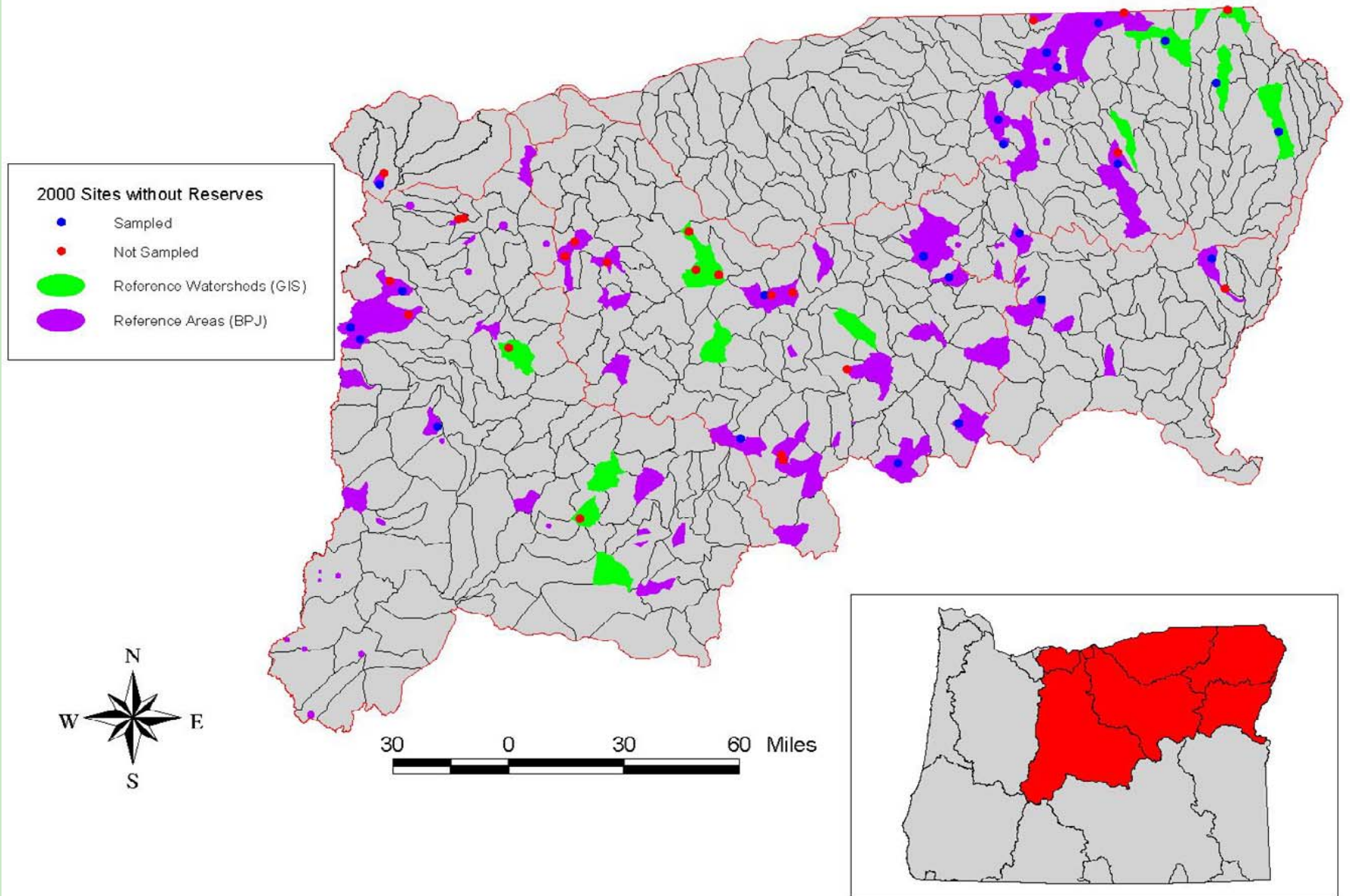30   0   30   60   Miles

NE Prescreening Coverages

- Ag Lands
- Grazing
- Population Density
- Road Density
- WQ Impairment

NE BPJ Prescreening Survey

20 State & Federal professionals
100 BPJ candidate watersheds

- How do GIS candidate watersheds look?
- Does it agree with where you find least-impaired watersheds?
- Did we miss any watersheds in reference condition?

Fifth Field Basins in the Study Area

2000 Sites without Reserves
- Sampled
- Not Sampled
- Reference Watersheds (GIS)
- Reference Areas (BPJ)

N
W E
S

30   0   30   60 Miles

Willamette Ecoregion
Prescreening & Reconn

- GIS and Reconnaissance primarily used
- Ecoregion sliced into elevation classes
- MRLC, Forest fragmentation, Road density
- Focused on best of what is left in valley floor (< 500 feet)

Willamette Prescreening
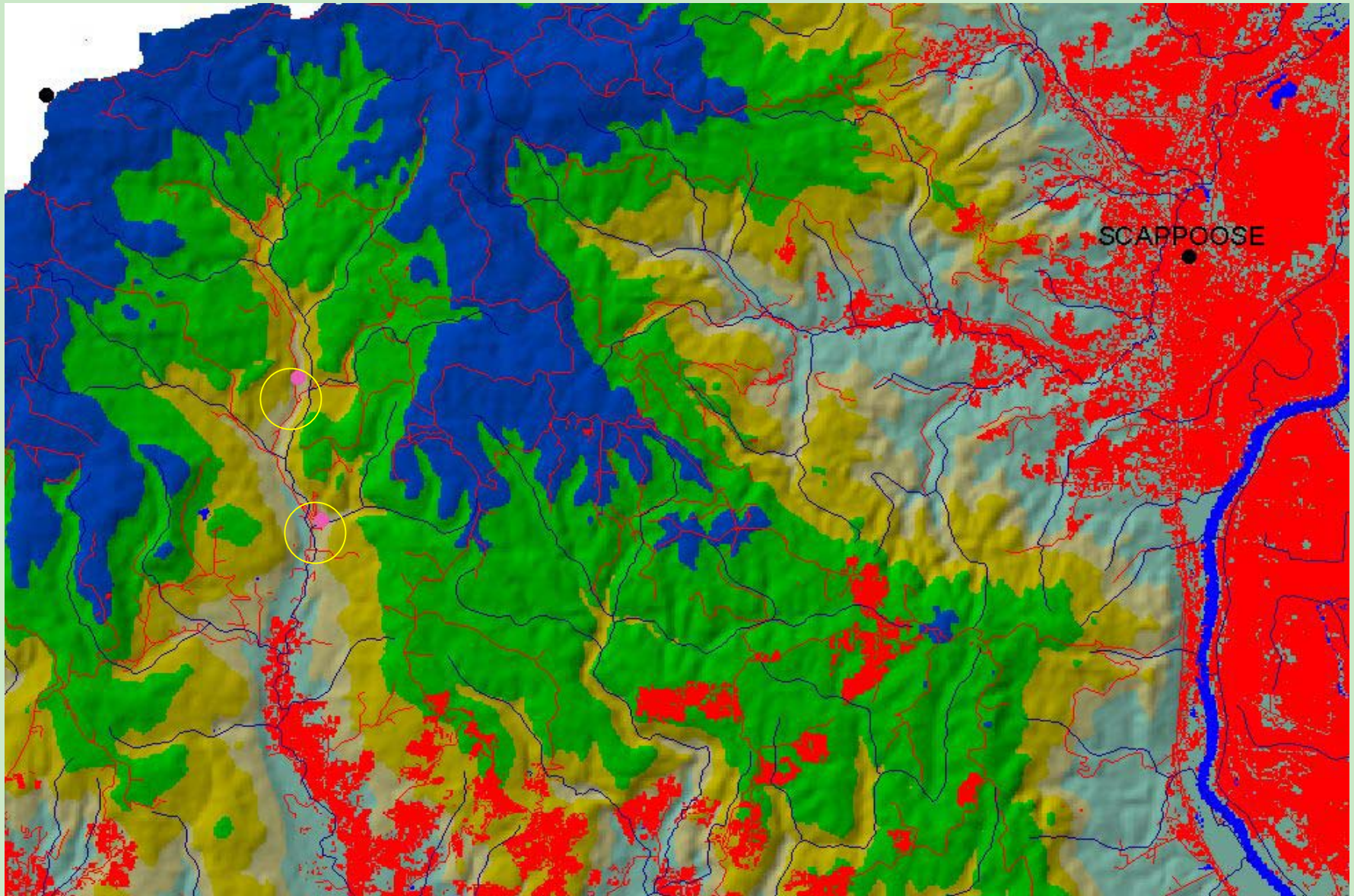
John Day Basin Prescreening

- GIS and reconnaissance primarily used
- Natural gradient is elevation (3 classes)
- Used previous GIS (Roads, Ag, Grazing, Pop. & WQ) added MRLC and forest fragmentation.
- Used candidate areas to perform intense reconnaissance.

John Day Site Visits

Reconnaissance Checklist

• Human Disturbance reach-level activity checklist (modified from Kaufmann et al, 1999)

• Uses simple set of metrics to produce a reach-level Human Disturbance Score to rank sites

• Allows for objective ranking of candidate sites for sampling

Site Visit
Reconnaissance or Sampling

Reach data – 5 metrics scored* based on proximity of these disturbances:

- Roads,
- Logging,
- Agricultural and/or Urban land use,
- Rangeland,
- Miscellaneous (includes mining, recreational activity, other).

*absent=0, present=1, within 10 m=3, on the bank=5
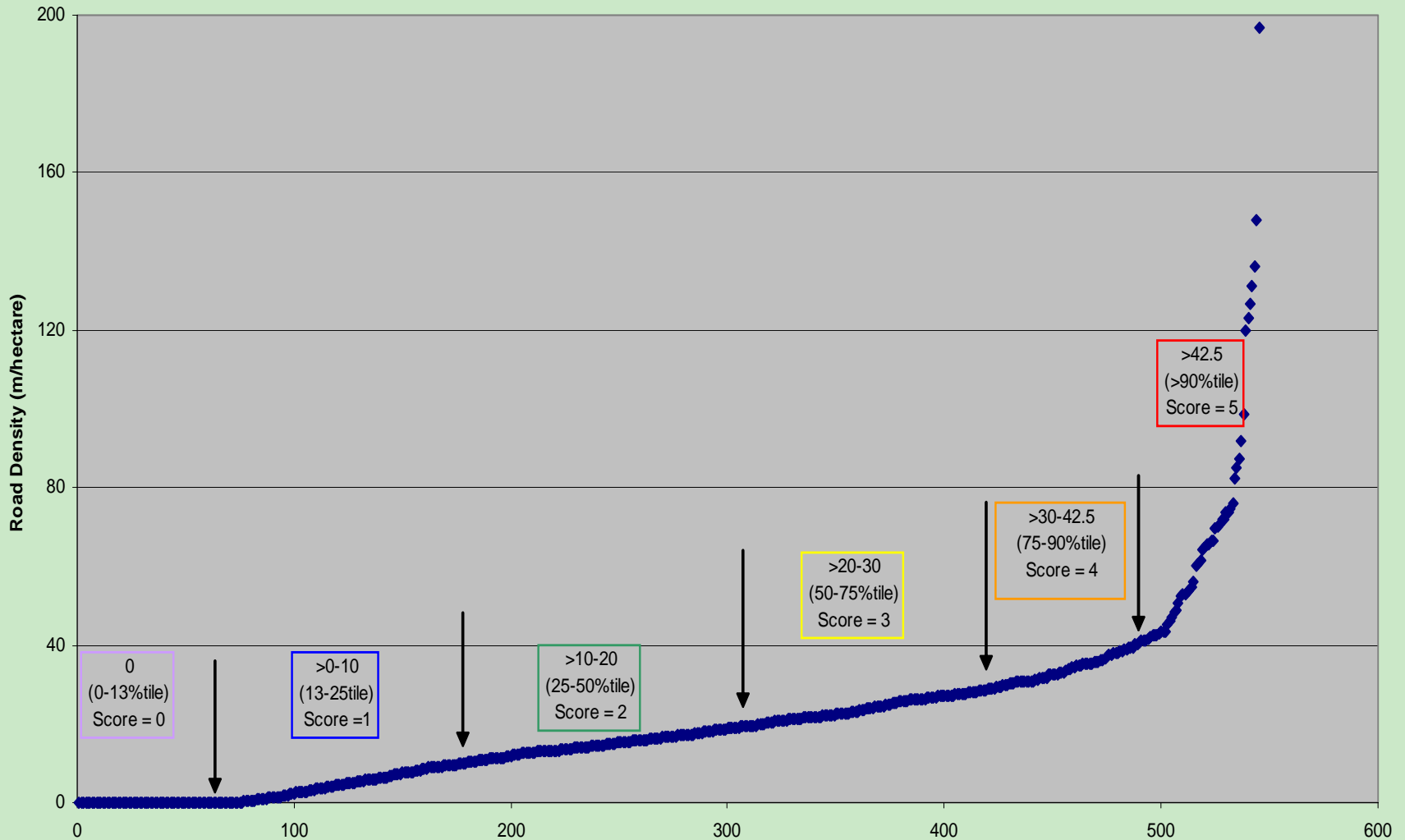
Site Verification
Watershed specific assessment

GIS data – 3 Metrics scored* based on watershed extent of :

- Percent Ag-Urban land use

- Forest fragmentation

- Road density

*absent=0, >0-25%tile=1, >25-50%tile=2, >50-75%tile=3, >75-90%tile=4, >90%tile=5

Road density scoring

0
(0-13%tile)
Score = 0

>0-10
(13-25tile)
Score =1

>10-20
(25-50%tile)
Score = 2

>20-30
(50-75%tile)
Score = 3

>30-42.5
(75-90%tile)
Score = 4

>42.5
(>90%tile)
Score = 5

Site Verification

- **HDI (Human Disturbance Index)** - Reach and watershed scores are added together to give relative index score

- **Review sample data** – Anomalous sites are flagged and reviewed before assigning final grade

HDI Score examples

Activity (scale)	Cultus Creek	Testament Creek	Tillamook River
Ag/Urban (reach)	Not present = 0	Not present = 0	Within 10 m = 3
Logging (reach)	Not present = 0	Present = 1	Within 10 m = 3
Range (reach)	Not present = 0	Not present = 0	Within 10 m = 3
Roads (reach)	Not present = 0	Present = 1	On the bank = 5
Misc (reach)	Not present = 0	Boy Scout camp present = 1	Garbage within 10 m = 3
Ag/Urban (watershed)	Not present = 0	Not present = 0	>25-50%tile = 2
Forest Frag (watershed)	Not present = 0	>90%tile = 5	>50-75%tile = 3
Road (watershed density)	Not present = 0	>90%tile = 5	>50-75%tile = 3
HDI Score	0	13	25

Flagged Site examples
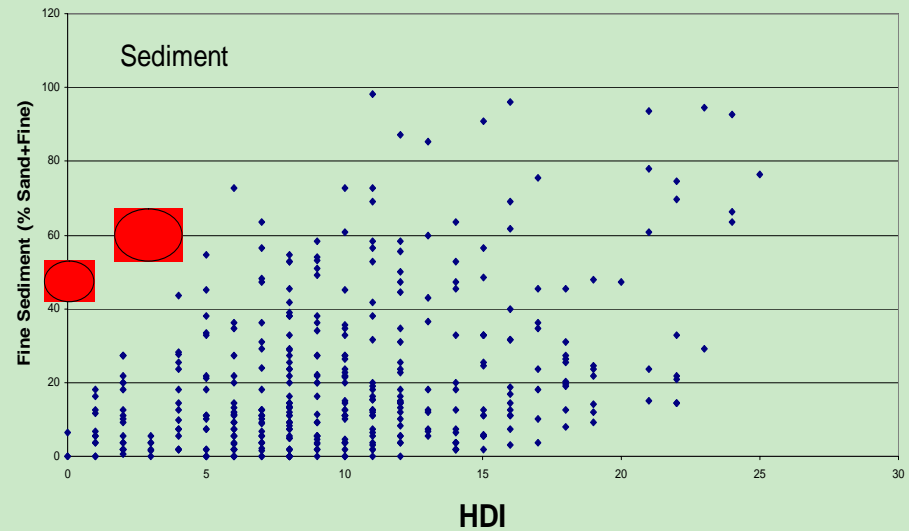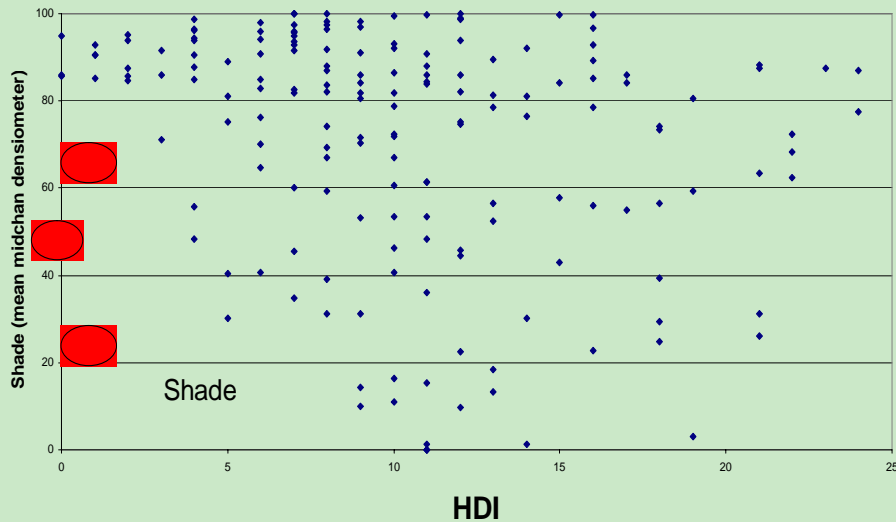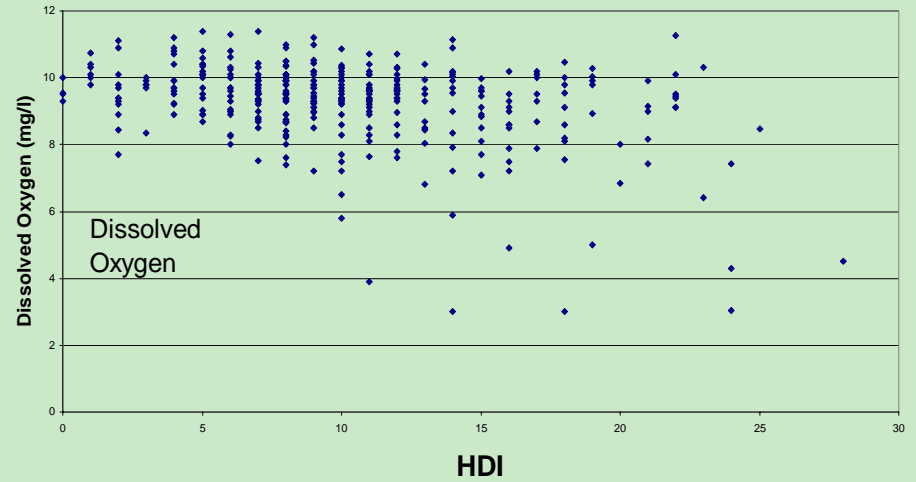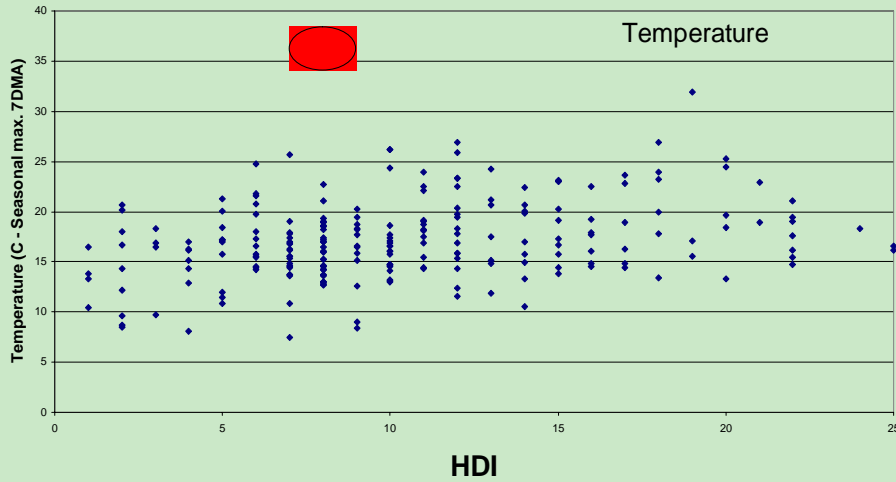
Site Verification
Flagged sites

High sediment – Flynn (low slope/geology)

Cultus (meadow)

High Temp – Canyon (ran dry)

Low Shade – Battle (above ave. width)

Cultus (meadow)

Goose (dry, PHAB only)

Site Grading

A - Ideal watershed and stream condition, a watershed with virtually no human disturbance.

B - Good watershed and stream condition, some limited human disturbance and/or BMPs are well implemented.

C - Marginal watershed and stream condition. Considerable human disturbance. Best available. Replace if better quality reference sites are located.
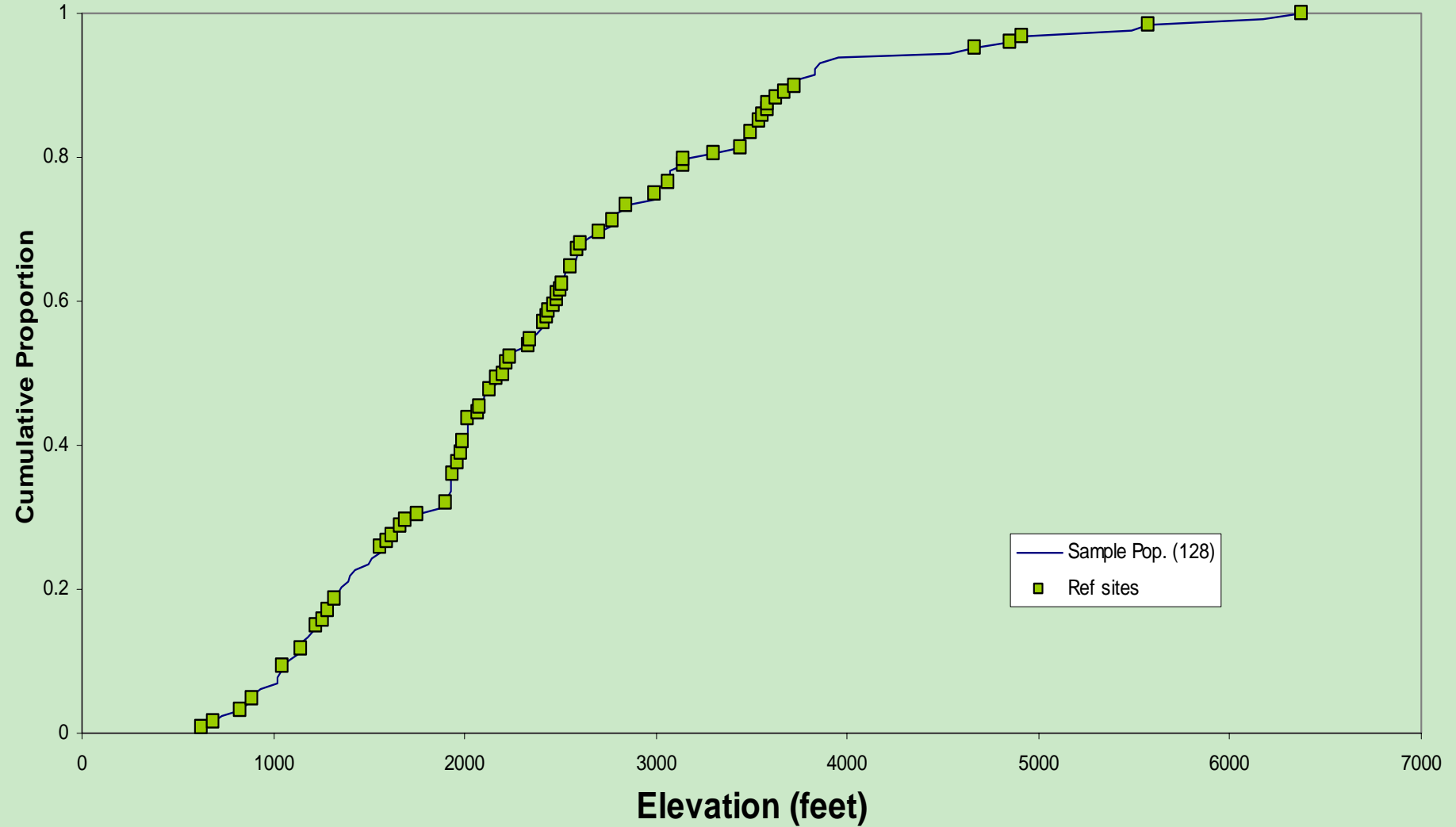
Site Grading *continued*

D - Site represents sub-marginal stream and watershed conditions, considerable human disturbance is present at reach or watershed.

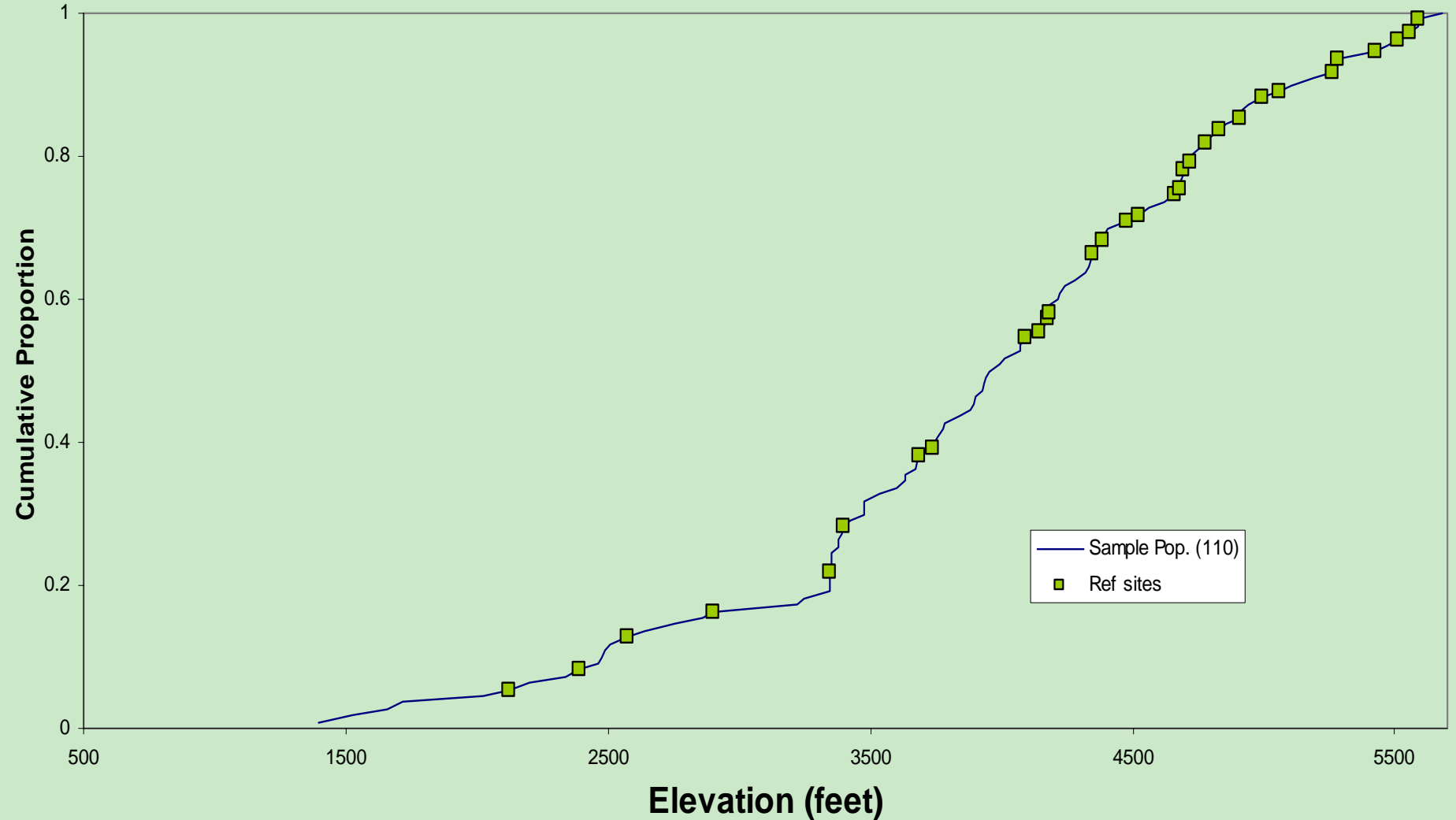**E** - Site represents poor stream and watershed conditions, considerable human disturbance is present at reach and watershed.

F - Site represents very poor stream and watershed conditions, human disturbance is extensive throughout reach and watershed.
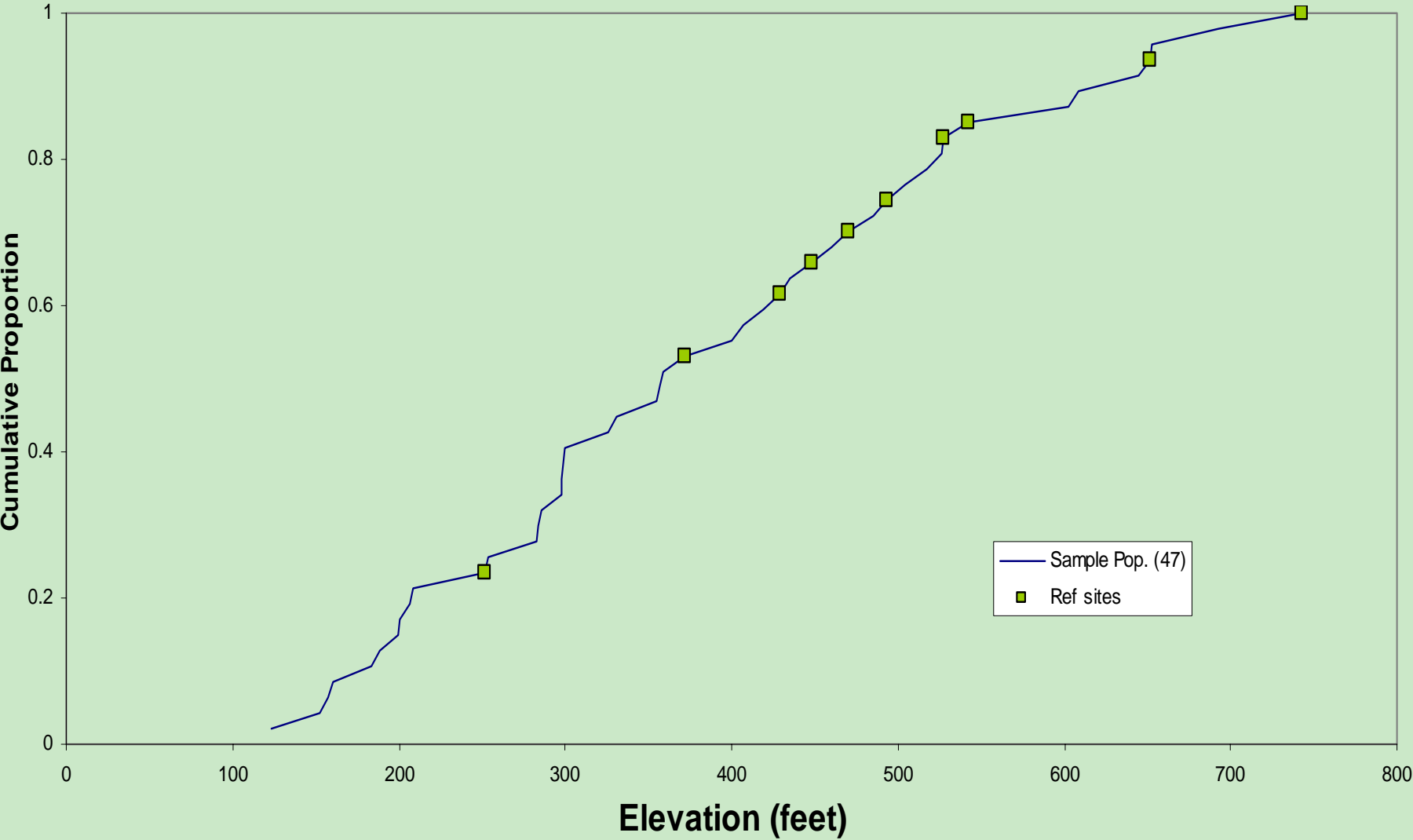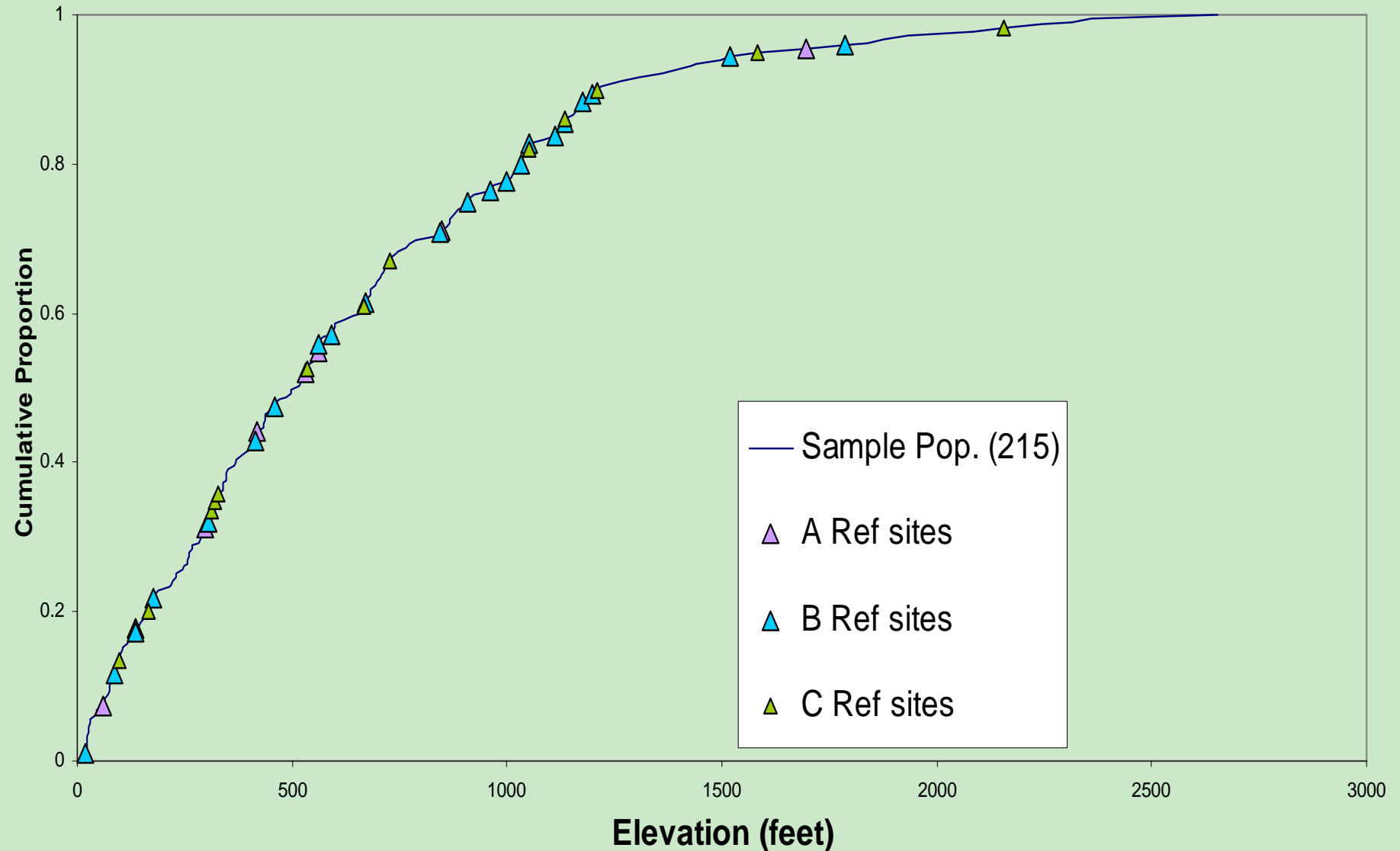
Cascades

Blue Mts.

Willamette

Coast Range (HDI graded Sites)

A scatter plot with **Elevation (feet)** on the x-axis (ranging from 0 to 3000) and **Cumulative Proportion** on the y-axis (ranging from 0 to 1). The legend shows:
- Sample Pop. (215)
- △ A Ref sites
- △ B Ref sites
- △ C Ref sites

HDI Graded Watersheds

A	(dark blue)
B	(blue)
C	(light blue)
D	(light pink)
E	(red)
F	(dark red)
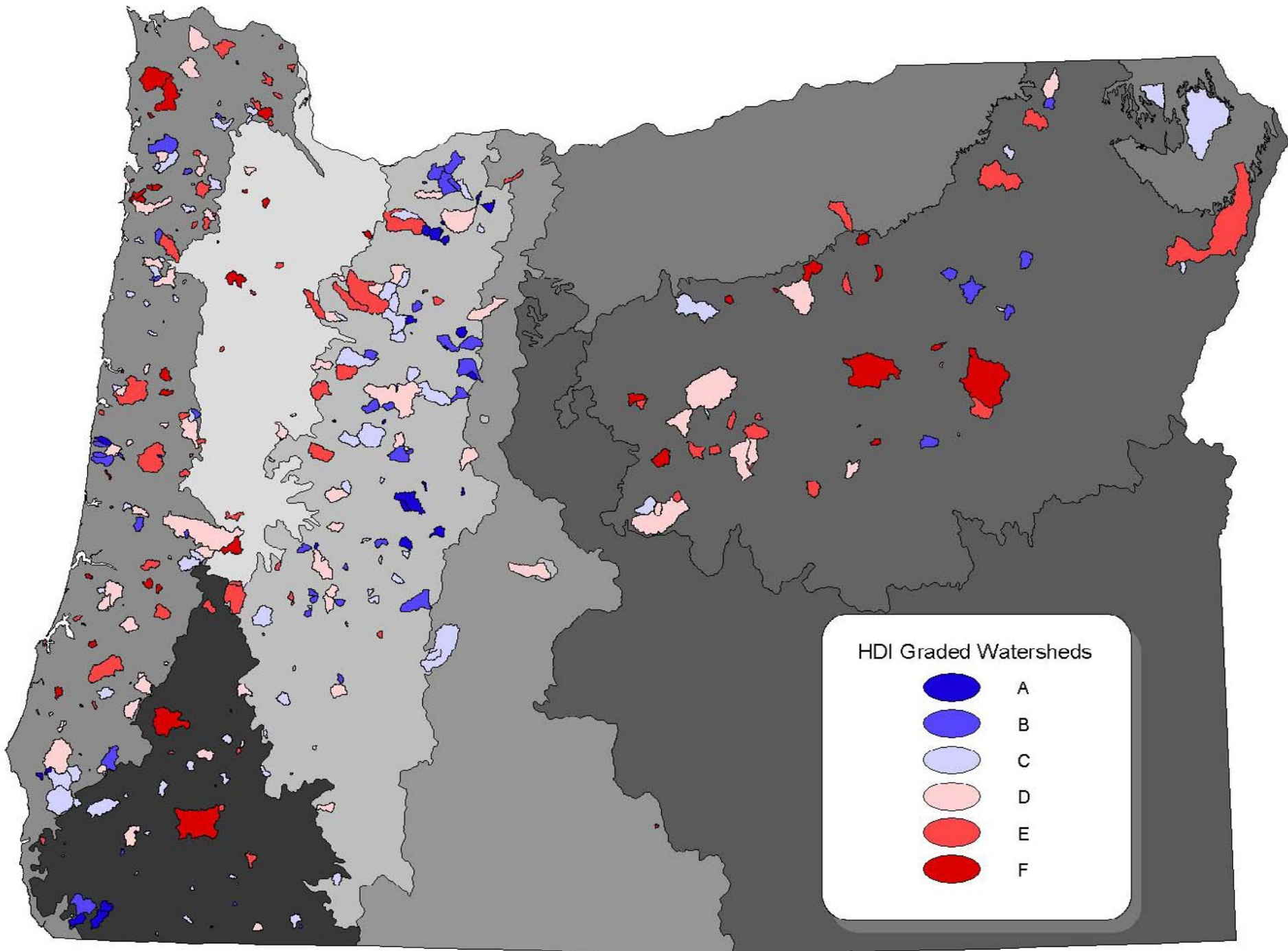
Lessons Learned

- **BPJ surveys** - are helpful but everyone is busy

- **GIS information** – Use what you have, but have process that allows for latest info to be incorporated

- **Reconnaissance** – Can't do too much

- **Verification** – Anomalous or unique sites may be trying to tell you something

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