"Taking the temperature" of a North Coast watershed:
measuring stream health at the Garcia River Forest

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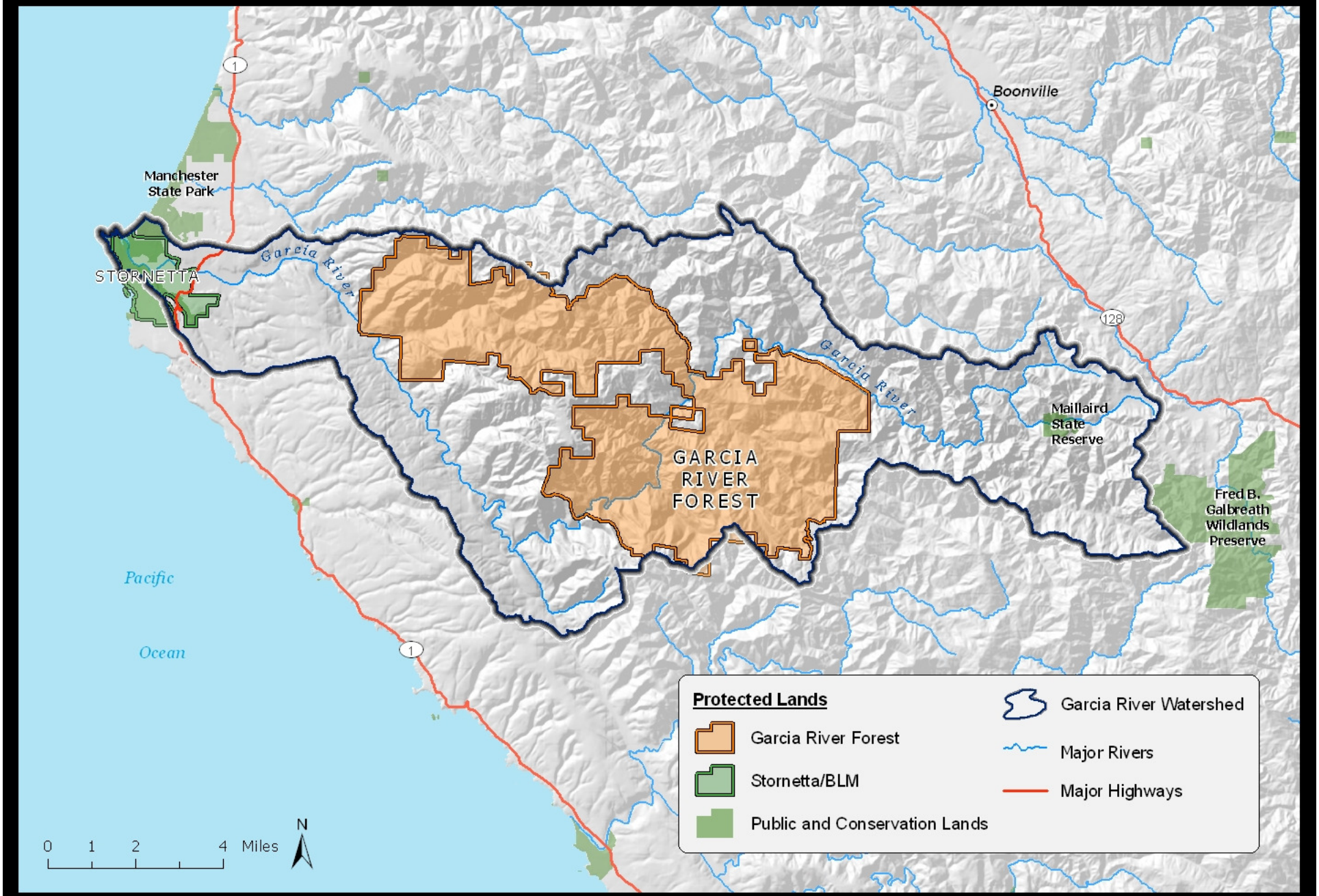
Garcia River Forest Conservation Context



Garcia River Forest

- Practice uneven-aged forestry
- Harvest levels significantly less than growth rates
- Develop old growth forest habitat elements

Garcia River Forest

Garcia River Forest

- Hypothesis: We can produce long-term and sustained-yield production of valuable forest products in a healthy, vigorous and diverse forest while protecting and enhancing the associated biodiversity values of watershed, wildlife, and fish.

Conservation Targets

Viability Analysis

Key Ecological Attributes:

Factors that *characterize* the target, *limit* its distribution, or determine its *variation* over space and time

- e.g. Water quality

Indicators:

Measurable entities used to *assess the status and trends* of a conservation target's Key Ecological Attribute(s)

- e.g. Water temperature

From Conservation by Design (TNC 2006)

Viability Analysis

KEY ECOLOGICAL ATTRIBUTES		INDICATORS
Migration Passage	→	Migration barriers
Water Quality	→	Water temperature
Habitat Features	→	Pool shelter
	→	Thalweg variability
	→	Pool frequency
	→	Embeddedness
	→	Riparian cover
	→	d50
	→	LWD

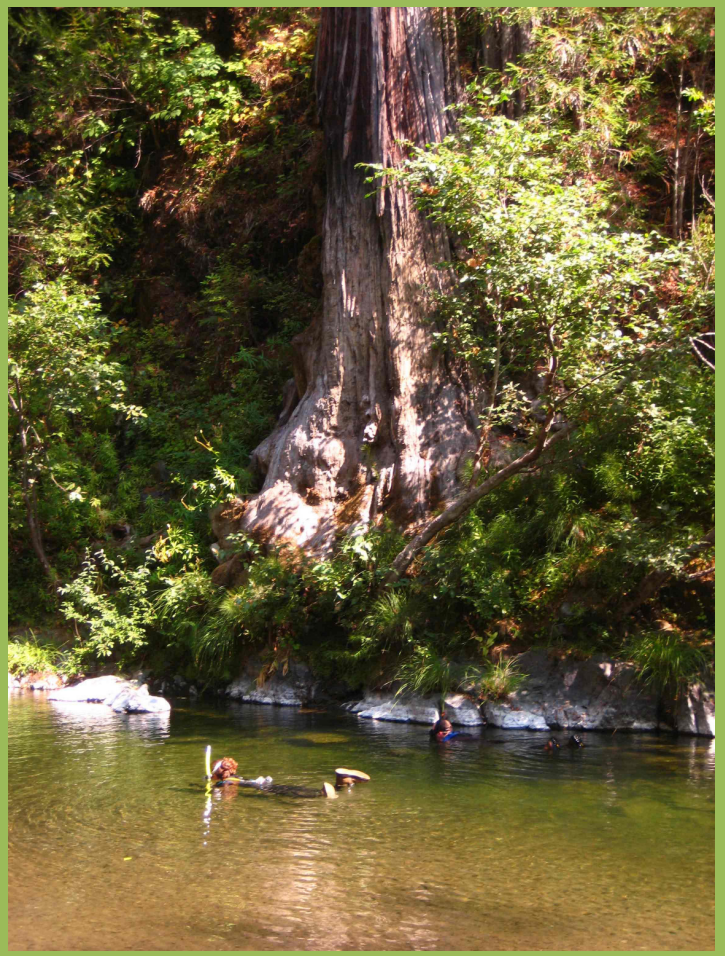
Protocols

- US EPA EMAP
- Attributes measured:
  - Channel Dimensions
  - Channel Gradient
  - Anthropogenic Alterations
  - Substrate Size
  - Habitat Complexity, Cover, LWD
  - Riparian Vegetation Cover and Structure
  - Stream Discharge
  - Benthic Macroinvertebrates
  - Fish
  - Invasives

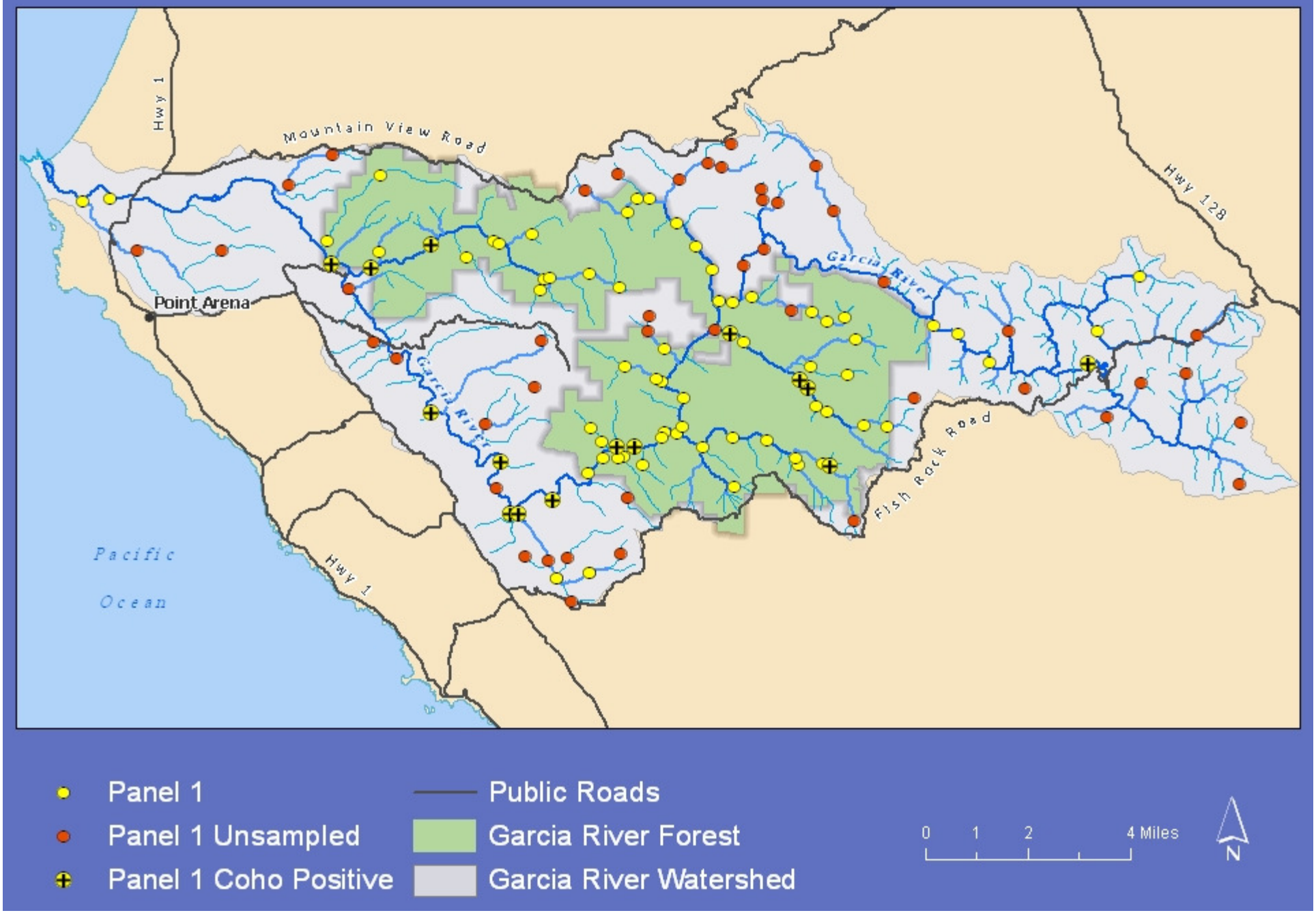
TMDL/EMAP Interface

Garcia TMDL Parameters:

1. Migration barriers
2. **Embeddedness**
3. **% fines< 0.85mm***
4. **% fines <6.5mm***
5. **Primary pool frequency**
6. V* in 3rd order streams
7. **Median particle size (d50)**
8. **Large woody debris volume**
9. **Channel width-to-depth ratio**
10. **Variability in thalweg profile (habitat heterogeneity)**
11. **Riparian canopy closure**



Garcia River EMAP X-Sites



Conservation Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Primary pool Frequency in Inman	0-20%	**20-39%**	*>40% of length of total habitat*		39%	Fair	Good
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Primary pool Frequency in Signal	0-20%	**20-39%**	*>40% of length of total habitat*		31%	Fair	Good
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Riparian canopy cover Inman	**<89%**	89-98%	*>99%*		81%	Poor	Good
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Riparian canopy cover Signal	**<89%**	89-98%	*>99%*		91%	Fair	Good
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Large woody debris (instream) Inman	<200 cu.m./km.	200-372 cu.m./km.	>372 cu.m./km.		191	Poor	Good
1	Anadromous Fish Bearing Stream	Condition	Habitat features	Large woody debris (instream) Signal	<200 cu.m./km.	200-372 cu.m./km.	>372 cu.m./km.		655	Good	Good

Macroinvertebrates

North Coast IBI
Scoring:

- 81-100 - very good condition
- 61-80 - good condition
- 41-60 - fair condition
- 21-40 - poor condition
- 0-21 - very poor condition
- ≥52 = impaired waters

North Coast IBI values - Garcia River

Very good condition: 28.3% of sites

Good condition : 34.8% of sites

Fair condition: 34.8% of sites

Poor condition: 2.2% of sites
(actually just one site)

Very poor condition: 0 sites

Impaired Waters:

- 19.6% of all sites
- 41.2% of Garcia River mainstem sites

North Coast Index of Biotic Integrity (Rehn and Ode 2005)

Macroinvertebrates

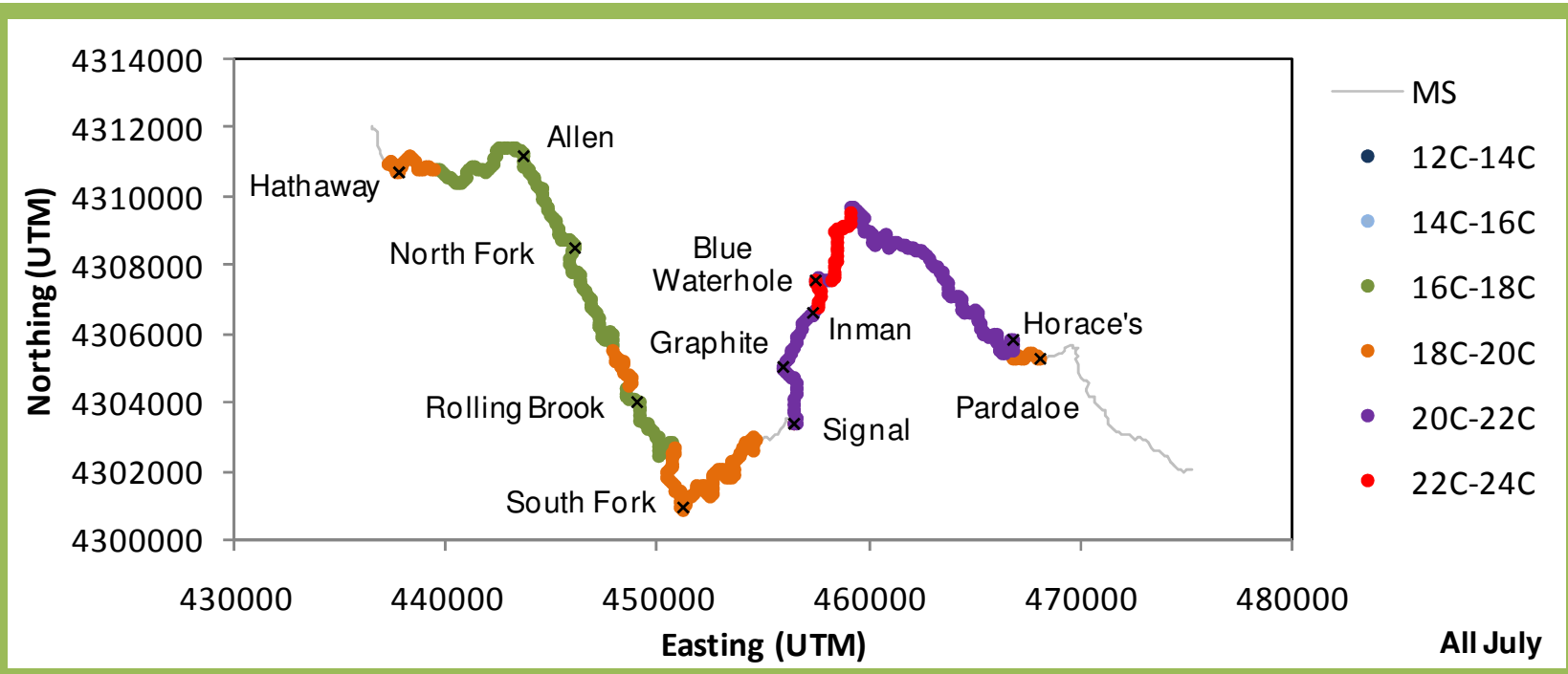
366 species of aquatic macroinvertebrates

- EPT taxa – 166
  25.8% of the California EPT fauna

- Ephemeroptera (mayflies) -39
  33.9% of CA fauna

- Plecoptera (stoneflies) - 45
  24.5% of the CA fauna

- Trichoptera (caddisflies) - 82
  23.8% of the CA fauna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Blue Waterhole
Graphite
Inman
Horace's
Rolling Brook
Signal
Pardaloe
South Fork
MS
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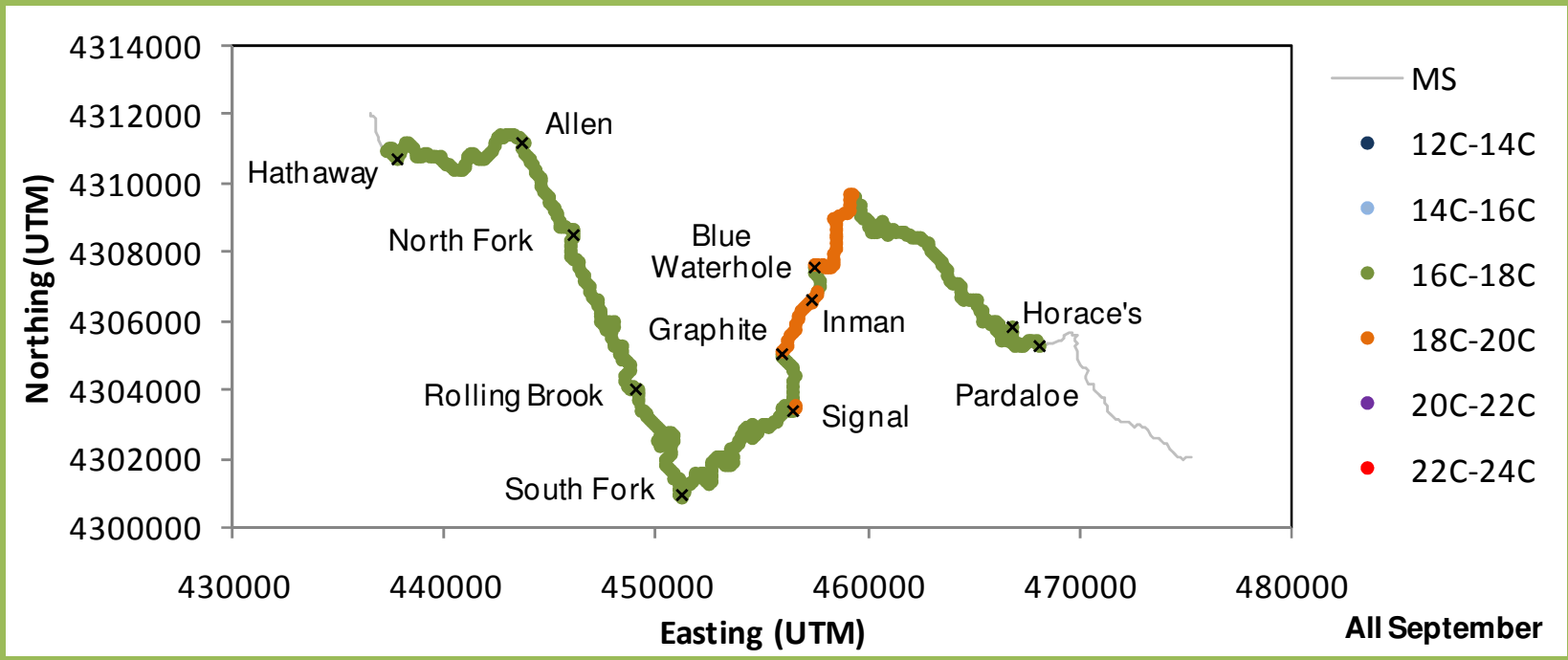
14C-16C
16C-18C
18C-20C
20C-22C
22C-24C
All July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All September

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