Water Quality Monitoring Proposal for the Judd Creek Watershed

Principal Investigator

Cajun James PhD, Research and Monitoring Manager for Sierra Pacific Industries, P. O. Box 496011 Redding, California 96049-601;(530) 378-8000; email cjames@spi-ind.com.

Other Contributing Investigators

Morgan Hannaford PhD (Aquatic Entomology), Lee Benda PhD (Geomorphology), and Bruce Krumland PhD (Statistics and Biometrics).

Other Cooperators

Pete Cafferata, Forest Hydrologist, California Department of Forestry and Fire Protection, P.O. Box 944246, Sacramento, California; (916) 653-9455.

Background

Throughout the last decade, questions emerged surrounding the effectiveness of forest management practices in California to adequately protect water quality. In order to determine the potential impact of timber management operations on water quality, the Board of Forestry and Fire Protection (BOF) has established cooperative research projects with various landowners. Two such projects were initiated in the year 2003; South Fork of Wages Creek (Campbell Timberlands) and the Garcia River Project (Mendocino County RCD). The proposed monitoring prospectus that follows outlines a cooperative watershed scale experiment between Sierra Pacific Industries, the California Department of Forestry and Fire Protection and the Central Valley Regional Water Quality Board. The materials submitted are a condensed version of a longer monitoring research proposal that will be available by the end of October and will be discussed at the November 10th Monitoring Study Group meeting. These *draft materials* are made available currently to allow for the exchange of ideas and suggestions from other scientists and interested parties. This project will be implemented by Sierra Pacific Industries before winter 2004 and is based on the Judd Creek "Engebretsen" timber harvest plan that is currently in the public review period and is expected to be approved by early October 2004. Peer Review comments and suggestions are welcome and should be submitted to Dr. Cajun James whose contact information is listed above.

Study Area

The proposed research project is located in the Judd Creek Watershed, California Watershed number 5509.630101. This watershed covers 6,350 acres and is 11.02 miles in length from the headwaters of Judd Creek down to the confluence with the North Fork of Antelope Creek. The Judd Creek watershed assessment area is a combination of private and public forestland ownership. Private landowners include Sierra Pacific

Industries (72%) and a private ranch (16%). The United States Forest Service manages the remaining 12% of the watershed.

The stream gradient, annual rainfall, soil type, aspect, slope, and land use history of the Judd Creek watershed is typical of the characteristics of headwaters watersheds owned by Sierra Pacific Industries in mixed-conifer forests of the Southern Cascades. Headwaters watersheds that are similar to Judd Creek comprise 81% of the 1.2 million acres that Sierra Pacific Industries currently owns in the area regulated by the Central Valley Regional Water Quality Control Board. Therefore, results from this monitoring project will contribute valuable information to regulators, forest landowners, and the public on the effect of forest management operations on water quality for inland California headwaters watersheds.

In order to effectively monitor the potential impact of forest management practices it is important to not only select a monitoring watershed that is representative of Sierra Pacific Industries ownership, but to also assess the full range of timber harvest operations that are currently practiced. Therefore, a timber harvest plan, the Judd Creek "Engebretsen", was developed specifically for this monitoring purpose. The plan proposes 41 clear-cut units (ranging from 10 to 26 acres), new road construction, abandonment of older road sections, culvert removals, new landing construction and the abandonment of older landings. The plan would harvest 816 acres or 13% of the entire Judd Creek watershed. This represents almost 18% of SPI lands in this watershed, which places this experiment on the high end of intensive management and potential effects

Baseline Data Available for Inclusion in Monitoring Project

Another reason to locate the monitoring project in the Judd Creek Watershed is because previous studies have been conducted there and baseline data exists for a variety of parameters. Since 1999, Cajun James has collected data for a series of riparian buffer studies in sections 8 and 9 and at the confluence with Antelope Creek. The following parameters were recorded; water temperature, discharge, turbidity, suspended sediment, near stream microclimate, precipitation, canopy cover, and water quality (ph, conductivity, dissolved oxygen). Currently, two water quality-monitoring stations exist in lower Judd Creek that have been collecting data year round since the fall of 2000 as part of these riparian studies. This area in the Judd Creek watershed was designated *experimental forestland status* by the BOF. Dr. Morgan Hannaford has collaborated with Dr. James riparian buffer studies to examine the response of macro invertebrates to timber harvest operations upland of Judd Creek. Dr. Lee Benda has also constructed a sediment budget and a large wood budget for the Judd Creek Watershed in conjunction with the riparian buffer studies.

Monitoring Objective

The objective of this monitoring project is to examine the response of water quality in Judd Creek due to intensive upland forest management activities. Changes in the spatial and temporal variability of stream flow, turbidity, and suspended sediment transport regimes for Judd Creek will be characterized before and after timber harvest operations to determine the effect of timber harvest operations on water quality. In addition, the effect of stream crossing reconstruction, road abandonment, and new road construction on turbidity above and blow treatment sites will be evaluated. Data collected from five water quality stations[1], grab samples and photo points will be included for analysis. Additional baseline data available from other research projects within the watershed will also be used to verify that changes in response variables over time and space resulted from the timber harvest activities implemented in this monitoring project.

Monitoring Timeline and Methodology

- This monitoring project will be implemented over a five-year period and includes six phases beginning in year 2004 and lasting at least through winter 2008. The six phases proposed in this monitoring project are depicted in a flowchart (*Figure A*). Please note that in *Figures 1-6,* each phase of this project is mapped and placement of research equipment is shown. On each map, a solid black and orange line is drawn. This line was mapped to illustrate which direction water will drain within the watershed and help explain equipment placement. The timber harvest units mapped to the right or east of the line will drain into the uppermost water quality station and the timber harvest units mapped to the left or west of the line will drain into the four water quality stations located below the meadow. The water quality station sites were chosen to capture the response of in stream water quality parameters to timber harvest operations in the six phases of this project, located where Judd Creek flows year round, and on Sierra Pacific Industries property.

- In Phase 1, three additional water quality stations will be installed during the fall of 2004. In *Figure1,* red stars represent the location of the two already existing water quality stations and the yellow stars note the proposed new locations.

- In Phase 2, scheduled roadwork will be performed within the Engebretsen THP area during summer 2005 and be concluded by the fall of 2005. In *Figure 2*, proposed roadwork is identified on the map by the following symbols; new road construction (green line), road decommissioning (hatched pink line), culvert removals (orange square), new landing construction (green circle), and the abandonment of older landings (red circle).

[1] Water quality stations include the following equipment: Waterlog data logger, Waterlog gas bubbler, YSI 6280 Multi-Parameter Sonde, Isco suspended sediment sampler.

- In Phase 3, twenty-four units that drain into the lower west side of Judd Creek will be chipped during the summer 2006. In *Figure 3*, the units to be treated in Phase 3 are mapped in gold. Sub-merchantable trees less than or equal to 8 inches in diameter at breast height (DBH) will be chipped. All timber harvest units within this timber harvest plan will be chipped, but because of operational limits, it is not possible to treat all 41 units in a single season. Therefore, mechanical chipping will occur over a two-year period. Mechanical chipping before timber harvest is performed to reduce fire hazard on forestlands in lieu of prescribed burning after harvest. This common forestry practice is increasingly being implemented on Sierra Pacific Industries forestlands because of the risks associated with prescribed burning and because the number of days when prescribed burning is allowed by various agencies has been drastically reduced within the last decade.

- In Phase 4, the twenty-four units chipped in Phase 3 will be clear-cut harvested and seventeen units that drain into the upper east side of Judd Creek will be chipped before harvest in Phase 5. In *Figure 4*, the units harvested are mapped in blue, and the units to be treated with chipping are gold. Phase 4 is scheduled for implementation during the summer of 2007.

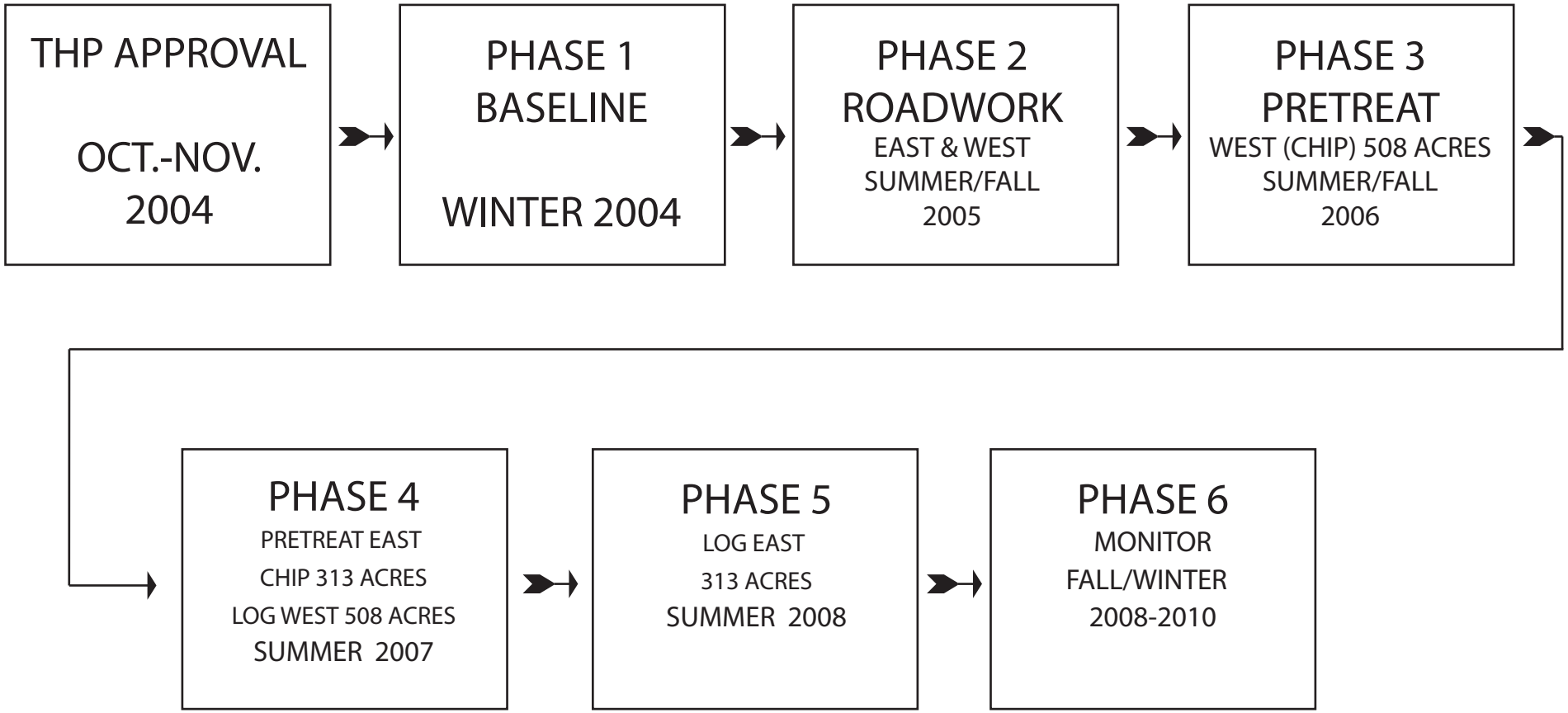
- In Phase 5, the 17 units chipped in Phase 4 will be clear-cut harvested during the summer of 2008. In *Figure 5*, the units to be harvested are mapped in blue and the units that were harvested in the prior year 2007 are now mapped green because they will have been reforested. All treatments are now complete.

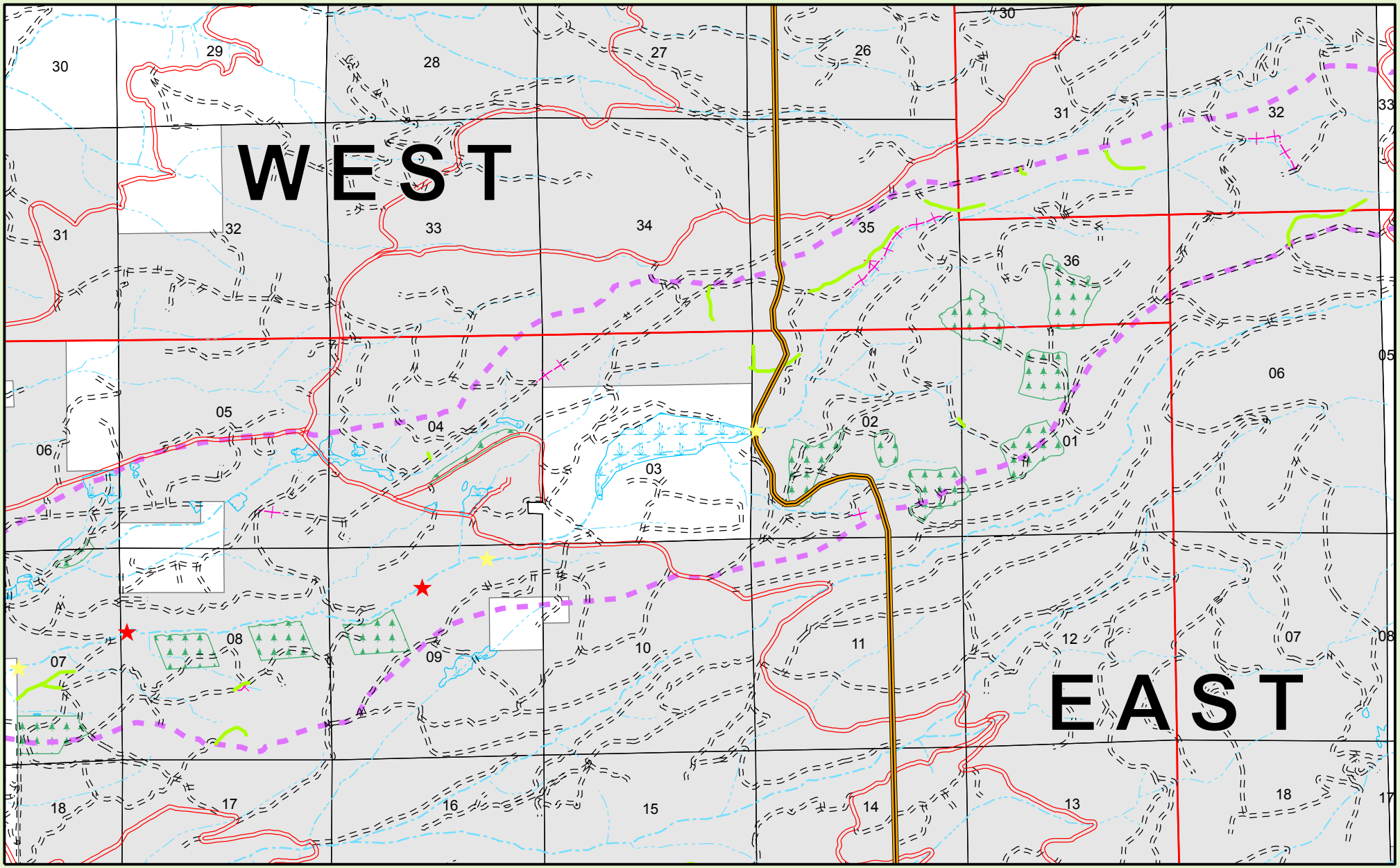
- In Phase 6, all treatments have been implemented and monitoring will continue. In *Figure 6*, all 41 clear-cut harvest units are now mapped in green because they will have been replanted.

Reports to MSG

Each year progress reports will be presented to the MSG and field trips will be arranged if requested.

JUDD CREEK
MSG TIMELINE





Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde

Judd Creek Monitoring Study Group

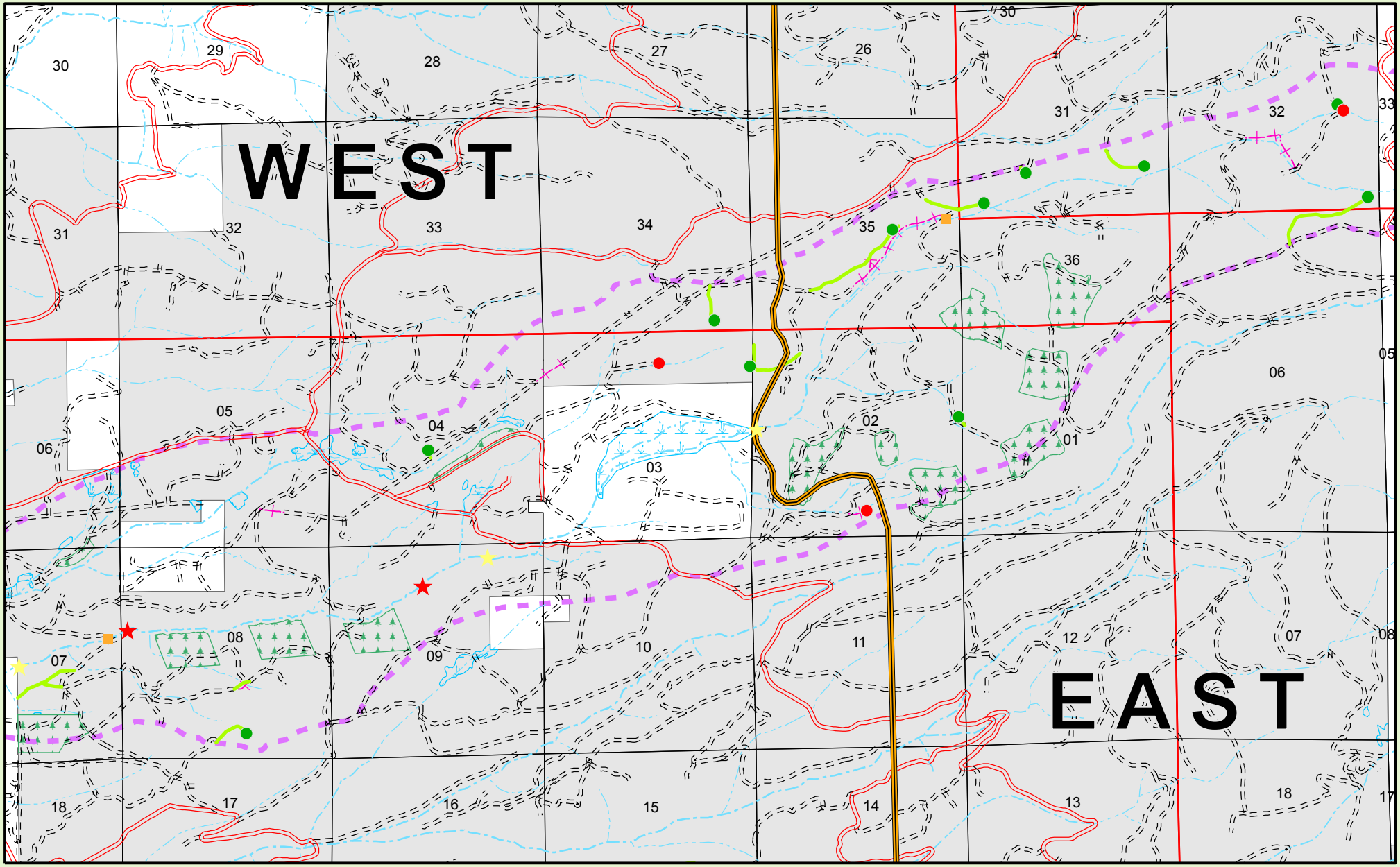
Draft Experimental Design

Phase 1 Baseline Winter 2004

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet



Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde
- Abandoned Landing
- Proposed Landing
- Culvert Removal/ Photo Point

Judd Creek Monitoring Study Group

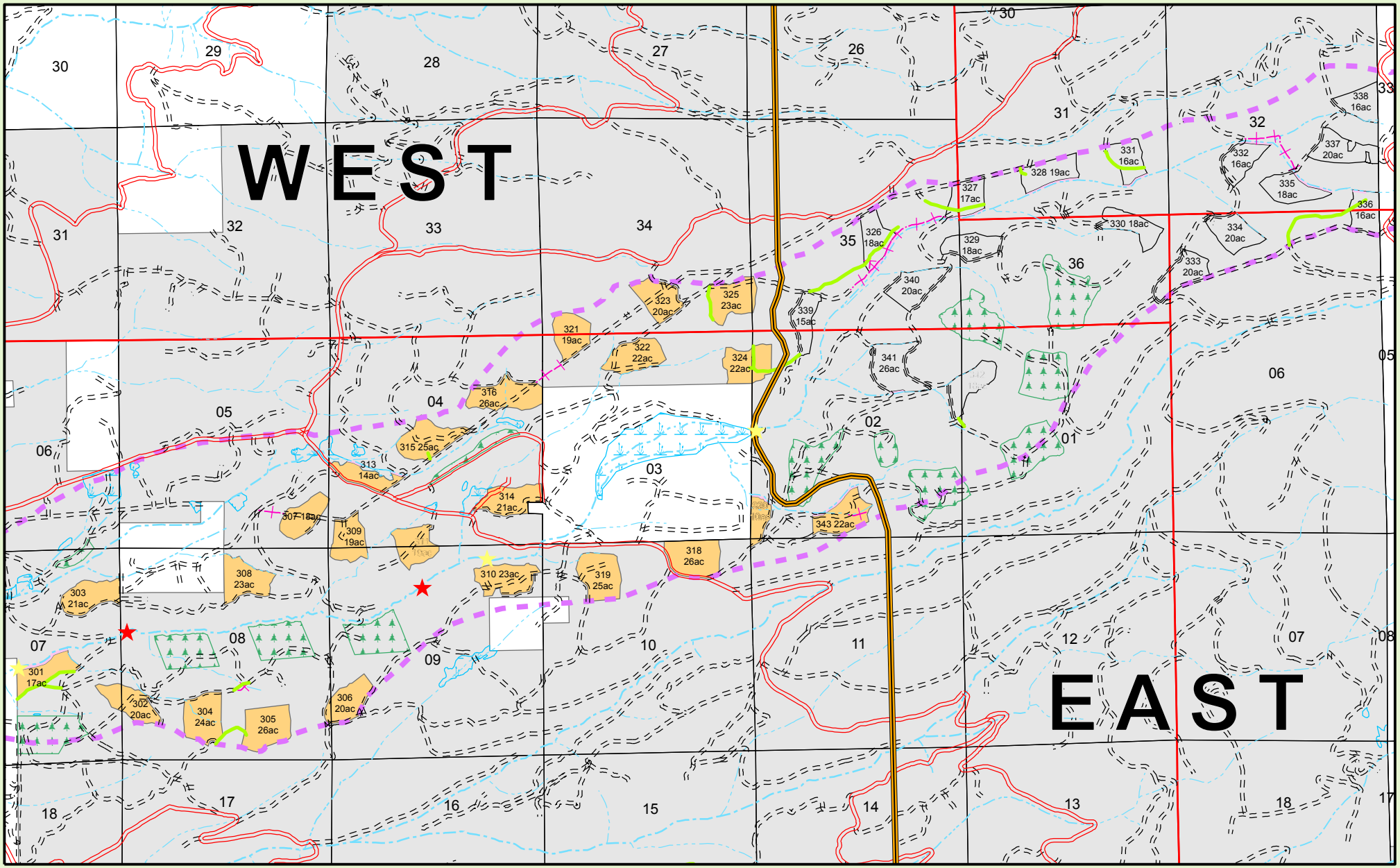
Draft Experimental Design

Phase 2 Road Work Summer / Fall 2005

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet



Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde
- *East Units No Treatment*
- *West Units Chip*
- *WLPZ*

Judd Creek Monitoring Study Group

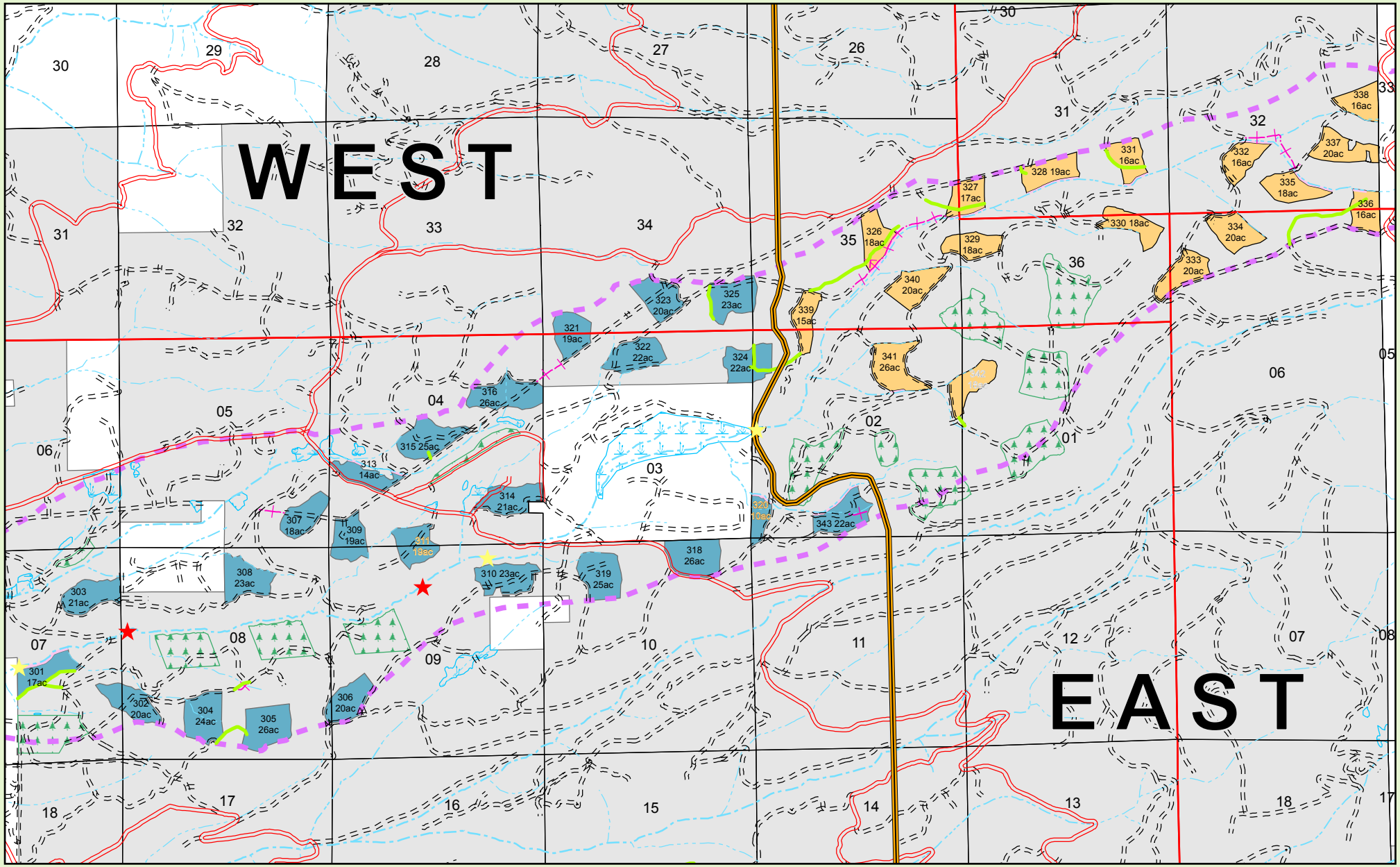
Draft Experimental Design

Phase 3 Pretreat West (Chip) Summer 2006

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet



Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde
- *East Units Chip*
- *West Units Log*
- *WLPZ*

Judd Creek Monitoring Study Group

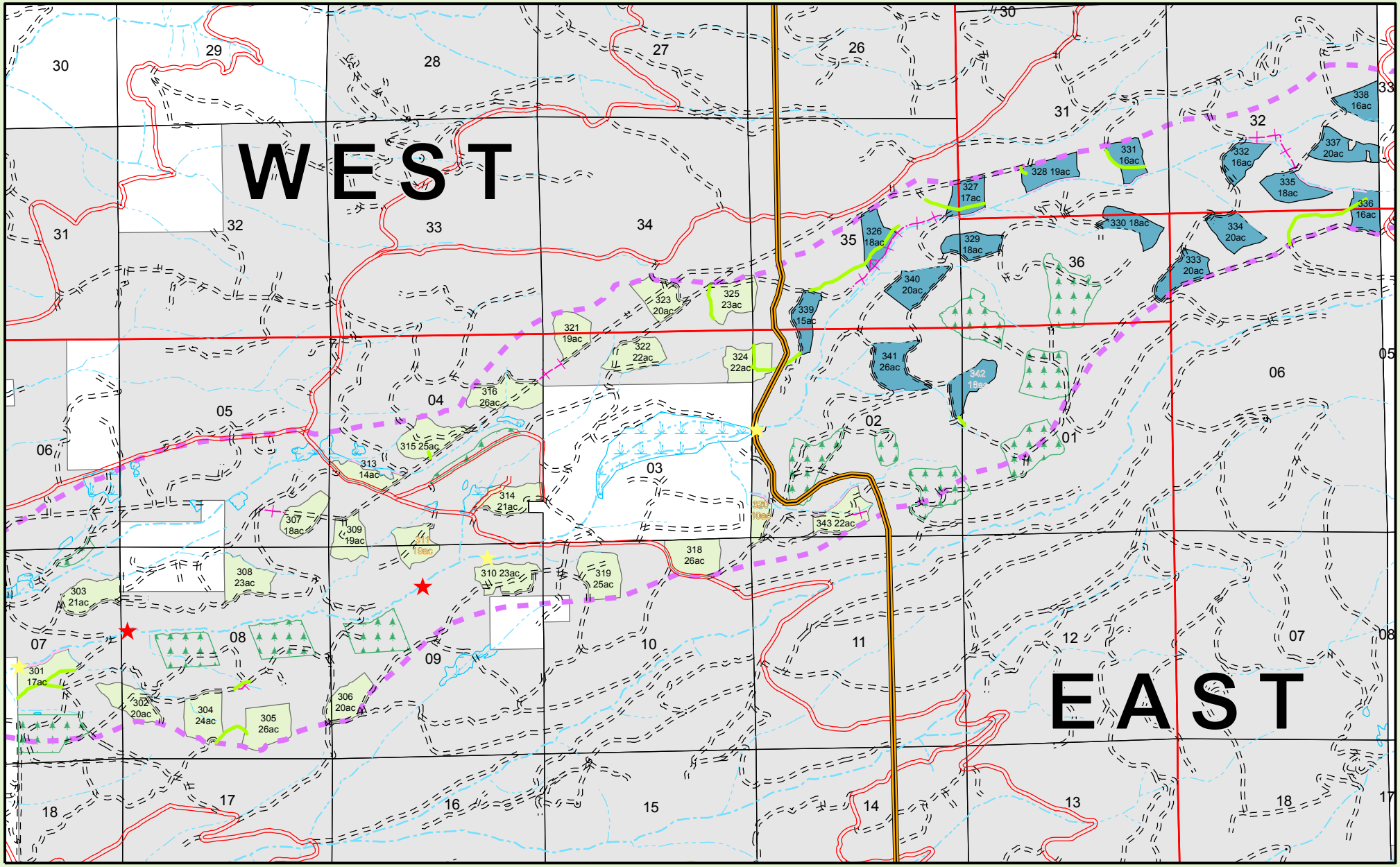
Draft Experimental Design **Phase 4**

Log West Pretreat East (Chip) Summer 2007

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet



Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde
- *Log East Units*
- *West Units Completed*
- *WLPZ*

Judd Creek Monitoring Study Group

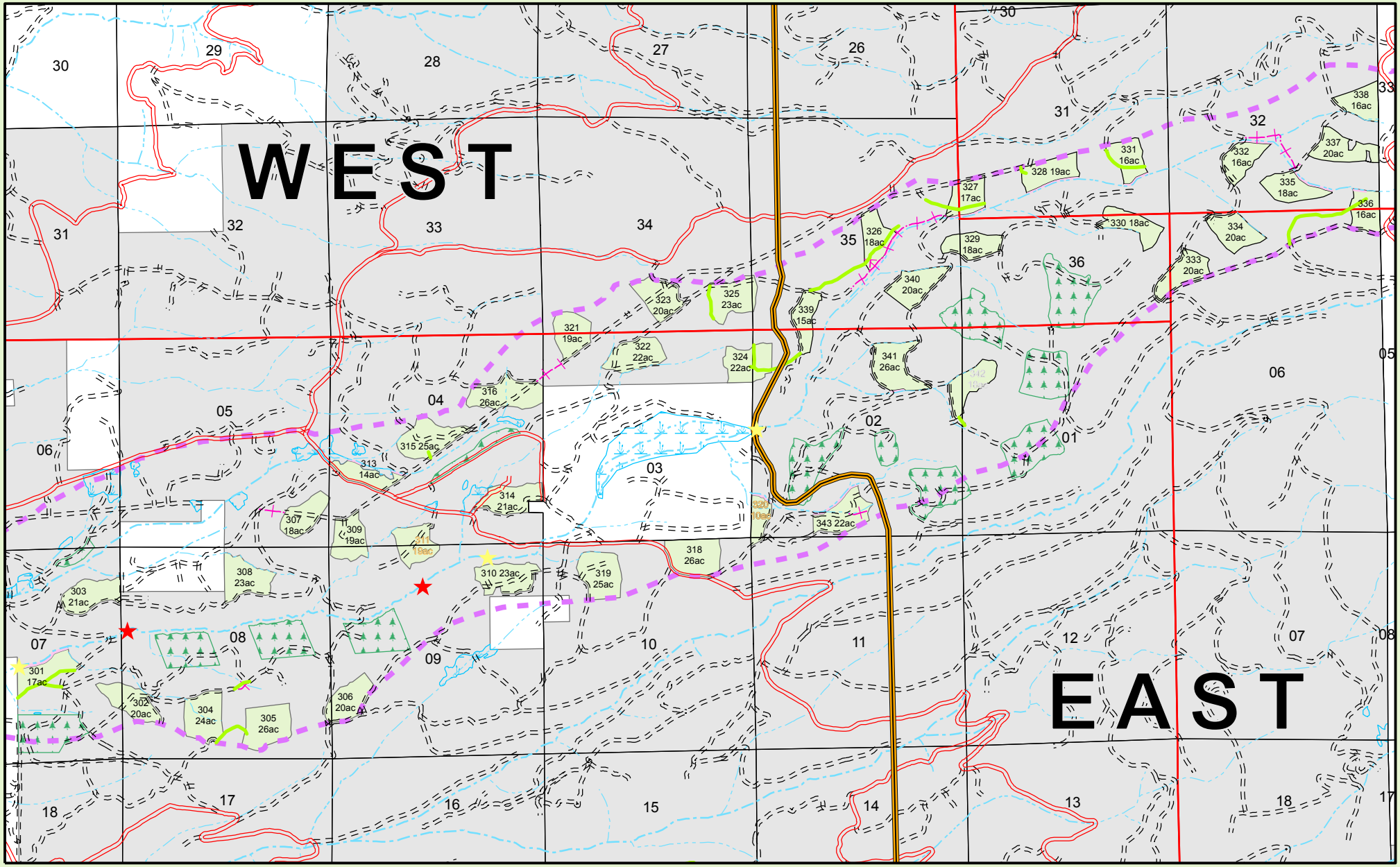
Draft Experimental Design

Phase 5 Log East Summer 2008

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet



Legend

- Sierra Pacific Industries
- Watershed Boundary
- Plantation < 5 years
- Wet Area
- Road Proposed to be Abandoned
- Proposed Road
- Permanent Road
- Seasonal Road
- Class 1 Watercourse
- Class 2 Watercourse
- Class 3 Watercourse
- Existing Sonde
- Proposed Sonde
- *East Units Completed*
- *West Units Completed*
- *WLPZ*

Judd Creek Monitoring Study Group

Draft Experimental Design

Phase 6 Monitor Fall / Winter 2008

N W E S

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

0 750 1,500 3,000 4,500 6,000 Feet