U.S. Department of the Interior
Bureau of Land Management

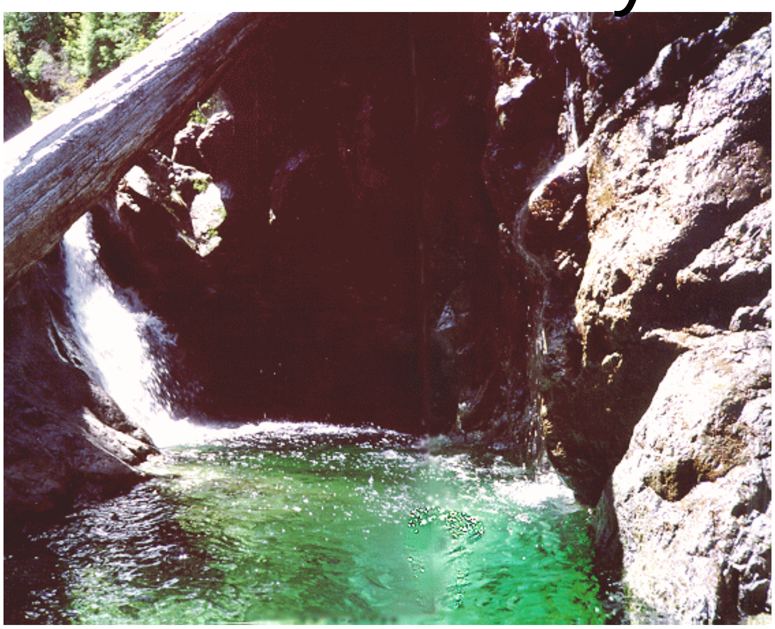
U. S. Department of Agriculture
U.S. Forest Service

Medford District Office
Grants Pass Resource Area
3040 Biddle Road
Medford, OR 97504

Siskiyou National Forest
Illinois Valley Ranger District
26568 Redwood Highway
Cave Junction, OR 97523

July 2000

East Fork Illinois River Watershed Analysis



REO Fifth Field Watershed # 1710031101

Version 2.0

United States Department of Agriculture
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Dear Reader:

The purpose of this watershed analysis is to identify the various ecosystem components in the **East Fork of the Illinois River Watershed** and their interactions at a landscape scale. The analysis looks at historical ecological components, current ecological components and trends. It makes recommendations for future management actions that could be implemented to reach certain ecological conditions.

The Forest Service and the BLM are the major federal land managers in the watershed and have prepared this watershed analysis jointly. It is organized into a terrestrial module, an aquatic module and a social module. A concluding synthesis module integrates the findings and recommendations of each of the others.

As you read this document, it is important to keep in mind that the watershed analysis process is an iterative and ongoing process. As new information becomes available it will be included and periodic updating is anticipated. It is also important to keep in mind that **this analysis document is *not* a decision document**. The recommendations that are included are a point of departure for project specific planning and evaluation work. Project planning then includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA). Project planning and land management actions would also be designed to meet the objectives and directives of our land use plans (Medford District Resource Management Plan (RMP) and Siskiyou National Forest Land and Resource Management Plan).

This watershed analysis will thus be one of many tools in land management planning and project implementation within the East Fork of the Illinois River watershed on National Forest and Bureau of Land Management (BLM) administered lands. Although ecological information, discussions and recommendations are presented at the landscape scale irrespective of administrative ownership, please understand that the Forest Service and BLM will only be implementing management actions on the lands they administer.

If you have additional resource or social information that would contribute to our better understanding the ecological and social processes within the watershed, we would appreciate hearing about them.

James M. Fincher

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District Ranger
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Douglas C. Lindsey

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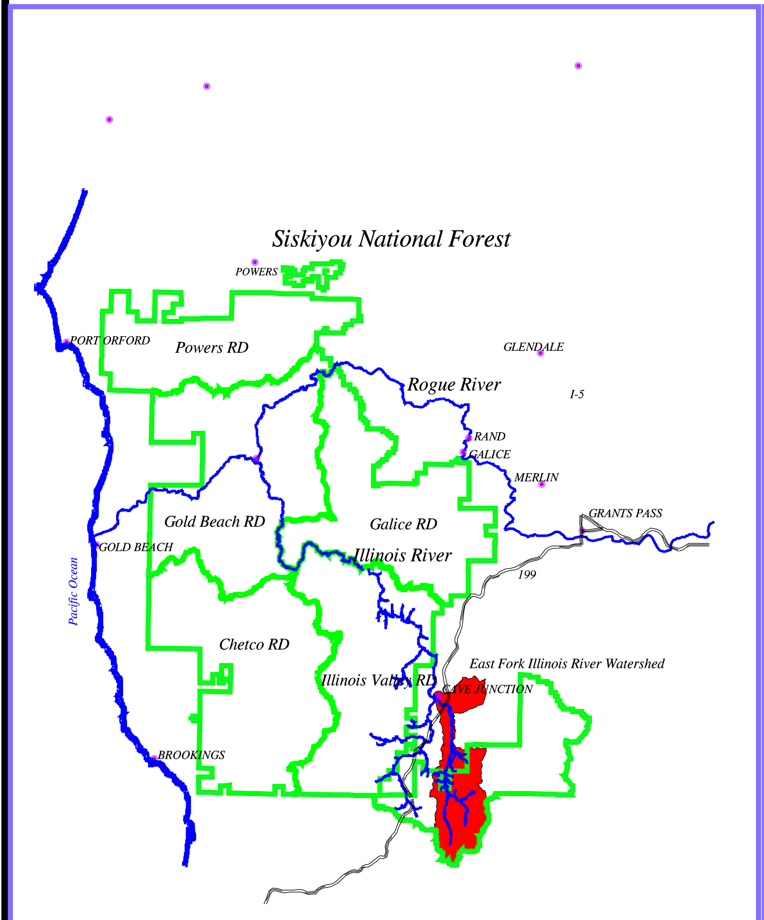
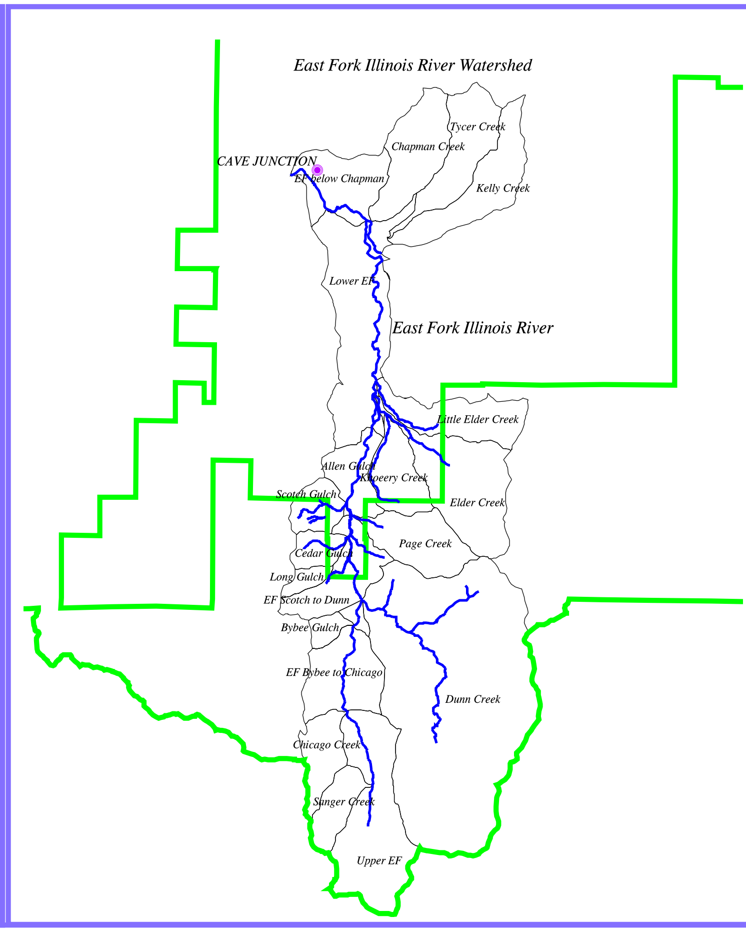
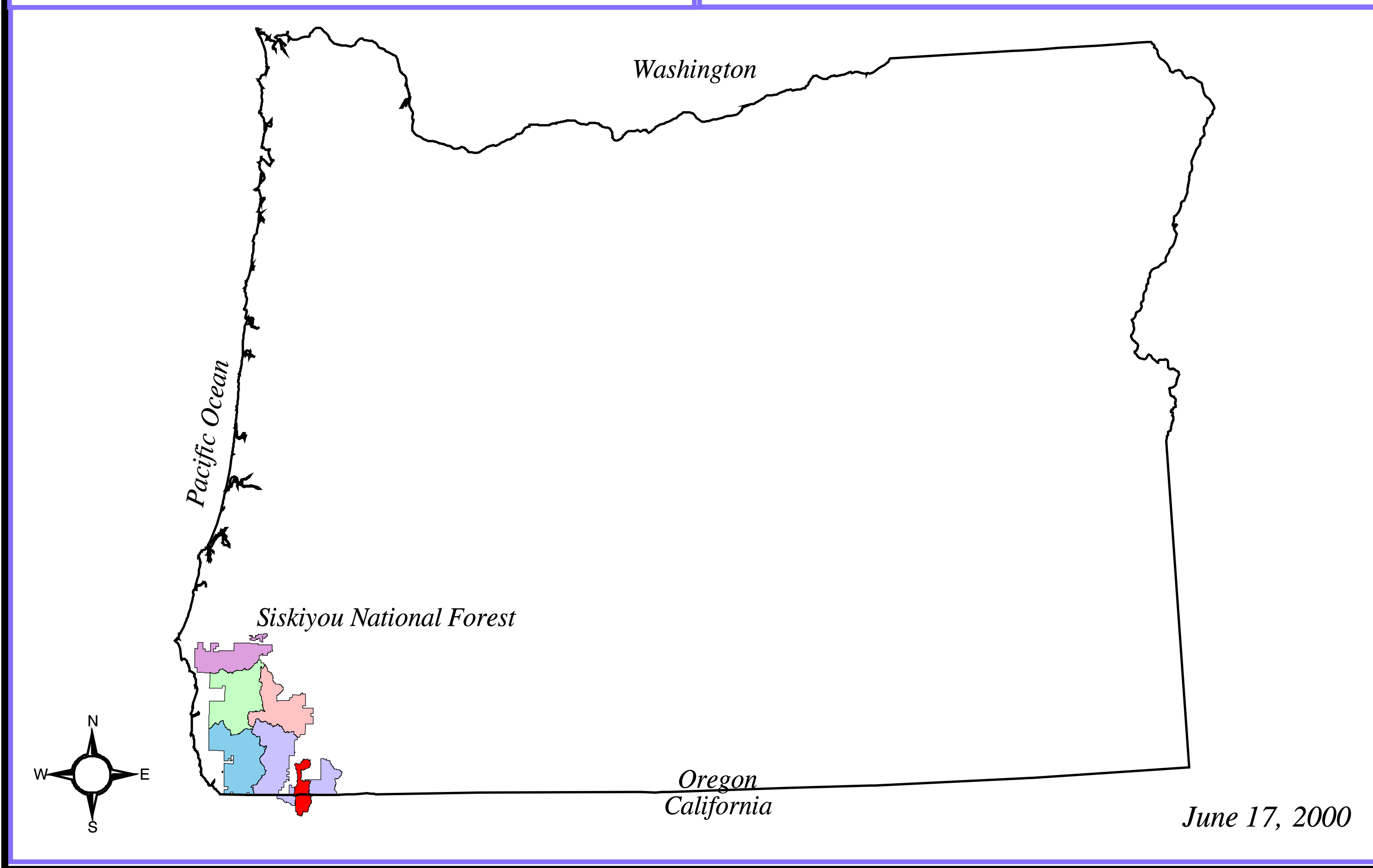
Medford District BLM

East Fork Illinois River Watershed
Vicinity Map







EAST FORK OF THE ILLINOIS RIVER

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Illinois Valley Ranger District

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I. INTRODUCTION AND A BRIEF SUMMARY OF KEY FINDINGS

The focus of this section of East Fork of the Illinois Watershed Analysis is the identification of habitat conditions to which different species are adapted and to make recommendations as to how to restore and maintain these conditions. Another focus is the identification of fire hazard conditions and timber availability.

Timber and other commodities contribute to the local economy. However, levels of some habitat types (such as saplings, poles, and young forests) are higher than what might be desirable. The watershed also has a high percentage of fire intolerant plants (such as white fir) and high to moderate fire hazard. On the other hand, some habitat types such as old growth forest, interior mature and old growth forest, pine/oak savanna, and grass/forb are less frequent than might be desirable, and fire tolerant plants such as sugar pine and ponderosa pine are declining in abundance.

A single issue both threatens the maintenance of the certain important habitat types and retards their recovery to historical conditions: current high stand densities. Abnormally high densities of small trees (<32” dbh), compared to reference conditions, create a fire hazard that threatens maintenance of most of these habitats. It also retards tree growth and, therefore, retards the recovery of old growth forest and interior mature and old growth forest habitat. High stem densities also contribute to the decline of pine/oak savanna and grass/forb habitats, create higher insect and disease infestations (especially in 32"+ dbh pines), increases fire hazard in the rural interface (adjacent to private land and homes), reduces timber yield over time, and changes the species composition of the various plant communities.

II. TERRESTRIAL CORE (KEY) QUESTIONS

The core questions used to focus this analysis are listed below. Section V of this module addresses each question in turn.

T-1. What are the existing conditions, what were the historic conditions, what are the trends, and what are the desired future conditions for:

- The relative abundance and distribution of wildlife species of concern in the watershed (i.e., threatened or endangered species, special status species, species emphasized in other plans).
- The distribution and abundance of their habitats.
- The processes that affect these species and their habitats?

T-2. Where and how has fire affected the watershed, and where and how could fire affect the watershed in the future?

T-3. What are the historic disturbance patterns for the watershed? How have management activities affected these patterns? In what way and how well does the watershed manage disturbance?

T-4. What is the existing condition of fire hazard on the perimeter of the rural intermix, and what can be done to improve those fire hazard conditions?

T-5. How much timber has been harvested in the watershed in the past? How much timber volume is available on the lands allocated to Matrix?

T-6. How has and how will stand densities and tree pathogens affect the watershed? Where are the Port-Orford-cedar root disease infection centers within the watershed and what can be done to minimize or prevent the spread of this disease?

T-7. What are the road networks and road maintenance needs for managing recreation, fire, timber sales, and habitats for species of concern?

T-8. Where are the priority areas for terrestrial maintenance and restoration treatments?

T-9. What are the historic and existing conditions and the trends for geologic and soil conditions in the watershed? What can be done to restore and maintain desired conditions?

T-10. What are the historic and existing conditions and the trends for botanical resources of concern in the watershed? What can be done to restore and maintain desired conditions?

T-11. What and where are the conflicts between various resources in terms of treatment recommendations? How can recommendation conflicts be mitigated or minimized?

III. KEY TERRESTRIAL FINDINGS

Private citizens own 28% of the watershed. The majority of the watershed, 72%, is public land. The Siskiyou National Forest manages 63% of the watershed and the BLM manages 9%.

This watershed analysis found that, when compared to historic / reference conditions, the East Fork Illinois River watershed, like many other watersheds on the eastern portions of the Siskiyou Mountains, currently has higher amounts of:

- Small diameter trees (< 32" dbh);
- Tree mortality from competition, insects, and disease (especially pines and shade intolerant hardwoods);
- Fire hazard;
- Risk of landslides;
- Roads that adversely impact erosion processes (especially in Dunn creek); and
- Adverse effects to rare plants from noxious weeds, road and vehicle impacts, and the encroachment of vegetation.

Conversely, when compared to historic / reference conditions, there are currently lower amounts of certain ecosystem elements:

- Big trees (old growth, >32"dbh with > 40% canopy closure) (USDA/USDI 1994: FSEIS Vol. 1., p. 3&4-26);
- Interior mature and old growth forest habitat;
- Grasses and forbs;
- pine / oak savannah;
- pine species, and
- Low intensity fire.

The disparity between historic and current conditions puts many resources at risk, from old growth forest habitat to water quality. This disparity can be primarily attributed to timber harvest of old growth forest stands, road construction, mining, rural development, and fire suppression / exclusion. Most forest habitats are not developing as they did historically because tree densities are now much higher, diameter growth is slower, and species composition is shifting towards fire intolerant and shade tolerant species such as white fir and tanoak (Tappeiner et al. 1997; Sensenig 1998).

Reducing the density of trees could help restore reference ecological conditions, thereby improving ecological resilience and the safety of rural communities (from catastrophic high intensity fires). Stand density reduction could also accomplish the following goals:

- Increase the growth rate of smaller trees, which accelerates the restoration of mature and old growth forest habitat;
- Reduce the risk of mortality to mature and old growth forest from wildfire, competition induced mortality, and insect and disease attacks;
- Increase the amount of fire tolerant/shade intolerant species;
- Restore and maintain savanna, meadow, and forest under-story grass/forb habitats;

- Reduce the potential for catastrophic fires in the rural interface.

To achieve desired stand density conditions, potential tools include manual, mechanical or prescribed fire treatments.

Past timber harvest, roading, and mining have altered historic erosion processes. Historically, landslides delivered more large wood into streams than more recent landslide events. Timber harvest of large diameter trees (>32" dbh) has reduced the potential for delivery of these larger trees with landslides. Large wood is important for water quality (*e.g.*, sediment storage) and fish habitat. Roads constructed across streams have also reduced the potential for delivery of large wood and cobble to fish bearing streams and have increased the potential for diversion of streams out of normal drainage systems - which increases the delivery of fine sediments to streams. Historic placer mining activities, especially in the lower reaches of the watershed, removed a large amount of vegetation (see Social Module) and displaced a great deal of soil.

Out of seventy-four recently recorded (since 1964) debris slides or debris flows on National Forest System (NFS) lands in the watershed, the majority (50) occurred in the Dunn Creek drainage and most are associated with existing roads. The other area of significant past debris slide activity is the Chicago Creek/Chicago Peak area, where 10 debris slides were recorded and where the largest slide is located. However, none of the sub-watersheds within the East Fork Illinois watershed seem to be immune to mass wasting events. Past mass wasting / slides are is evident throughout the watershed. Many recent failures have occurred on sites of ancient failures.

IV. SUMMARY OF TERRESTRIAL RECOMMENDATIONS

The general objective of these recommendations is to maintain and / or restore the distribution and abundance of ecosystem components (*e.g.*, vegetation types and habitats) to historic levels or the reference condition. It should be kept in mind that these conditions may not be consistent with the resource allocations and management objectives of the current or future resource management plans.

Inherent in these recommendations is the assumption that the reference conditions are were within the average range of natural variability. The type or intensity of treatments can and will vary for different land allocations. For example, treatments that help maintain or restore old growth forest could be emphasized in Late-Successional Reserves and Riparian Reserves. LSR and Riparian Reserve allocations, combined with wilderness, make up about 55% of the watershed. This would not be a primary management emphasis on the Matrix (about 17%) and private land (about 28%) that make up the rest of the watershed. The recommendations are summarized in Table T-1.

It is important to keep in mind that these recommendations do not constitute management decisions for federal lands. The recommendations may conflict or contradict one another. They are intended as a point of departure for project specific planning and evaluation work. Project planning then includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA). It is within this planning context that resource conflicts would be addressed and resolved and the broad recommendations evaluated at the site specific or project planning level. Project planning and land management actions would also be designed to meet the objectives and directives of the Siskiyou NF's LRMP and the BLM's RMP.

Table T-1: Recommendations Summary for Terrestrial Ecosystem Components

Ecosystem Component	**Recommendations for Maintenance and Restoration of Wildlife Habitat Elements, primarily NFS and BLM administered lands**
Grass/Forb (Currently there are fewer acres of this habitat than in the reference condition)	- Under-burn young, mature, and old growth forests, as well as pine/oak savannas. - Burn regeneration harvest units hot enough to provide a seed bed for grasses and forbs. - Remove encroaching woody vegetation from meadows with manual, mechanical, and/or prescribed fire treatments. Maintain meadows with prescribed fire. - Use native species when seeding disturbed areas. - A number of meadow restoration opportunities exist. – See Map 25: Special Wildlife Areas (National Forest) – See Map 9A: BLM Plant Series. All Jeffrey pine, ponderosa pine, and white oak sites, as shown on the plant series map, are candidates for savannah restoration.
Shrub Dominated (Currently there are fewer acres of this habitat than in the reference condition)	Use prescribed fire, manual, or mechanical treatments in openings and under-story of forest habitats to reduce current fuel ladder conditions, to reduce shrub levels on serpentine sites and to increase grass.
Seed/Sap/Pole (Currently there are many more acres of this habitat than in the reference condition , over 5,000 more)	- Use timber harvest (regeneration or widely spaced thinning) and prescribed and natural fire to create this habitat. *Widely spaced or variable thinning and under-burning is preferred until old growth forests are restored in the watershed; i.e., avoid regeneration harvest of old growth.* - Extend the time which seedling-sap-pole habitat provides grass, forb, and shrub habitat for 180 associated species (Brown et al. 1985) with treatments such as manual release and pre-commercial thinning. Priority areas are wildlife winter range (*i.e.*, south aspects with < 40% slope and < 3000 feet elevation).

Table T-1: Recommendations Summary for Terrestrial Ecosystem Components	
Ecosystem Component	**Recommendations for Maintenance and Restoration of Wildlife Habitat Elements, primarily NFS and BLM administered lands**
Young Forest (9-21" Dbh) (Currently there are 600+ more acres of this habitat than reference)	- Increase diameter growth in young forest stands to accelerate the restoration of old growth forest habitat. - Maintain hardwoods, especially shade-intolerant species at target levels of approximately 70 stems / acre in the matrix and 100 stems / acre in the riparian reserves. - Reduce fire hazard to this habitat by reducing ground and under-story fuels, fuel ladders, the density of over-story crown and by increasing the distance to over-story crown (to reduce crown fire potential) (Agee 1997). Priority areas are: a) Upland (driest) portions of Riparian Reserves and adjacent to intermittent and ephemeral streams; b) Sites adjacent to •Roads (for use as control points and to improve economic feasibility), • Wilderness areas (to facilitate letting natural fires burn inside wilderness), • Private land / rural interface, • Sites within or adjacent to connections between interior mature and old growth habitat (especially those at lower elevations or occupied by northern spotted owls) see Map 13: Current Interior / Mature and Old Growth. Excellent opportunities to treat young forest habitat exist in Elder, Little Elder, Page, Chapman, and portions of Dunn Creek drainages within both managed and unmanaged stands.
Late-Successional Forest: Mature Forest (21-32" Dbh) Old Growth Forest (>32" dbh) Interior Mature and Old Growth, patches > 20 ac. in size (400ft. edge effect). (Currently there is more than the reference amount of mature, but less than half of reference amounts of old growth and interior habitats).	*On National Forest land*: - Increase the overall abundance of old growth forest habitat on non-serpentine sties in the watershed, especially trees > 45" dbh. - At the watershed scale, manage such that 45-75% of the non-serpentine sites is in late-successional (mature and old growth) forest habitat (On National Forest land 40% of which should be old-growth) - In Riparian Reserves, manage such that 50-80% of the area is in mature and old growth forest habitat (45% old-growth on National Forest – see Table T-2). - At the stand scale, manage to provide 8-16 mature conifers per acre, 8-16 old-growth trees per acre, and an appropriate amount of hardwoods (Bingham and Sawyer, 1991), amount of trees > 45" dbh per acre is a DATA GAP. A significant percentage of the large trees should have defect or deformities such as cavities, large limbs, and witch's brooms (from mistletoe). Increase the size of interior mature and old growth forest patches and the connectivity between patches. - Thinning and/or prescribed fire should, in the short term, help to maintain mature and old growth habitat conditions; and in the long term hasten restoration of mature and old-growth habitat (Agee, 1997). - Priority habitats to treat for restoration of old-growth forest habitat are: 1) mature, 2) young, and 3) seed-sap-pole. •Priority locations for restoration are adjacent to or connections between interior mature and old-growth forest and within Riparian or Late-Successional Reserves. • For the long term, priority locations for restoration of old growth are within Riparian or Late-Successional Reserves. • Maintaining mature forest in Matrix is consistent with timber management objectives, but maintaining old growth habitat is not; therefore, restoration of old growth habitat is less likely in Matrix. - Reduce fire hazard to mature and old growth forest habitat. Priority areas are where the fire hazard is moderate or high within interior mature and old growth habitat patches (especially the largest patches), and in Riparian and Late-Successional Reserves. The location of interior habitat patches with moderate or high fire hazard is a DATA GAP. However, the location of young, mature, and old growth habitat that has moderate fire hazard is shown on Maps 21A and 21B: Fire Hazard Levels / Rating. Treatments could include manual, mechanical, or prescribed fire, or let wildfire burn when conditions are appropriate.
Cliffs, Rock outcrops, Caves, Adits, and Talus	- Maintain the majority as undisturbed areas.
Dead Wood: Large Woody Material and Snags	- Meet Siskiyou National Forest Guidelines (USDA Forest Service, 1996) or, where appropriate, use "A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California" (USDA 1996) or use "Snag Densities on the Gasquet Ranger District, Six Rivers National Forest, California" (USDA 1989). Specific data for East Fork Illinois watershed is a DATA GAP.

Table T-1: Recommendations Summary for Terrestrial Ecosystem Components

Ecosystem Component	**Recommendations for Maintenance and Restoration of Wildlife Habitat Elements, primarily NFS and BLM administered lands**
Pine/Oak Savanna	- Reduce encroachment and maintain savannas by burning as frequently as needed (about every 5 years). - Priority locations are anywhere this habitat is found. This habitat is more common in the lower elevations on BLM lands, primarily on the west side of the watershed and lower portions of Chapman Creek. On National Forest land, it is most often found on foothills adjacent to the valley bottom; *e.g.*, lower Page Creek and some south aspects near lower Dunn Creek.
Fire	- Restore or maintain the historic fire regime where compatible with resource objectives. - Develop a wilderness fire management plan for the Siskiyou Wilderness (joint plan by the Klamath, Siskiyou, and Six Rivers National Forests). - Reduce fire hazard to the Siskiyou Wilderness; facilitate the use of prescribed natural fire in the Wilderness. - Reduce fire hazard to the rural interface. - Reduce fire hazard to interior mature and old growth forest habitat patches. - Reduce fire hazard to young plantations and other early seral patches (tree-form vegetation). - Break up the fuels continuity (in moderate to high fire hazard areas) within the Longwood Fire area. - Maintain a road system in the watershed that permits efficient wildfire suppression and economical fuel hazard reduction treatments.
Timber and Vegetation	*NFS Matrix* - Produce a commercial timber yield. - Maintain an appropriate distribution and abundance of age classes to ensure a sustained production of forest products across the Forest. - Provide early-successional wildlife habitat. - Maintain a diversity of species, such as pines and hardwoods, appropriate for the site. - Commercially thin stands to maintain desired species composition and stand structure, promote long-term tree and stand health, reduce fire hazard, and salvage potential mortality. - Pre-commercially thin/release young stands to maintain desired species, stand structure and development rates. Treat stands early (within 10 years of stand initiation) to reduce potential fire hazard from fuel accumulations. *BLM Matrix*: - Produce a commercial timber yield and other forest commodities. - Provide connectivity (along with other allocations such as Riparian Reserves) between Late-Successional Reserves. - Provide habitat for a variety of organisms associated with both late-successional and younger forests. - Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees. - Provide early-successional habitat.
Port-Orford Cedar	- Restore POC distribution and abundance on National Forest Lands; - Maintain current disease control strategies per current guidelines (e.g., education, eradication, vehicle washing, etc); - Finish the commercial sanitization on roads 4803 and 4808; - Improve the road surface and drainage on the Sanger Peak tie road; - Restrict wet season access on the 4808.019 spur with either a gate or a barricade; and - Maintain or improve drainage and road surfaces to reduce POC infestation risk on open roads with POC present. - Eradicate potential infection areas, sanitize other roads and areas as needed. Protect un-infested areas.
Root Diseases (other than POC - *Phytophthora lateralis*)	- Maintain tree vigor. Minimize root disease effects by favoring resistant species adapted to the sites and sanitation treatments.

Table T-1: Recommendations Summary for Terrestrial Ecosystem Components

Ecosystem Component	Recommendations for Maintenance and Restoration of Wildlife Habitat Elements, primarily NFS and BLM administered lands
Soils	- Manage roads to reduce their contribution to erosion processes such as landslides, surface erosion, stream diversion, and gully formation. Minimize or avoid new road construction on granitic or serpentine soils. - Decommission unnecessary roads as identified through the agency prescribed interdisciplinary processes. To minimize soil disturbance or gully formation, evaluate the appropriateness of ground disturbing restoration techniques such as scarification and ripping. Evaluation should include but is not limited to parameters such as slope gradient, aspect and soil type. - Numerous recent failures are associated with older landslide forms. Map ancient and inactive erosional forms to help guide future management decisions. - On granitic and ultramafic soils, minimize or avoid soil disturbance by using appropriate and site-specifically determined logging systems, road location and design, prescribed fire, silvicultural, and restoration techniques. - During the upcoming revision of the Siskiyou National Forest Plan, re-examine the amount of exposed mineral soil allowed for ground disturbing activities, especially in ultramafic soils, and ensure that what constitutes "exposed" mineral soil is well defined, e.g., does cover include overstory and/or surface rocks? - Monitor fire effects on ultramafic soils to determine short and long term erosion hazards following burning.
Botany	- Noxious weeds: -- Eradication of some weeds will involve removal of those weeds and revegetation of those same sites. Priority locations include the Happy Camp/Waldo Road Highway corridor, especially the areas infected with knapweed, wild sweet peas, Dyers woad, and the scotch broom along several of the main roads in the valley. -- Map weeds as projects are planned and implemented to diminish the threat to sensitive plant populations in the future in this area. -- Re-vegetate road corridors and around parking areas with native species, as these areas are rehabilitated. Add local species for seed collection to the WCF procurement plan. Work with local nurseries to provide native, genetically similar shrub species for restoration purposes. - On ultramafic soils areas which have an excess of small to mid-sized shrubs and trees, burn to decrease these vegetation types and to decrease the dead and accumulated duff. Burn in pockets or strips to create a mosaic pattern. - Maintain or increase large woody material to meet management recommendations for survey and manage bryophytes, lichens and fungi. - Maintain adequate canopy cover in forested habitats to meet management recommendations for survey and manage vascular plants, bryophytes, lichens and fungi. - Maintain openings in forested habitats to benefit California globe mallow, wayside aster, and McDonald's rockcress. - Special Forest Products: Identify key habitats and possible conflicts with rare plants, minimize impacts to these areas. - Avoid burning known sites of sensitive plants during prescribed or natural fire. Burn around population areas under very controlled, experimental conditions. Monitor results. - Research and develop effective restoration strategies for past mining areas, especially where tailings are present, where it is necessary to re-vegetate these areas. - In places such as the French Flat ACEC stop recreational vehicle trespassing. - Pursue an evaluation of the RNA / ACEC designation potential for those cells identified in the analysis.

V. ANALYSIS OF KEY QUESTIONS

A. Key Question T-1: Wildlife and Wildlife Habitats

T-1: What are the existing conditions, what were the historical conditions, what are the trends, and what is the desired future condition for:

- the relative abundance and distribution of wildlife species of concern in the watershed (i.e., threatened or endangered species, special status species, species emphasized in other plans).
- the distribution and abundance of their habitats.
- the processes that affect these species and their habitats?

More than 200 vertebrate and thousands of invertebrate wildlife species may live in the East Fork of the Illinois River watershed. Of these, the species of concern are:

1) Species federally listed as “proposed, endangered or threatened” by the Endangered Species Act;

2) Species listed as Sensitive by Region 6 or Region 5 of the USDA Forest Service; and

3) Species identified as “survey and manage”, “protection buffer”, “needing more analysis,” State listed, or ``management indicator” species by the Siskiyou National Forest Land and Resource Management Plan (LRMP) or the Medford District Resource Management Plan (RMP). See Appendix A - Wildlife for more detailed species of concern information.

Although knowledge about the distribution and abundance of species of concern and locations of individuals are important for managing species, relatively little is known about most animals (See Appendix A). Except for a handful of the “ESA listed” species, almost nothing is known about wildlife distribution and abundance in this watershed. Systematic surveys for a few species have been primarily conducted in project areas. Data about other species comes primarily from incidental sightings. Location information is important for maintaining wildlife that are threatened with extinction, such as northern spotted owls, because human activities that may have negative impacts on nesting success can be avoided during breeding season. Northern spotted owls are known to nest in the watershed.

Location information is important to management activities near some species; however, habitat management has the greatest effect on all species. If adequate habitats for species of concern are not present in the watershed, these species will not be there. Conversely, if habitat conditions are present a species of concern could occur in the watershed.

Assessing habitat adequacy depends on identifying appropriate habitat elements to measure and evaluate, and then determining the distribution (where) and abundance (how much) of these elements that are necessary for meeting the wildlife needs. Although neither the appropriate habitat elements nor the distribution and abundance is known for all the species of concern, a considerable amount is known. Wildlife research has identified a host of habitat elements that wildlife need, and analysis can shed light on the distribution and abundance of these elements in the watershed.

1. Habitat Elements

Habitat associations for wildlife species of concern in the East Fork of the Illinois River watershed were identified using information from Management of Fish and Wildlife Habitats of Western Oregon and Washington (Brown et. al. 1985) and the LRMP and RMP. Species of concern are associated with a wide range of habitat elements: grass/forb, shrub, seedling/sapling/pole, young forest, mature forest, old growth forest, caves & burrows, cliffs & rims, large down wood, snags, talus, and riparian/aquatic (Appendix A, Tables T-A-2).

Habitats with the most species of concern using them as primary habitat are:

- Old-growth forest (20 species)
- Interior mature and old-growth forest, as well as large (>32" dbh) trees with deformities (e.g., cavities, witch's brooms, and large limbs) are also identified as important wildlife habitat characteristics by the NW Forest Plan (see Appendix A, Table T-A-3).
- Snags (20 species)
- Riparian/aquatic (19 species)
- Mature forest (13 species)
- Large down wood (13 species)

Maintaining an appropriate distribution and abundance of these habitats is part of the purpose of the NW Forest Plan.

The LRMP and RMP’s standards and guidelines focus heavily on the habitat elements listed above. The plans determined that the viability of many mature and old-growth and aquatic species is not at risk if the plan is followed. These plans also identify many species whose viability are in question and need more analysis. This forms the basis for the S&M species.

The aim of the wildlife portion of this watershed analysis is to make recommendations that will maintain and / or restore wildlife habitat elements to levels within their reference / historic range of variability.

2. Disturbance

Disturbance, especially fire, has changed the distribution and abundance of habitat elements for millennia, and species are adapted to this natural range of variability. In fact, some species require disturbance. For example, pine and Douglas-fir trees historically reached large size because periodic low intensity fires removed competing vegetation.

To provide for the needs of wildlife species of concern, the range of conditions they are adapted to should be sustained. Species are the result of their past adaptations, and their survival can only be assured if the conditions they are adapted to are maintained.

In order to make a first approximation of the natural range of habitat variability, this watershed analysis focuses on attempting to understand how much habitat components have changed. Disturbance and site productivity influence these habitat elements. Site productivity is influenced heavily by climate and geology. Climate (especially available moisture) and geology (soil parent material) have the greatest influence on a site's ability to produce these habitat elements. Good soil and high moisture availability combine to produce abundant vegetation which produces many animals. Forest types were stratified into plant series that reflect how weather and soil parent material effect site productivity and how fire disturbance effects each plant series (Atzet and Wheeler 1984).

The species of concern identified in this document are not generally identified as being associated with a particular plant series but certain plant series can provide important habitats for certain of these species. Conversely, some plant series can be identified that will not support certain species of concern. For example, the Jeffery pine plant series (found on serpentine) does not normally produce the large sized trees (>32" dbh) or the canopy closure (>40%) necessary for old growth forest habitat, but it does provide conditions that are suitable for many rare plants. There are approximately 5,200 acres (14%) of low productivity serpentine soils on Forest Service and approximately 1,400 acres on BLM lands in the watershed. Except for shrub and other understory development, these serpentine areas have not changed dramatically since around 1940. Generally, serpentine does not support closed canopy old growth forest wildlife habitat, primarily because canopy closures greater than 40% are rare and old growth sized trees (>32" dbh) generally cannot develop. Therefore, serpentine areas were not considered when modeling historic (circa 1940) conditions on National Forest lands because it is assumed that current forest conditions on serpentine are generally similar to reference conditions.

Maintaining the range of variability for important habitat elements is dependent upon maintaining the effects of disturbance similar to the effects of past disturbances. It is recommended that while the extremes of the range of variability be maintained, management should primarily focus on conditions in the middle portion of the range of variability for any given habitat element (Atzet, personal communication, 1999). For example, managing late-successional (mature and old-growth) forest at the lower end of the natural range of variability may benefit some resources, such as short-term timber production and deer forage, but this could also put long-term productivity of these resources at risk, and reduce the resilience of ecosystems. Analysis cannot completely identify ranges, but approximations can be made. Future modification of these "approximations" is expected as better information is obtained. It is acknowledged that when recommending appropriate ranges that many extreme fluctuations of distribution and abundance of habitat elements are responses to factors outside human control. These factors, such as climate change and severe fire weather conditions, will happen regardless of our efforts.

Table T-2 provides a first approximation of reference conditions for wildlife habitat components on non-Serpentine areas in the watershed. This was created using information from East Fork of the Illinois River and other ecosystem analyses which covered over 300,000 acres on Galice and Illinois Valley Ranger Districts. (For details about modeling assumptions used to derive reference conditions see Appendix A, Table MA, Modeling Assumptions for PMR data).

The amounts of habitat components listed in Table T-2 generally represent what is thought to be an average of the historic range of variability at a time (circa 1940) before timber harvesting and fire exclusion changed conditions. Actual historic ranges are unknown

Table T-2: First Approximation of Reference Conditions for Wildlife Habitat Components on Non-Serpentine Areas

Habitat Components	Reference Condition (average/range)*
Cliffs, Rock outcrops, Caves, Adits, and Talus	Maintain as undisturbed areas
Grass/Forb openings and forest under-story	Grass / Forb: 2% of the watershed Understory: undetermined.
Seed/Sap/Pole (FS: <9"dbh - USFS BLM: < 11" dbh)	Maintain 20% of area in forage for deer and elk (Siskiyou LRMP) and 180 other associated species (Brown 1985). Much of this 20% would be from seed-sap-pole; however, meadows and under-burned mature and old-growth would also contribute if over-story canopy closure is reduced and/or canopy gaps are present.
Young forest (Small conifer and hardwood) (FS: 9 -21"dbh; BLM: 11-21")	20%
Late-Successional (BLM: >21" dbh) (FS: Mature (21-32" dbh) and Old Growth (>32"dbh) conifer and hardwood)	45-75% of landscape with 75% in LSRs (USDA/USDI 1995:36) and in Riparian Reserves; at the stand scale, 8-16 mature trees, 8-16 old growth trees per acre and numerous hardwoods (Bingham and Sawyer 1991). Canopy closure (based upon 1940 aerial photo analysis) should average approximately 50%.
Old Growth (>32"dbh). Data from Stair Creek, East Fork Illinois River, Althouse Creek, and Sucker Creek (non-serpentine).	40% of watershed in late-successional forest. Canopy closure (based upon 1940 aerial photo analysis) should average approximately 50%.
Old Growth (>32"dbh) in Riparian Reserves (class 1-3 streams) Stair Creek, East Fork Illinois River, Althouse Creek, and Sucker Creek.	FS: 45% of Riparian Reserves had old growth forest. Canopy closure (based upon 1940 aerial photo analysis) was approximately 50%. BLM: Data gap.
Interior Mature and Old Growth (non-serpentine) conifer and hardwood (19% Althouse, 25% Caves & Grayback, 35% Indigo, and Stair 49%)	25-35%
Dead Wood: Large Woody Material and Snags	Reference condition is a DATA GAP. As a starting point, use Standards and Guidelines from amended Siskiyou Forest Plan as described in “Guidelines for Harvest Prescriptions; Large Woody Material, Green Tree Retention, [and] Wildlife Reserve (Snag) Tree Retention Guidelines (USDA Forest Service, 14 Nov. 1996) or, where appropriate, “A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California” (Jimerson 1996). These guides are based on existing condition data, collected from un-managed stands; therefore represent conditions modified by decades of fire exclusion. Specific existing condition data for East Fork Illinois watershed is a DATA GAP.
Pine/Oak Savanna (pines and oaks provide food for more animal spp. than any other plants (Martin et al.1951)	Restore as much as possible.

* Reference condition may be a desired condition, but not for all situations. For example, reference condition for canopy closure in mature and old growth forests (in uplands and Riparian Reserves) is 50% in East Fork of the Illinois on National Forest lands; this canopy closure may not be desired by perennial streams until more of the stream-side shade is recovered in the watershed. Also, research indicates some species are associated with higher than 50% canopy closure in mature and old growth forest habitat; e.g., Del Norte salamander. However, this research was conducted in habitats affected by decades of fire exclusion and consequently, in habitats with increased canopy closures. Reference condition may also not be the desired condition identified and selected through the agencies’ resource planning processes (RMP, LRMP).

Tables T-3a and T-3b describe the current and reference conditions of wildlife habitat components in the watershed on National Forest System (Tables T-3a) and then BLM (Tables T-3b) lands.

Table T-3a: Habitat Components on Non-Serpentine areas in East Fork of the Illinois River Watershed on National Forest Lands

Habitat Components on National Forest lands	Current Condition East Fork of the Illinois River	Reference Condition ** East Fork of the Illinois River
	PMR Pixel Data	Modeled PMR Pixel Data To Pre-Harvest Condition
Non-Forest	Steady state or declining due to encroachment	Steady state
Grass/Forb	76 ac. or <1 %	DATA GAP
Shrub Dominated	2199 ac. or 7 %	
Seed/sap/pole (<9"dbh)	9,519 ac. or 30%	4,192 ac. or 13%
Young Forest (11-21" dbh)	3,256 ac. or 10%	2,622 ac. or 8%
Mature Forest (21-32" dbh)	8,273 ac. or 26%	7,862 ac. or 25%
Old Growth (> 32" dbh)	6,026 ac. or 19%	13,166 ac. or 42%
Interior Older Forest (Analysis considered Mature and Old Growth patches larger than 20 ac.)	3,200 ac. or 10% This habitat is in twenty-nine patches, with six larger than 100 acres and the largest 747 acres. The majority of these patches are relatively isolated / disconnected.	9,371 ac. or 30% This habitat was in 24 patches, with ten patches larger than 100 acres, and the largest 4,447 acres. Over 70% were in four relatively connected patches that joined most of the WAA's on the eastern portion of the watershed (Dunn, Elder, & Little Elder areas).
Cliffs, Rock outcrops, Caves, and Talus	Sometimes impacted by rock pit and road development. Also impacted by timber harvest effects on microclimate, esp. on talus. Fire suppression has increased stand densities, therefore may have increased humidity on talus microclimate.	Were essentially undisturbed except for some fire impacts.
Dead Wood: Large Woody Material and Snags	Reduced amounts of high concentrations of class 1 & 2 pieces of dead wood due to fire suppression, fire salvage, and timber harvest. The landscape may have more background levels of dead wood over the watershed due to fire exclusion preventing consumption by frequent fires, especially older (class 3+) down wood.	Historic conditions are unknown. Reference conditions were established using Eco-plot data and used to establish direction for the Siskiyou National Forest for different plant series' in Guidelines for Harvest Prescriptions; Large Woody Material, Green Tree Retention, [and] Wildlife Reserve (Snag) Tree Retention (14 Nov. 1996).
Pine/Oak Savanna	Most of the areas with pine/oak savannas are nearly gone, due to heavy encroachment by Douglas-fir and other vegetation. Many pines, especially the big ones, are dead or dying. Some large black oaks and white oaks remain. Encroachment and mortality will continue unless stand densities are decreased.	Historically, this habitat was common at lower elevations in the watershed. This habitat is maintained by frequent natural, and many human caused fires (Borgias 1997 (see Social Module discussion of burning by Native Americans).

** For details about modeling assumptions used to derive reference conditions see Appendix A, Table MA, Modeling Assumptions for PMR data.

Table T-3b: Vegetation Condition on Non-Serpentine Areas in East Fork of the Illinois River Watershed on BLM Land

	Current Condition; East Fork of the Illinois River	Reference Condition: East Fork of the Illinois River (1949 Timber Inventory for Josephine County)
Non-Forest/Non-Vegetated	94 ac / 2%	115 ac. or 3%
Grass/Forb	0 ac / 0%	31 ac. or 1%
Shrub Dominated	3 ac / <1%	DATA GAP
Seed/sap/pole (<11"dbh)	508 ac / 10%	1,692 ac. or 44%
Young Forest (11-21" dbh)	1067 ac / 21%	329 ac. or 9%
Mature Forest (21-32" dbh)	2004 ac / 40%	1,676 ac. or 44%
Old Growth (> 32" dbh)	DATA GAP	

Table T-3c: Vegetation Condition on Serpentine Areas in East Fork of the Illinois River Watershed on BLM Land

	Current Condition; East Fork of the Illinois River	Reference Condition: East Fork of the Illinois River (1949 Timber Inventory for Josephine County)
Non-Forest	0ac / 0%	DATA GAP
Grass/Forb	456 ac / 9%	DATA GAP
Shrub Dominated	109 ac / 2%	DATA GAP
Seed/sap/pole (<11"dbh)	32 ac / <1%	DATA GAP
Young Forest (11-21" dbh)	269 ac / 5%	DATA GAP
Mature Forest (21-32" dbh)	470 ac / 9%	DATA GAP
Old Growth (> 32" dbh)	DATA GAP	

Tables T-3b and 3c show current and reference (circa 1950) conditions on BLM lands. The recent era of timber harvest on BLM lands started after this point in time. However, impacts from previous mining (1850-early 1900's) and associated logging were intense in and around the valley floor and are reflected in the 1950 reference condition data. The condition of BLM lands before significant modifications from mining is not known. There are some areas identified that were particularly heavily impacted by mining and where forest retention after mining activities is unlikely. These areas are:

Allen Gulch (40-8-34): Approximately 80 acres of Allen Gulch has forest vegetation growing on placer mine debris. This land is located in the southwest 1/4 of the northeast 1/4 (approx. 15 acres), the southeast 1/4 of the northwest 1/4 (approx. 25 acres), the northeast 1/4 of the southwest 1/4 (approx. 30 acres), the northwest 1/4 of the southeast 1/4 (Shenon 1933). Smaller diameter trees occur just downhill from the Allen Gulch cemetery indicating more intense or more recent disturbance. Below that, the trees are larger and demonstrate the ability of closed canopy forest vegetation to re-establish itself even after severe disturbance. Second-growth timber including trees 50 to 60 years old covered most of the mined ground in Allen, Sailor, and other gulches, and fixes rather definitely the time elapsed since that mining period (Shenon 1933). This would approximate the end of the mining at around 1878.

Scotch Gulch (40-8-33 and 41-8-3): Sluice boxes were used to separate the gold from rocks and dirt. One of these, operated in Scotch Gulch in the 1870s was said to have employed as many as 50 men, shoveling, piling rocks, etc. (Street and Street 1973).

Esterly Mine (40-8-22): The most extensive mining was done by the hydraulic method. If you can imagine a two to six inch diameter nozzle with perhaps one hundred to one hundred fifty pounds per inch water pressure you will have some idea of the amount of power such a thing would have. With this, large boulders and tree stumps can be rolled out of the way, high banks undermined and caved and an immense amount of dirt washed through a sluice in a day. The Easterly mine is said to have handled five hundred to one thousand cubic yards of dirt per day by this method (Street and Street 1973).

For more information, see Map 14, (East Fork Watershed Analysis Historic Interior, Mature and Old Growth Forest) Map 13,(East Fork Watershed Analysis Current Interior, Mature and Old Growth Forest)

Tables T-4a and T-4b describe the current and reference conditions of wildlife habitat components in the riparian reserve areas on National Forest System (Tables T-4a) and then BLM (Tables T-4b) lands.

Table T-4a: Habitat Components (Forest Size/Structure) on Non-Serpentine in Riparian Reserves on National Forest Lands

Habitat Components	Riparian Reserves: Current Condition (PMR); East Fork of the Illinois River. (% figures below are % of total Stream Class Acres)			Riparian Reserves: Reference Condition (PMR) ** East Fork of the Illinois River. (% figures below are % of Stream Class Acres) Canopy closure of Mature and Old Growth in 1940 averaged about 50 % on National Forest		
	Class 1&2; 3,661 ac.	Class 1,2,&3; 7,656 ac.	Classes 1,2,3,&4; 13,141 ac.	Class 1&2; 3,661 ac.	Class 1,2,&3; 7,656 ac.	Classes 1,2,3,&4; 13,141 ac.
Grass / Forb Shrub Dominated	DATA GAP	DATA GAP	DATA GAP	DATA GAP	DATA GAP	DATA GAP
Seed/sap/pole	1,455 ac. 40%	2,982 ac. 39%	5,129 ac. 39%	986 ac. 27%	1,918 ac. 25%	3,224 ac. 25%
Young Forest (9-21" dbh)	357 ac. 10%	759 ac. 10%	1,360 ac. 10%	293 ac. 8%	615 ac. 8%	1,075 ac. 8%
Mature Forest (21-32" dbh)	934 ac. 26%	1,958 ac. 26%	3,215 ac. 24%	881 ac. 12%	1,859 ac. 24%	3,045 ac. 23%
Old Growth (> 32" dbh)	728 ac. 20%	1,445 ac. 19%	2,402 ac. 18%	1,358 ac. 37%	2,874 ac. 38%	4,979 ac. 38%

** For modeling assumptions used to derive reference conditions see Appendix A: Table MA, Modeling Assumptions for 1950 timber inventory data.

Table T-4b: Habitat Components (Forest Size/Structure) on Non-Serpentine in Riparian Reserves on BLM Administered Lands.		
Habitat Components, BLM	Riparian Reserves Current Condition East Fork of the Illinois River (% figures below are % total	Riparian Reserves: Reference Condition (1950 Timber Inventory): East Fork of the Illinois River. (% figures below are % of total)
	Fish bearing and 2+ order streams 754 ac.	Fish bearing and 2+ order streams 608 ac.
Non - vegetated	63 ac / 7%	DATA GAP
Grass/Forb	DATA GAP	DATA GAP
Shrub Dominated		
Seed/sap/pole	84 ac / 9%	229 ac. or 38%
Young Forest (11-21" dbh)	163 ac / 18%	78 ac. or 13%
Late-Successional Forest (21+" dbh)	444 ac / 50%	261 ac. or 43%

The following table, Table T-5, identifies the past and future trend for habitat components on the non-serpentine soils of the watershed. The future trends noted assume continued successful fire exclusion, which becomes less likely as more time passes and fuel loading increases, or assumes density reduction treatments are successful over the majority of the watershed on federally administered lands. If fire exclusion or density reduction is not successful at the watershed scale, an increase in the amount of intense fires (caused by fire in high density stands) is likely.

Table T-5: Trends for Habitat Components on Non-Serpentine Soils (National Forest and BLM)		
Habitat Components	Trend: Past 100 Years	Trend: Future 100 years
Grass/Forb	Large grass/forb areas lost to tree encroachment in meadows and mature and old growth forest areas. Until the past five to ten years, fall burning of clear-cuts created good conditions for grasses and forbs. Cooler spring burns of the recent past do not create favorable conditions for this habitat element.	Same as past 100 years except some meadows will be restored.
Shrub Dominated	Shrub dominated areas reduced by tree encroachment caused by fire exclusion.	Trend will continue.
Pole/Sapling	Amount of pole/sapling acres increased by regeneration timber harvest, fire exclusion, and mining (primarily in lowlands).	Decreased from past trend as and timber harvest levels are reduced and these tree sizes grow into larger size classes. Amounts will decrease, but distribution may not be natural due to the distribution of the Matrix land allocation and private land.
Young Forest (FS: 9-21" dbh; BLM: 11-21")	Amount of young forest increased by timber harvest, fire exclusion, and mining (primarily in lowlands).	

Table T-5: Trends for Habitat Components on Non-Serpentine Soils (National Forest and BLM)

Habitat Components	Trend: Past 100 Years	Trend: Future 100 years
Mature Forest (21-32" dbh)	Amount decreased by mining and timber harvest, and increased as young forest grew into larger trees with successful fire exclusion. Increased amount of fire intolerant vegetation and canopy closure in natural stands. Canopy closures increased from about 45-55% historically (1940 aerial photo analysis) to current canopy closures that are currently much higher.	Amount of mature and old growth, and interior mature and old growth forest habitat on National Forest Lands and in riparian reserves on all federal land should increase over the next 50-100 years as smaller trees grow into these larger size classes. Amounts could increase but distribution may not be similar to historic conditions due to distribution of LSRs, other land allocations, and private land. Matrix lands will generally not have forest >32" Dbh reflective of the objectives for the allocation.
Old Growth Forest (> 32" dbh)	On National Forest, approximately 50% of old growth forest was clear-cut, compared to pre-harvest condition. Fire intolerant vegetation and canopy closure has increased in natural/unmanaged stands. Canopy closures increased from about 45-55% historically (1940 aerial photo analysis) to levels that are currently much higher. Data gap on BLM.	
Interior Mature and Old-Growth (400 ft. edge effect)	Harvest strategies have generally maximized fragmentation by dispersing harvest over the landscape and harvesting relatively small areas *(i.e.* less than 60 acres) compared to pre-harvest conditions.	
Cliffs, Rock outcrops, Caves, Adits, and Talus	Rock pit and road development peaked in the 1970's and 1980's and has declined in the 90's, so impacts to cliffs and talus have also declined. Also impacted by timber harvest effects on microclimate, esp. on talus. Fire exclusion has increased stand densities, therefore increased humidity on talus microclimate.	Microclimate humidity will recover in areas disturbed by roading or harvest. Some rock pits may remain open. Humidity will increase as forest stands grow and canopy closure increases, until fire or other density reducing disturbances occur. Renewed mining efforts, and collapse could cause a decline in the amount of adits.
Dead Wood: Large Woody Material and Snags	*Unmanaged stands:* increase in how long dead wood lasts, due to fire exclusion. Decrease of area with high densities of dead wood due to fire exclusion, fire salvage, and timber harvest. *Managed Stands*: Most timber harvest areas are below desired levels, especially for snags. Early timber cutting left more down wood than cutting over most of the past 30 years has; recent harvest (last five years) left more.	Increased amounts, as high stand densities cause mortality of trees (including large sizes) or more is left following timber harvest in Matrix or density reduction in other land allocations. Riparian Reserves will eventually have late-successional component of both snags and down wood.
Pine/Oak Savanna	Most of the areas with pine/oak savannas have been converted to farmland or housing developments, or heavily encroached by Douglas-fir and other trees. Most pines are dead or dying. Some large black oaks and white oaks remain among encroachment, but mortality will continue unless encroachment is reduced or eliminated.	Without active restoration efforts this habitat type will continue to disappear.

Table T-6 compares the amounts of current and reference conditions for different habitat components on non-serpentine sites on National Forest land in the watershed. These numbers represent what is thought to be the middle of the range of variability. The actual historic <u>range</u> is unknown.

Habitat conditions of BLM lands before significant modifications from mining are not known. Although BLM lands in the watershed were no doubt quite different from National Forest lands, such as more pine/oak savanna and more historic impacts from Native Americans, perhaps using the reference conditions described for National Forest lands is a reasonable “first approximation” of reference conditions on some of the BLM lands. For example, the reference conditions of mature and old-growth forest on National Forest land is 67%, but on BLM it is only 44%.

Table T-6: Key Findings: Comparison of Current and Reference Habitat Components for Non-Serpentine Areas on National Forest Land			
Habitat Components, National Forest System lands	Current Condition	Reference Condition	Difference between current and Reference Conditions
	Percentages represent the percent of National Forest lands		
Grass/Forb	Much less than the past DATA GAP	Meadows & brush-fields restored and grass/forb & shrub abundance increased in forested habitats: DATA GAP	DATA GAP
Shrub Dominated			
Pole/Sapling	9,519 ac. or 30%	4,192 ac. or 13%	-5,327 ac. or -17%
Young Forest	3,256 ac. or 10%	2,622 ac. or 8%	-634 ac. or -2%
Mature Forest - 21-32' dbh -(8-16 mature trees per acre)	8,273 ac. or 26% (18% of mature is in Matrix)	7,862 ac. or 25 %	-411 ac. or -1%
Old Growth - >32" dbh - (8-16 old growth sized trees per acre)	6,026 ac. or 19% (21% of OG is in Matrix)	13,166 ac. or 42%	7,140 ac. or 23%
Interior Mature and Old-Growth	3,200 ac. or 10% The majority of these patches are relatively isolated/disconnected.	9371 ac. or 30% The vast majority - over 70% - were in four relatively connected patches that joined most of the WAA's on the eastern portion (Dunn, Elder, & Little Elder areas) of the watershed.	6,171 ac. or 20% Restoration is a function of location; *i.e.*, proximity to exiting interior habitat. The total amount of acres that need treated could be less or more than 20%.
Riparian Reserve, Grass/Shrub	DATA GAP	DATA GAP	DATA GAP
Riparian Reserve, Pole/Sapling	5,129 ac or 39% of RR	3,224 ac. 25%	-1,905 ac. or -14%
Riparian Reserve, Young Forest	1,360 ac. or 10%	1,075 ac. 8%	-285 ac. or -2%
Riparian Reserve, Mature Forest (21-32" dbh -(8-16 trees per acre)	3,215 ac. or 24%	3,045 ac. 23%	-170 ac. or -1%
Riparian Reserve, Old Growth - >32" dbh - (8-16 trees per acre)	2,402 ac. or 18%	4,979 ac. 38%	2,577 ac. or 20%
Cliffs, Rock outcrops, Caves, and Talus	Developed rock pits and reduction of micro-climate by timber harvest have degraded habitat quality	Minimize disturbance of sites.	DATA GAP
Dead Wood: Large Woody Material and Snags	Below reference condition in many managed stands	See Siskiyou Guidelines or "A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California" (Jimerson 1996).	Meet Siskiyou Guidelines or "A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California" (Jimerson 1996).
Pine/Oak Savanna	Heavily encroached by undesirable trees and brush	Healthy pines and deciduous oaks with grass/forb under-story	All places where this habitat occurs

Table T-7 outlines management recommendations that could be used to maintain or restore wildlife habitat components to the reference / historic condition on federal lands.

Table T-7: Management Recommendations for Maintaining and Restoring Wildlife Habitat Components for Federal Lands.

Habitat Component	Recommendations
Grass/Forb	- Under-burn young, mature, and old growth forests, as well as pine/oak savannas. - Burn regeneration harvest units hot enough to provide a seed bed for grasses and forbs. - Remove encroaching vegetation from meadows with manual, mechanical, and/or prescribed fire treatments. Maintain meadows with prescribed fire. - Use native species when seeding disturbed areas. - A number of meadow restoration opportunities exist. See Map 25: Special Wildlife Areas - National Forest Lands. See Map 9A (Plant Series on BLM) and those lands where all Jeffrey pine, ponderosa pine, and white oak sites, as shown on the plant series map, are candidates for meadow restoration.
Shrub Dominated	- Use prescribed fire, manual, or mechanical treatments in openings and under-story of forest habitats.
Seed/Sap/Pole	- Use timber harvest (regeneration or widely spaced thinning) and prescribed and natural fire to create this habitat consistent with land allocation objectives. - Extend the time which seed-sap-pole habitat provides grass, forb, and shrub habitat for 180 associated species (Brown et al. 1985) with treatments like manual release and pre-commercial thinning. - Priority areas are winter range (i.e., south aspects with < 40% slope and < 3000 feet elevation).
Young Forest (9/11-21" dbh)	- Increase diameter growth of young forest trees to restore old growth forest habitat consistent with land allocation and management objectives. - Maintain hardwoods, especially shade-intolerant species. - Reduce fire hazard to this habitat by reducing: ground and under-story fuels, fuel ladders, and the density of over-story crown; and increasing the distance to over-story crown to reduce crown fire potential (Agee 1997). - Priority areas are: a) Upland portions of Riparian Reserves and adjacent to intermittent and ephemeral streams; b) Sites adjacent to - Roads (for use as control points and to improve economic feasibility), - Wilderness areas, - Private land (rural interface), - Sites within or adjacent to connections between interior mature and old growth habitat (especially those at lower elevations or occupied by nesting spotted owls). - Excellent opportunities to treat young forest habitat exist in Elder, Little Elder, Page, Chapman, and portions of Dunn Creek drainages within both managed and unmanaged stands.

Table T-7: Management Recommendations for Maintaining and Restoring Wildlife Habitat Components for Federal Lands.

Habitat Component	Recommendations
Mature Forest (21-32" dbh) Old Growth Forest (>32" dbh) Interior Mature and Old Growth, patches > 20 ac. in size (400ft. edge effect).	*National Forest Lands*: - Increase the overall abundance of old growth forest habitat in the watershed, especially trees > 45" dbh. * - At the watershed scale, manage such that 45-75% of the area is in mature and old growth forest habitat (40% of which should be old-growth on National Forest - In Riparian Reserves, manage such that 50-80% of the area is in mature and old growth forest habitat - At the stand scale, manage to provide 8-16 mature conifers per acre, 8-16 old-growth trees per acre, and an appropriate amount of hardwoods (Bingham and Sawyer 1991), amount of trees > 45" dbh per acre is a DATA GAP. A significant percentage of the large trees should have defect or deformities such as cavities, large limbs, and witch's brooms (from mistletoe). *BLM lands:* - In riparian reserves actively manage for an approximate distribution 70% late-seral, 15% mid-seral, and 15% early-seral. Active management will be critical as this level of late-seral forest is greater than the historic / reference level. - Increase the size of interior mature and old growth forest patches and the connectivity between patches. - Thinning and/or prescribed fire should, in the short term, help to maintain mature and old growth habitat conditions; and in the long term hasten restoration of mature and old-growth habitat (Agee 1997). - Priority locations for restoration are adjacent to or connections between interior mature and old-growth forest and within Riparian or Late-Successional Reserves. For the long term, priority locations for restoration of old growth are within Riparian or Late-Successional Reserves. Maintaining mature forest in Matrix may be consistent with timber management objectives, but maintaining old growth habitat may not be; therefore, old growth habitat is less likely to be restored in Matrix. - Reduce fire hazard to mature and old growth forest habitat. Priority areas are where the fire hazard is moderate or high within interior mature and old growth habitat patches (especially the largest patches), and in Riparian and Late-Successional Reserves. The location of interior habitat patches with moderate or high fire hazard is a DATA GAP. However, the location of young, mature, and old growth habitat that has moderate fire hazard is shown on Maps 21A and 21B: Fire Hazard Levels / Rating. Treatments could include manual, mechanical, or prescribed fire, or let wildfire burn when conditions are appropriate. (**See Note below**)
Cliffs, Rock outcrops, Caves, Adits, and Talus	- Maintain the majority as undisturbed areas;
Dead Wood: Large Woody Material and Snags	- Meet Siskiyou National Forest Guidelines (USDA Forest Service 1996) or, where appropriate, use "A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California" (Jimerson 1996) or use "Snag Densities on the Gasquet Ranger District, Six Rivers National Forest, California" (Jimerson 1989). Specific data for East Fork Illinois watershed is a DATA GAP.
Pine/Oak Savanna	- Reduce encroachment. Maintain savannas, after removing encroachment, by burning as frequently as needed (about every 5 years). - Priority locations are anywhere this habitat is found. This habitat is more common in the lower elevations on BLM lands, primarily on the west side of the watershed and lower portions of Chapman Creek. On National Forest, it is most often found on foothills adjacent to the valley bottom; e.g., lower Page Creek and some south aspects near lower Dunn Creek.

Note: With density reduction in young and mature forest stands, it may be possible to restore old growth forest habitat, as described by Bingham and Sawyer (1991), to desired levels within 30 to 40 years (see Figure T-1, "Years To Reach Mature Or Old Growth Forest Habitat" and Table T-18, "Density Treatment Scenarios"). Care must be taken during density reduction treatments to ensure all old growth characteristics are retained or restored. These characteristics include the appropriate levels of dead wood and a significant percentage of the large trees should have defect or deformities such as cavities, large limbs, and witch's brooms (from mistletoe) (NW Forest Plan). ***Without density treatments, old growth forest is not likely to be restored to desired levels in the watershed, due to the probability of intense stand-replacing wildfires*** (Atzet, personal communications, 2000). Fire exclusion has caused a shift in the fire-regime from primarily low-intensity but frequent fires, to a regime that it has more high-intensity but less frequent fires. Frequent low-intensity fires reduced tree densities in mature and old growth forest and facilitated large diameter, while high-intensity but less frequent fires eliminate mature and old growth forest habitat; e.g., the Longwood Fire in 1987. This shift in fire regime will probably prevent attainment of the desired levels of old growth forest habitat in the watershed. Density reduction could set the stage for restoring the historic low-intensity fire regime and significantly reduce the future need for: mechanical treatments in Late-Successional and Riparian Reserves, and roads in Late-Successional Reserves.

B. Key Question T-2: Fire and Fire Effects

T-2. Where and how has fire affected the watershed, and where and how could fire affect the watershed in the future?

1. Historic Wildfire Effects

Frequent fires characterized the Klamath Mountains Province. Prior to fire exclusion policies, wildfires occurred at least every 10 to 30 years in most forested areas of the watershed. American Indians were known to use fire to manipulate the vegetation for basket materials, and to maintain acorn production areas, wildlife habitat, hunting, and travel access. Early Euro-American settlers and miners were also reported to use fire to clear land for mining, grazing or farming. Natural ignitions from lightning are still a regular occurrence in the watershed today.

Limited wildfire suppression began with the creation of the Siskiyou National Forest in 1906. The Page Creek Guard Station was built near Takilma in 1909. A smoke jumper base also operated in the Illinois Valley from the 1940's until 1979. Siskiyou National Forest records indicate large fires occurred up to the 1940's (Table T-8), although at a lower number of acres burned than historic levels. Fire suppression efforts became very effective for the forest as a whole during the 1940's.

Table T-8: Number of Acres Burned on the Siskiyou National Forest, 1910-1998

Decade	Acres Burned
1910-1919	410,369
1920-1929	60,813
1930-1939	153,812
1940-1949	4,157
1950-1959	5,805
1960-1969	4,601
1970-1979	2,942
1980-1989	112,822
1990-1998	10,679
Total	**766,000**

Historically (before 1900), the fuel/vegetation profile was in a mosaic across the landscape. Skinner and Taylor (1998) found that a fire occurred about once every 5 years somewhere within their 5,000 acre Thompson Creek study area in northern California. These fires were often small in extent, but periodically (12 - 26 year interval) burned the entire study area. As a result, the vegetation/fuel profile was influenced by both the severity and the time since the last fire occurred. The landscape would have small to large areas with low fuel accumulations interspersed with areas with greater fuel concentrations. Fire spread in most low elevation, open stands would have been primarily through fine herbaceous fuels. These were surface fires where cured grasses, forbs and scattered shrubs, in addition to litter and dead-down stem-wood from an open shrub or timber over-story, contributed to fire intensity. Stands probably contained occasional concentrations of fuels that would generate higher intensities. In denser conifer or hardwood dominated stands, fire generally spread through light timber litter and dead-down stem-wood. These slow-burning ground fires had short flame lengths, although fires may have encountered an occasional "jackpot" or heavy fuel concentration where flame lengths increased (*i.e.*, flare up). Only under severe weather conditions involving high temperatures, low humidity, and high winds did these fuels pose significant fire hazards. Fuel accumulations would have been greater on more mesic sites where the fire-return interval was longer or where a past severe fire had killed many overstory trees.

In spite of fire suppression efforts, wildfires have continued to occur in the watershed (see Map 23: Fire History - National Forest Land). There have been 6 large fires (> 50 acres) on National Forest Lands in the watershed since 1940. Lightning caused all of these fires. The most recent were the 1987 lightning fires that involved over 8,000 acres in the East Fork Watershed. The largest was the Longwood Fire (9,916 acres including areas outside the watershed) near Takilma. The 1987 fires occurred in a below normal precipitation year, were late in the fire season (August into September), and resulted from multiple lightning caused ignitions. Dry weather conditions and multiple ignitions are common in the upper Illinois River.

Fire exclusion policies and timber management practices have changed the historic "frequent fire" regime in the watershed. Large fires have continued to occur, but suppression has lengthened the fire return interval. As the fire regime changed, the structure of the vegetation and fuels profile changed at both the stand and landscape scales. Under-story vegetation has increased, downed fuels have increased, continuity between under-story and over-story vegetation has increased (fuel ladders), and the vegetation / fuel profile is more uniform over the landscape. These conditions have created the potential for severe wildfires that can cause severe resource damage, and are difficult and expensive to suppress. See Appendix B, Fire and Plant Series for more detailed descriptions of the relationships between fire and vegetation.

The 1987 Longwood Fire is an example of the results of the changed fire regime in the watershed. Over 40% of the Longwood Fire burned with a high severity (e.g., stand replacement). When several fire events have been missed due to fire exclusion, the fires that do occur, are often more severe than those that historically occurred. Taylor and Skinner (1998) estimated historic fire severity in their Northern California study area was 59% low, 27% moderate, and 14% high.

Fires rarely escaped initial attack in the fire suppression era, except under severe fire weather conditions. This contributes to large fires burning under the most severe conditions. In the case of Longwood, the result is the single largest are of early-seral vegetation in the watershed.

Observations of the 1987 fires and the 1994 Dillon fire (Klamath National Forest) suggest that early-seral vegetation burned the most severely. Young conifer, hardwood stands, and brush fields, whether managed or unmanaged (natural), have densely distributed fine fuels (horizontally and vertically) and present a high hazard fire environment.

When wildfires such as Longwood occur, after the area has “skipped” many fire events, they are not "restored" to a historic fire regime. Increased fire severity in combination with dense stands can contribute to high fuel accumulations from fire-killed vegetation. Subsequent fires have the potential to remain severe until the vegetation and fuel profile is reduced to levels that are more historic.

Table T-9 summarizes average fire disturbance characteristics of the primary plant series in the watershed.

Table T-9: Average Fire Disturbance Characteristics By Plant Series

Plant series	Average Stand Age	Average Interval (in years)	Estimated Interval Range
Douglas-fir	230	15	10 - 60
Jeffrey Pine	282	14	10 - 80
Ponderosa Pine*	DATA GAP	15*	5 - 25*
Port-Orford Cedar	419	50	40 - 130
Tanoak	243	12	25 - 150
White Fir	213	25	10 - 60
White Oak**	DATA GAP	DATA GAP	5 - 10**

Source: Forest Service Southwestern Oregon Ecology Plot Data and White et al., except where noted by an * or **.
*Ponderosa pine average interval is taken from Bork (1985) and Weaver (1959). Ponderosa pine estimated interval range is from Bork (1985) and Martin (1982).
**White oak estimated interval is from Agee (1990).

2. Hazard, Risk and Values at Risk

Wildland fire management considers the hazard, risk, and values at risk to identify the potential for wildfire to effect expected management outcomes in the watershed. Wildfire occurrence can prevent or delay achievement of land management goals and objectives. For example, stand destroying wildfire can prevent the development of mature and late-successional forest conditions as well as convert existing mature forests to early seral forests.

Hazard, risk and values at risk are defined as follows:

Fire Hazard: A fuel complex defined by volume, type, condition, arrangement, and location, which determine the ease of ignition and resistance to control. Resistance to control includes both fire behavior and suppression difficulty.

Fire Risk: The chance of a fire starting from all causative agents, including lightning.

Values at Risk: Any natural resources, improvements, or human values that may be lost due to fire.

The data collected for the watershed for hazard, risk, and values at risk for loss from wildfire are summarized in Tables T-9 through T-11. Ratings and other fire and fuels assessment information are displayed on Maps 19 through 24. Rating classification criteria are summarized in Appendix B.

Table T-10: Fire Hazard						
	HIGH		MODERATE		LOW	
	Acres	%	Acres	%	Acres	%
National Forest (Includes non-federal lands within NF boundary)	6,393	18	22,356	61	7,838	21
BLM	2,549	50	2,355	47	139	3
Non-Federal Lands	7,347	46	7,849	49	757	5
Total	16,289	28	32,560	57	8,734	15

Only 15% of the watershed is in a LOW fire hazard condition. This is primarily due to fire exclusion policies and the resulting accumulation of fuels and increased vegetation density. Forest management practices that did not treat activity fuels have also contributed to this condition.

Table T-11: Fire Risk						
	HIGH		MODERATE		LOW	
	Acres	%	Acres	%	Acres	%
National Forest	1,179	3	30,104	82	5,405	15
BLM	2,295	45	1,751	35	997	20
Non-Federal Lands	11,400	71	3,457	22	1,096	7
Total	14,874	26	35,312	61	7,498	13

Lightning, past human caused fires, and the current level of human use produces a medium to high level of risk for wildfire occurrence in the watershed.

Table T-12: Values at Risk						
	HIGH		MODERATE		LOW	
	Acres	%	Acres	%	Acres	%
National Forest	31,283	85	0	-	5,405	15
BLM	1,295	26	2,505	50	1,243	24
Non-Federal Lands	10,161	64	1,696	11	4,096	25
Total	42,739	74	4,201	7	10,744	19

Values at risk are the resources and human values that may be lost due to wildfire in the watershed. Over 80% of the watershed has a moderate to high values at risk value. This is due to the amount of high value wildlife habitat, recreational values, and private property within the watershed.

A majority of the watershed (85%) is currently in a moderate to high fire hazard condition. Wildfires occurring on average worst fire condition days could exceed initial attack capability and have potential to become large stand replacement events. Takilma is an area of concern due to the high hazard, risk, and values at risk.

The Longwood Fire area is rated as mostly a moderate fire hazard within National Forest boundaries.

This rating should be a high due to the difficulty of suppressing a potential wildfire in the current post-wildfire fuel profile. Numerous snags, large continuous areas of untreated slash, and brush re-growth, make fire line construction difficult and fire fighter safety a concern.

3. Desired Future Condition For Wildfire Effects

Wildfires will continue to occur in the watershed. Desired future conditions for wildfire effects include:

- Reducing the number of acres burned by high severity wildfire;
- Reducing long-term fire suppression costs;
- Increasing firefighter and public safety;
- Protecting lives and property in the rural interface areas.

The potential for high severity wildfire can be reduced with implementation of fuel/vegetation treatments that reduce the fire hazard. Fire risk can be mitigated somewhat with fire prevention efforts, but all of the recent large fires in the watershed have been lightning caused. Reducing the fire hazard would also improve fire suppression effectiveness, firefighter safety, help protect rural interface areas around Takilma, and help protect and maintain wildlife habitats. Fuel/vegetation treatments should focus on reducing ground fuels, ladder fuels, continuous crown canopy closure, and favoring more fire tolerant tree species.

A low fire hazard fuels profile should be predominant in the watershed, especially within rural interface areas, patches of interior forest habitat, and adjacent to the Siskiyou Wilderness. In some situations, it may be advisable to implement manual, mechanical or other silvicultural treatments (commercial and non-commercial) alone or prior to the use of prescribed fire. Manual and mechanical treatments can reduce fuels loadings in high hazard or high value areas to permit future prescribed and prescribed natural fire use. Multiple entry / low intensity prescribed fire may also be utilized to gradually reduce fuel loadings to levels where future wildfire severity would be low. Some treatments may temporarily increase the fire hazard, but should provide a long-term hazard reduction benefit. Examples of potential fuel/vegetation treatments include: 1) Density management by commercial and pre-commercial thinning; 2) Fuel breaks along key ridge tops, adjacent to private lands, or other strategic locations; 3) Understory vegetation reduction by chipping, cutting, piling or underburning, 4) Fuel bed rearrangement by chipping, scattering, piling or underburning; and 5) Pruning to reduce ladder fuels.

4. Management Recommendations for fuels and fire include:

- Restore or maintain the historic fire regime where compatible with resource objectives.

- Develop a joint wilderness fire management plan for the Siskiyou Wilderness (Klamath, Siskiyou, and Six Rivers National Forests).

- Reduce fire hazard to the Siskiyou Wilderness; facilitate the use of prescribed natural fire in the Wilderness.

- Reduce fire hazard to the rural interface.

- Reduce fire hazard to interior mature and old growth forest habitat patches.

- Break up the fuels continuity in the moderate to high fire hazard areas within the Longwood Fire.

- Maintain a road system in the watershed that permits efficient wildfire suppression and economical fuel hazard reduction treatments.

C. Key Question T-3: Disturbance Patterns

T-3. What are the historic and current disturbance patterns for the watershed? How have management activities affected these patterns?

1. Pre-settlement Period

Fire appears to have been the most dominant, frequent disturbance in the watershed and a major determinant of biological diversity. The pre-settlement fire regime (pre-1850) was one of generally frequent, low to moderate severity fires. These fires burned through a landscape of complex topography, diverse vegetation and areas of previous disturbance, which affected the fire severity. Fires were generally low intensity surface fires with occasional higher intensity, stand replacement patches. The result was a patchy landscape where higher severity burned patches were interspersed within a larger area of low intensity, under-burned areas. Large-scale stand replacement patches of hundreds to thousands of acres were infrequent for the watershed's landscape.

Fire not only altered stand development by returning vegetation to earlier successional stages, it often served to maintain plant communities at later successional stages with frequent low intensity under-burns. These frequent fires influenced the structural characteristics, species composition, and density of stands. Surface fuels were kept at low levels, under-stories were relatively clear of trees and vegetation that could serve as ladder fuels, and stands were generally more open than today.

Fire created openings and provided favorable conditions for regeneration and growth of shade-intolerant species (such as the pines and non-tanoak hardwoods). The more fire resistant/fire adapted species were favored by survival through subsequent fire events. Under-burns favored those species and created stand structures adapted to these fire conditions. The more shade-tolerant and less fire resistant species, such as white fir or tanoak at lower elevations, would also have regenerated in openings and in the under-story. However, subsequent fires would have kept their numbers relatively low, especially in the under-story. The more mesic sites generally experienced longer fire return intervals and were the places where, at higher elevations, white fir dominated stands often developed. Low stand densities often improved or maintained the growth of larger, older trees and maintained early seral species as a minor to major part of most stands.

Other disturbances, such as mass soil movement (landslides), floods, wind, and insects or pathogens also played a role in determining vegetation diversity, but they were of a more localized or infrequent nature. Wildfire exclusion has resulted in significant increases in both stand densities and the proportion of shade-tolerant and fire sensitive species. Although there is more vertical structure (multi-storied) at the forest stand level, at the landscape level there is less diversity, stands are more homogenous, and canopy closures have increased. These changes can be expected to increase the future effects of disturbances by insects and disease as well as fire in the watershed.

Fire also affects geomorphic processes within a watershed (Swanson, 1981). Fire alters vegetation and soil properties, which can alter hydrologic and geomorphic processes. The effects are generally increased soil water and overland flow, which can result in accelerated erosion by a variety of surface and mass movement processes. The magnitude of geomorphic effects of fire depends on the fire regime (primarily frequency and severity) and the sensitivity of geomorphic systems to disturbance by fire. Geomorphic sensitivity is controlled by hill-slope and channel steepness and the effectiveness of vegetation in regulating physical processes in the system. Fire is less geomorphically significant in ecosystems where fire is less frequent and/or less intense and where erosion potential is lower. A changed fire regime in the watershed may result in more and larger patches of high severity fire that could increase surface erosion, mass movement processes, and reduce water quality.

2. Settlement Period

During the Euro-American settlement period (post-1850), mining, farming and grazing were significant new disturbances in the watershed (see discussion in the Social Module). Early mining activity was concentrated in lower elevation streams and adjacent riparian areas (McKinley and Frank 1995). They noted that in areas such as the Althouse region and the East Fork Illinois around Waldo, the streambeds were virtually turned upon themselves. Ditches and water diversions changed water flow patterns (32 miles of ditches and flumes in the Indian Hill, French Flat, Waldo and Takilma areas), deciduous and conifer trees in the way of mining operations were removed, and the soil was washed away.

Mining activities heavily impacted many areas in the watershed including:

Allen Gulch (40-8-34): Approximately 80 acres of Allen Gulch has forest vegetation growing on placer mine debris. This land is located in the southwest 1/4 of the northeast 1/4 (approx. 15 acres), the southeast 1/4 of the northwest 1/4 (approx. 25 acres), the northeast 1/4 of the southwest 1/4 (approx. 30 acres), the northwest 1/4 of the southeast 1/4 (Shenon 1933). Smaller diameter trees occur just downhill from the Allen Gulch cemetery indicating more intense or more recent disturbance. Below that, the trees are larger and demonstrate the ability of closed canopy forest vegetation to re-establish itself even after severe disturbance. Second-growth timber including trees 50 to 60 years old covered most of the mined ground in Allen, Sailor, and other gulches, and fixes rather definitely the time elapsed since that mining period (Shenon 1933). This would approximate the end of the mining at around 1878.

Scotch Gulch (40-8-33 and 41-8-3): Sluice boxes were used to separate the gold from rocks and dirt. One of these, operated in Scotch Gulch in the 1870s was said to have employed as many as 50 men, shoveling, piling rocks, etc. (Street and Street 1973).

Esterly Mine (40-8-22): The most extensive mining was done by the hydraulic method. Nozzle diameters of two to six inch diameter with water pressures commonly up to 150 psi were used. With this, large boulders and tree stumps can be rolled out of the way, high banks undermined and caved and an immense amount of dirt washed through a sluice in a day. The Easterly mine is said to have handled five hundred to one thousand cubic yards of dirt per day by this method (Street and Street 1973).

Wetland areas were among the most intensely disturbed by mining and farming practices. Streams were channelized, and the once more extensive marsh areas likely found at various locations along the lower East Fork, and where side drainages joined the river (McKinley and Frank 1995) were turned into farmlands or pasture. Early homesteads were primarily in the more open vegetation types (Hickman 1998), that were easier to graze or prepare for farming than more heavily wooded areas.

Timber harvest began close to areas of human activity such as Waldo and Takilma in the early mining days (McKinley and Frank 1995). The big pines scattered amongst the oak savannah, woodlands and lower elevation mixed-conifer forests were often harvested. They provided much of the lumber for sluices, fences, homes, stores and barns. Oaks were also often removed as barriers to agriculture and pasture, and provided a source of fuel wood.

The steeper lands, lack of railroad access and generally poorer stands of timber compared to the Southern Cascades, delayed significant logging in the Illinois Valley area until after the turn of the century. Private lands were largely logged first and significant timber harvest did not begin from National Forest and BLM administered lands till after World War II. Particularly in the early years, pine was the most valuable species and was often preferentially harvested from private lands.

Surveyor's notes from the Donation Land Claim (DLC) surveys of 1850 to 1855 reveal a landscape in lower elevations of the Upper Illinois Valley that was dominated by black oak, white oak or ponderosa pine. The average diameter of these species was significantly less than for other surveys, such as the Applegate, suggesting that as a whole the Illinois Valley DLC's were a younger age (McKinley and Frank 1995).

With the success of fire suppression resulting in fire exclusion on many sites, the vegetation composition has changed. A good example of this can be seen in the monument trees in the French Flat area. At the southeast corner of section 15 (T40S, R8W) the bearing trees in 1855 were: a yellow pine 24" dbh, and 3 black oak 2", 4", and 8" dbh. In 1957, the bearing trees at the same corner were an oak (no species listed) 9" dbh, and three Douglas-fir, 10", 12", and 15" dbh. At the quarter corner between section 22 and 23, the bearing trees in 1855 were 2 black oaks: 3 and 6 inches in diameter. The bearing trees in 1957 at this corner were 2 (Douglas) firs: 10 and 17 inches in diameter. This change in bearing trees over time (102 years) supports the notion of fire tolerant, shade intolerant trees (in this case ponderosa pine and black oak) are being replace by more shade tolerant fire intolerant trees (Douglas-fir).

Borgias (1997) noted the changes to the ponderosa pine-black oak woodland and white oak savanna that once dominated the French Flat area of the watershed in a comparison of land surveyor's notes. The cessation of fire use by Native Americans, fire suppression, grazing, and selective harvest of pines allowed Douglas-fir to encroach, and in some cases overtop what was once open oak savannah and pine-oak woodland. The forest is now denser, the edge between denser forest and openings of scattered pine and oak reduced, and the role of pine diminished.

D. Key Question T-4: Fire Hazard

T-4: What is the existing condition of fire hazard on the perimeter of the rural interface, and what can be done to improve those fire hazard conditions?

See Map 21 (Fire Hazard Levels) for existing condition.

White oak and pine communities occur within the rural interface. Fire exclusion has allowed encroachment by shrubs such as ceanothus and tree species including incense cedar and Douglas-fir, resulting in increased fire hazard. Prescribed burning in conjunction with manual or mechanical treatments may be appropriate for reducing this hazard.

Tanoak communities within the rural interface also present a fire hazard, which could be reduced through the use of prescribed fire and other mechanical treatments.

Young stand management (less than 50 years) is a priority. Embark on a young stand management plan (brushing, precommercial thinning, hand piling and burning the resulting slash) in natural stands as well as old clear cuts. "Link" treatments: projects should not be seen as single events, but rather a sequence over time culminating in desired future condition. For example, stand initiation (new age class) to initial canopy closure of the desired number of trees by species per acre. This would incorporate multiple treatments over a 10 to 20 year project window and enhance planning/budgeting efforts.

E. Key Question T-5: Timber Harvest

T-5. How much timber was harvested in the watershed in the past? How much timber volume is available on the lands allocated to Matrix?

1. National Forest Lands

Timber harvest began in the lower elevations in the 1940's and progressed with the development of the transportation system. Approximately 7,238 acres have been regeneration harvested in the past five decades (see Map 15 Managed Stands). The highest levels of harvest in terms of acres regenerated occurred during the 1950's and 1980's. The 1990's saw a reduction in harvest from historic levels with the Dwyer injunction and the subsequent Northwest Forest Plan amendments to the Siskiyou Forest Plan.

With regard to land now in the Matrix land allocation, approximately 1,700 acres (39% of the lands suitable and available for timber harvest) have been regeneration harvested during the past five decades (See Table T-13).

Table T-13: Historic Regeneration Harvest in the current Matrix land allocation - National Forest Lands (Includes intermittent streams and unsuitable lands)			
Decade	Management Areas in the Matrix (acres)		
	Partial Retention	General Forest	Total
1940-1949	36	11	47
1950-1959	267	463	730
1960-1969	65	460	525
1970-1979	132	157	289
1980-1989	282	426	708
1990-1999	37	0	37
Totals	819	1,517	2,336

The following table displays the approximate acres available for Forest Service programmed timber management in the watershed.

Table T-14: Matrix Acres Available for Timber Harvest - National Forest Lands			
	Management Areas in the Matrix (acres)		
	General Forest	Partial Retention	Total
Matrix Acres - Total (1)	5,058	2,407	7,465
Unsuitable (2)	(931)	(551)	(1,482)
Managed Late-Successional	(107)	610	(168)
Intermittent (3)	(936)	(562)	(1,498)
Net Available Acres	3,084	1,233	4,317

(1) Does not include fish bearing or perennial non-fish bearing Riparian Reserves.
(2) TMR and TML. Lands unsuitable for timber management.
(3) Approximate from maps, aerial photos, and ground verification.

Potential Sale Quantity (PSQ) was modeled in the Siskiyou Forest Plan using suitable and available lands over the entire forest for sustained timber yield calculations. PSQ was adjusted for the reduction in the land base available for timber management after the Northwest Forest Plan Record of Decision (ROD). PSQ is not modeled at the watershed scale. A watershed is not considered a sustained yield unit.

Approximately 3,500 acres of managed stands in the watershed were harvested prior to 1970 (all land allocations). Many of these stands may require thinning within the next ten years to maintain current growth rates, species diversity, and reduce long-term fire hazards. The potential thinning opportunities are displayed in the East Fork Watershed Analysis Commercial Thins (efcomthin.gif).

2. BLM Lands

Table T-15 summarizes past timber harvesting on BLM lands in the watershed. The earliest dated harvest on BLM Lands in the watershed was 1956 in T39S,R8W, Section 27. Between that time and 1985 some type of timber harvest was done on approximately 1,834 acres (36.4% of BLM lands) received. Harvest type and volume removed are data gaps.

Table T-15: Pre-1986 Timber Harvest Acres by Township - BLM Lands			
DECADE	T39S, R7W	T39S, R8W	T40S, R8W
PRE 1960	0	140	236
1961-1969	0	0	311
1970-1979	59	238	169
1980-1985	361	320	0
Totals	**420**	**698**	**716**

Source: BLM microstorms data**. NOTE:** Harvest acres are greater than actual because inventory units include some acres outside of the watershed boundary. Acreages also assume no units were harvested more than once, and subsequently counted more than once.

For the period from 1986 to the present, approximately 444 acres (8.8% of BLM lands) and 6,961 MBF have been was harvested in the watershed.

Table T-16: Post 1986 Timber Harvest Acres and Volume - BLM Lands						
DECADE	T39S, R7W		T39S, R8W		T40S, R8W	
	Acres	MBF	Acres	MBF	Acres	MBF
1986-1989	91	819	138	1,167	85	1,859
1990-1999	0	0	130	3,116	0	0
Totals	**91**	**819**	**268**	**4,283**	**85**	**1,859**

Source: BLM microstorms data**. NOTE**: Harvest acres are greater than actual because inventory units include some acres outside of the watershed boundary.

In total, approximately 2,278 acres or 45.2% of the BLM administered lands have had some form of harvest on them. Current estimates show 32,105 MBF remaining in the watershed on 1,599 acres (31.7% of BLM lands).

Table T-17: Estimated Current Timber Volume on BLM Lands								
Township	T39S, R7W		T39S, R8W		T40S, R8W		T41S, R8W	
	Acres	MBF	Acres	MBF	Acres	MBF	Acres	MBF
Totals	539	6,550	431	8,900	556	14,600	73	2,000

Source: BLM microstorms data.

3. LRMP and RMP Timber Management Recommendations for Timber Management

The following summarizes the timber management recommendations from the National Forest LRMP and the BLM's RMP for lands in the matrix land allocation.

a. National Forest Lands

- Produce a commercial timber yield.
- Maintain an appropriate distribution and abundance of age classes to ensure sustained yield.
- Provide early-successional wildlife habitat.
- Maintain a diversity of species, such as pines and hardwoods, appropriate for the site.
- Commercial thin stands to maintain desired species composition and stand structure,

promote long-term tree and stand health, reduce fire hazard, and salvage potential mortality.
- Pre-commercial thin/release young stands to maintain desired species, stand structure and development rates.
- Treat stands early (within 10 years of stand initiation) to reduce potential fire hazard from fuel accumulations.

b. BLM Lands

- Produce a sustainable supply of timber and other forested commodities to provide jobs and to contribute to community stability.
- Provide connectivity (along with other allocations such as Riparian Reserves) between Late-Successional Reserves.
- Provide habitat for organisms associated with both early as well as late-successional forests.
- Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees.

F. Key Question T-6: Stand Densities and Pathogens

T-6: How has and how will stand densities and tree pathogens affect the watershed?

Tree mortality is a normal part of forest ecosystem processes. Insects, disease, drought, fire and competition with other trees and vegetation will kill trees. The patterns of mortality are complex. Mortality resulting from disturbances is determined by: vegetation structure and patterns, the type of disturbance, and the physical environment (USFS 1996). For example, dense stands increase the competition for available water and result in greater moisture stress to vegetation. During periods of drought, mortality can occur directly from drought stress or more likely from combinations of drought induced stress and subsequent insect attacks. Insects are often host specific, and more aggressive insect species can impact some tree species more than others.

Generally above the riparian zone in a riparian reserves, the vegetation is the same as the uplands and responds similarly to upland disturbances. Riparian reserves incorporate substantial areas of upland vegetation, especially along intermittent stream courses. Fluvial action (frequency, intensity and duration of high flows), high water tables, cold air accumulation, and topographic shading are key non-biotic features of riparian zones in mountainous terrain. Riparian-vegetation is strongly influenced by the environment created by fluvial processes. The vegetation is affected by direct stream flow and the substrates (gravel, silt, etc.), local water table conditions, and land forms created by fluvial activities.

1. Stand Density

Fire played a major role in the development and maintenance of late-successional forest structures in all plant series in the watershed (USDA 1993, Tappeiner et al. 1997, Agee 1991, Taylor and Skinner 1998). Tappeiner noted that the wide range of ages and low density of old stands in the Coast Range suggested that periodic, low intensity fire killed some trees, temporarily reduced shrub cover, and likely enabled some seedling establishment. A combination of available seed source and dense shrub and herbaceous competition may have limited conifer establishment after intense fires (even on productive sites). Self-thinning did not generally occur during the development of old stands although it likely occurred in dense parts of some stands. Canopy gaps in these forests were the result of the low rate and irregular density of conifer establishment as well as the death of individual large trees.

Taylor and Skinner (1998) described a fire regime in Northern California where frequent fires of mixed low and moderate severity killed some over-story trees, initiated recruitment, and thinned or killed understory stems. These mixed-severity fires created multi-aged stands where tree establishment was associated with more severe fires that killed parts of the canopy and opened the stand enough for regeneration to occur. Agee (1990) also described a similar stand development sequence for the Oregon Caves National Monument.

Stand density greatly influences stand development and the resulting stand structure. Given the initial species composition, initial density, site conditions, and past as well as future disturbance factors, forest stand development can be predicted (Oliver and Larson 1996). Patterns of stand development at different stand densities are well documented in the literature. Reineke (1933) showed that each species has a different maximum number of trees of a given diameter that a site can support (maximum size-density relationship). Fewer trees can be supported as diameter increases, and even fewer shade intolerant species (ponderosa pine) can be supported than shade tolerant species (white fir). Drew and Flewelling (1979) showed that these patterns are useful for achieving desired stand structural characteristics such as crown structure, individual tree and stand growth, tree diameter distribution, under story development, regeneration, and species composition. Above 25% of their maximum stocking level, individual trees begin to compete with each other and individual tree diameter-growth slows and crown lengths shorten. Above 55% of their maximum stocking level, stands enter a zone of "imminent competition-mortality" where the risk of mortality increases.

Stand densities on BLM administered lands in the watershed are high. During 1999, stand exams were conducted on approximately 1,000 acres in T40S, R8W. Stand densities were measured using the Curtis relative density index. This index was derived from the ratio of current stand basal area to the maximum stand basal area. Using this system, a stand is ready for thinning when the relative density reaches 35 and at the upper limit for thinning when the relative density reaches 55. All 1,000 acres examined in 1999 have relative densities greater than 55. This indicates that in this township all the stands visited can be characterized by slow rates of growth and a shift in species composition. Shade intolerant/fire tolerant species are declining while shade tolerant/fire intolerant species are increasing, and there is good potential for a stand destroying fire. From tree and stand growth and vigor perspective, these stands should have already been thinned.

Many early-seral stands in southwest Oregon are not developing along the same stand trajectories as existing late-successional stands (Tappeiner 1997, Sensenig 1998). Stand densities are higher and individual tree diameter growth rates lower than those of old stands. Higher stand densities reduce tree vigor, increase tree losses to insect attacks, increase competition-induced mortality, and delay the development of old growth structural characteristics. Reducing the density of forest stands can maintain stand vigor, species diversity, and accelerate the development of large trees.

2. Density Management

Commercial thinning is a silvicultural technique that can be used to meet local economic needs for timber, ecosystem restoration goals for wildlife, and a variety of other resource objectives. The amount of time to reach mature and old growth forest habitat conditions varies considerably between no density treatments and various types and intensities of density treatments. In the absence of density management actions, higher stand densities, increased tree pathogens, and more stand replacement fires will result. This would result in less old growth, more early seral vegetation, and more negative impacts to species of concern. Treatments that reduce stand densities could, over time, lessen the potential for high intensity fires, increase the amount of mature and old-growth forest, produce wood for human uses and maintain some historic forest conditions. The amount, location, and timing of these treatments could significantly affect how long it takes to reach any particular specified desired future condition. For example, with density management on relatively productive areas (McArdle Site III) found on National Forest land, a stand can develop into mature forest habitat (8 to 16 trees per acre @ 21” to 32" dbh) within approximately fifty-five years after a stand replacement event, and it can develop some old growth characteristics (8-16 mature trees and 8-16 trees larger than 32" dbh per acre) within about ninety years. However, without density management, the same stand could be at higher risk to diseases and stand replacement fire without treatment. Assuming no disease and no stand replacement fire, a stand would take about one hundred ten years to develop into mature forest and over 180 years to develop old growth forest habitat characteristics (*i.e*., trees > 32” dbh) without density treatment (see Figure T-1). Along with large diameters, the development of mature and old growth forest also requires snags, down woody material, and deformities such as mistletoe brooms, large limbs, and cavities. Silvicultural treatments can promote the development of these characteristics.

Figure T-1: Years to Reach Mature or Old Growth Forest Habitat

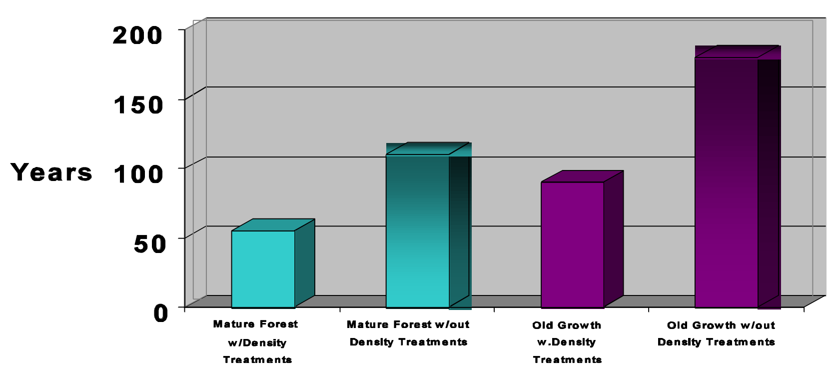

Table T-18 presents growth modeling results for different initial stand densities and thinning regimes to show the resultant stand size and densities. In doing this modeling the assumptions made were: a) competition from other vegetation is minor (e.g., low intensity prescribed under-burning or mechanical thinning will occur to reduce competition with trees intended to develop into mature and old growth forest habitat) and b) stand treatments would be designed to maintain minor species on appropriate sites (e.g. hardwood species in the Tanoak and Douglas-fir Series).

Table T-18: Density Treatment Scenarios					
Trees Per Acre (tpa) Planted	1st Thin pre-commercial	2nd Thin commercial	3rd Thin commercial	> 21" dbh	> 32" dbh
400 10'x10'	No treatment	No treatment	No treatment	13 tpa about 110 years after planting	6 tpa about 160 years after planting
300 12'x12'	To 125 tpa (19x19) about 10 years after planting.	No treatment	No treatment	21 tpa about 60 years after planting	20 tpa about 100 years after planting.
300 12'x12'	To 125 tpa (19x19) about 10 years after planting.	Treat about 40 years after planting.	No treatment	29 tpa about 60 years after planting	12 tpa about 95 years after planting.
300 12'x12'	To 125 tpa (19x19) about 10 years after planting.	Treat about 50 years after planting.	No treatment	16 tpa about 55 years after planting	11 tpa about 90 years after planting
300 12'x12'	To 125 tpa (19x19) about 10 years after planting.	Treat about 55 years after planting.	No treatment	25 tpa about 60 years after planting	13 tpa about 90 years after planting
300 12'x12'	To 125 tpa (19x19) about 10 years after planting.	Treat about 55 years after planting	Treat about 75 years after planting	25 tpa about 60 years after planting; 17 tpa about 100 years after planting	12 tpa about 90 years after planting; 20 tpa about 100 years after planting

3. Insects

Relatively high levels of mortality in large, old sugar pine due to mountain pine beetles (*Dendroctonus ponderosa*) have been observed in the past decade in the watershed and elsewhere in southwest Oregon. Bark beetles do not normally kill healthy and vigorous trees. Rather, they are most successful on low vigor or stressed hosts. Sugar pines are intermediately drought tolerant when they are young, but become less tolerant as they become older. Bark beetles prefer trees weakened by disease, injury, drought, or intense competition. The major factors contributing to high levels of mortality include the recent years of drought; dense stand conditions and blister rust. The basal area that a particular site can carry and maintain stand vigor varies depending on site productivity. In portions of southwest Oregon on pine sites recommendations are to maintain basal areas of less than 180 square feet on moderate to good sites and less than 140 square feet on poor sites to reduce the risk of mountain pine beetle attack (Don Goheen, personal communication). Understory vegetation of small trees and brush are also significant competitors for moisture, especially on poorer sites, and will increase the risk of beetle attack.

Map 16: the Risk of Decline in Forest Health shows areas at risk to bark beetle attack in the watershed (USDA 1995).

4. White Pine Blister Rust

White pine blister rust (*Cronartium ribicola*) is an introduced disease that affects five needle pines (sugar and western white pine) in the watershed. It causes top and branch killing, tree mortality, and weakens trees, which contributes to bark beetle attack. Blister rust has contributed to greatly reducing the numbers of five needle pines in the watershed over the last 50 years, especially western white pine. This has resulted in a loss of genetic diversity, shifting stand structure on some sites, and an increase in snags (Jimerson 1992). Douglas-fir and white fir have replaced the sugar pine on some sites, which because of their susceptibility to some root diseases and mistletoe, have contributed to poor stand health and productivity. Risk of infection with blister rust is greatest on sites where summer and autumn fog persist, such as low-lying riparian areas, saddles, and ridges toward the coast side of the watershed. Blister rust tends to intensify in years following particularly wet late summers and falls. Effects of blister rust are minimized when five needle pines are favored on low risk of infection sites, and when rust resistant pines are favored or planted.

5. Dwarf Mistletoe

Dwarf mistletoes (*Arceuthobium spp*.) are widely distributed on Douglas-fir and white fir in the watershed. They are less common on the pines, although lower elevation Jeffrey and ponderosa pine can be severely infected. Douglas-fir dwarf mistletoe in particular can cause decreased growth, stem and crown distortion, and the potential for tree mortality. Growth losses can often exceed 60% and are most significant when the upper halves of the crowns are infected or brooms exceed more than 30% of a tree crown. While growth rates may be reduced, mistletoe brooms and deformities provide valuable wildlife habitat. Many wildlife species utilize such trees for nesting, roosting and foraging, as well as using the aerial stems of plants for food.

Fire is considered one of the primary factors affecting dwarf mistletoe distribution (K. Marshall, personal communication). Many areas probably have more mistletoe-infected trees and more heavily infected individual trees now than in the past due to fire exclusion. Frequent fires probably killed many infected trees due to the flammability of large brooms and accumulations of ground fuels in heavily infected stands. Fire exclusion also has increased the density and continuity of host species, and led to an increase in multi-storied stands. Uneven-aged management and partial cutting in infected stands can in some instances promote mistletoe spread and intensification. Mistletoe, particularly in Douglas-fir, can significantly reduce the vigor, growth and potential for development of large trees. Existing large trees with the classic brooms preferred by wildlife probably were not infected early in life. They more likely developed heavy infections after they were mature. Dwarf mistletoe effects are minimized in single-storied stands, stands where infected over-stories are removed before the under-story becomes infected, and when non-host species can be favored in mixed species stands. Thinning can also increase growth rates in even moderately infected stands.

6. Root Disease

Several root diseases are also found in the watershed. The most significant are Armillaria root rot (*Armillaria ostoyae*), annosus root rot (*Heterobasidion annosum*), and laminated root rot (*Phellinus weirii*). Armillaria can occur on any conifer species, but has its greatest effects on white fir and Douglas-fir. Annosus affects true firs. Laminated root rot has its greatest effects on white fir and Douglas-fir, and to a lesser extent red fir. These root diseases cause host tree mortality, and are diseases of the site. The pathogens can survive for decades in infected roots and stumps. Trees are infected when their roots contact old infected roots or grow into the vicinity of a root rot center. The centers typically expand at the rate of 1 to 3 feet per year. Wind borne spores that colonize recent stumps or tree wounds also spread Annosus. All root diseases are favored by stands with high densities of susceptible trees, especially when they are near existing root disease centers. Armillaria is favored by host tree stress, annosus by stumps and wounded trees, and laminated by available host trees. Past management activity and fire exclusion have favored increased root disease effects. Fire exclusion has increased both the density and distribution of host species. In managed areas, stumps and wounds have increased the spread of annosus, and failure to recognize disease centers and replanting with susceptible species has increased potential disease losses. Maintaining tree vigor and favoring resistant and immune species adapted to the sites minimize root disease effects.

Phytophthora lateralis is a major root disease of Port-Orford cedar (POC). Port-Orford Cedar is distributed mainly within riparian areas primarily on National Forest Lands (see Map 18: Port-Orford Cedar Detections & Disease). The density of POC is generally low in the watershed (<5 % canopy closure) except within narrow riparian corridors.

Two factors are primarily responsible for the distribution patterns of POC: summer water availability and fire (Zobel et al. 1985). Summer water availability is related to many factors, including soil moisture, topography, geology and microclimate. The watershed receives less than 7 inches of dry season precipitation (Froelich and McNabb 1986), which are some of the drier sites on the Siskiyou National Forest. POC is limited to micro-sites that assure a consistent water supply, such as areas with moving subsurface or surface water, slumped topography with seepage, and slopes with sufficient watershed above to maintain seepage. POC is often limited to stream valleys, lower slopes or to northerly slopes where late summer water potentials are highest. Fire also has a major influence on the distribution of POC. Historic frequent fires may have eliminated POC from drier micro-sites. POC is more susceptible to fire than associated conifers in the seedling and sapling stages. This may not have allowed POC to become established where fires were frequent or more severe.

POC reproduction is apparently becoming established away from more typical wetter riparian sites. This is likely a result of longer "fire free intervals" associated with fire exclusion, and management related disturbances, such as road construction, that create locally wet micro-sites. Whether sufficient summer moisture will be available on these sites to allow these trees to continue to survive and grow is unknown.

Port-Orford cedar is ecologically significant in the watershed. It is the most shade tolerant conifer within its range and a contributor to diversity in mixed species stands. It is the primary conifer and often the largest tree species in riparian areas on ultramafic soils. It can significantly improve soil fertility by incorporating calcium into ultramafic soils. POC is a common component of many riparian areas where it provides large tree structure, shade, and superior long lasting downed wood that enhances stream structure and fish habitat.

Once introduced into a stream-course, POC root disease usually kills most of the POC downstream and within two to three crown radii of the last infected cedar. The extent of mortality appears (anecdotal) also be dependant on stream gradient and amount of water flow. Where the map displays infestation high in a stream-course, the stream reaches below are also likely infested. Mortality occurs over a period of years and is slowest where POC is scattered. POC is presently not significantly impacted by the root disease on dry micro-sites. Most of the lower elevation main drainages in the watershed are infested, particularly Elder, Little Elder, and Page Creeks. The west side of the watershed and the upper reaches, in the East Fork and Dunn Creek, are presently not infested. There is uninfested POC in Allen Gulch and Khoerry Creek. Adjacent watersheds to the west (Knopti Creek, Middle Fork of the Smith, Elk Creek, and Wood Creek) have varying levels of infestation. The Siskiyou Wilderness and tributaries to the Klamath River drainage are not currently infested. (see Map 18: Port-Orford Cedar Detections & Disease).

Infestation with root disease is highly dependent on the presence of free water in the vicinity of POC roots. High risk areas are stream courses, low-lying drainage areas down-slope from infested areas, or areas below roads and trails where inoculums may be introduced. The greatest potential for loss of POC from root disease in the East Fork watershed would be from introductions into the headwaters of either Dunn Creek or the main East Fork. The existing road systems and several trails access the headwaters through infested areas.

a. Recommendations for Port-Orford Cedar Root Disease

POC disease containment strategies have been utilized in the watershed for many years. Strategies have included: road decommissioning, seasonal road closures, road sanitization, road drainage and surface improvements, and limited operating seasons for high-risk activities. Preventing further spread of the disease should focus on limiting the movement of contaminated soil and water, and removing susceptible hosts from high-risk areas. Specific recommendations for National Forest Lands in the watershed are to:

- Restore POC distribution and abundance;
- Maintain current disease control strategies (education, sanitation, vehicle washing, etc);
- Finish the commercial sanitization on roads 4803 and 4808;
- Improve the road surface and drainage on the Sanger Peak tie road;
- Restrict wet season access on the 4808.019 spur with either a gate or a barricade; and
- Maintain or improve drainage and road surfaces to reduce POC infestation risk on open roads with POC presence.

The recommendation for BLM lands is to use the current Port-Orford management guidelines.

G. Key Question T-7: Road and Transportation Systems

T-7. What are the road network and maintenance needs for managing recreation, fire, timber sales, and habitats for species of concern?

See the roads discussion in the Aquatic Module.

H. Key Question T-8: Maintenance and Restoration Priorities

T-8. Where are the priority areas for terrestrial maintenance and restoration treatments?

This question is answered within other questions and the Synthesis Module.

I. Key Question T-9: Soil Conditions

T-9. What are the trends in erosional and other soil conditions in the watershed? What can be done to restore and maintain desired conditions?

1. Soil Types

Rock type and geologic history, along with slope, aspect, and climate, determine the soil types that develop from weathered bedrock. Table T-20, Soil Types, shows the percentage of each of the dominant soil types within the watershed. California and Oregon soils were mapped by different people at different times and, therefore, some discrepancies exist, such as truncated soil types at the state border and significant mapped acreage in Oregon (with none in California) of mixed ultramafics and metasediments/metavolcanics.

Table T-19: Soil Types

Soil Type	California (acres)	Oregon (acres)	Total acres	Percent
Alluvium	315	6,769	7,084	11%
Granitics	6,190	534	6,724	11%
Metasediments/metavolcanics	10,888	12,466	23,354	37%
Mixed metased./metavolcanics	0	7,686	7,686	12%
Ultramafics	7,488	4,341	11,829	19%
Other	453	6,758	7,211	11%
Total	25,334	38,554	63,888	100%

The following section outlines a brief description of the soil types found in this watershed and are grouped according to parent material (See Map 5: Parent Material and Soil Depth). *Geology and Mineral Resources of Josephine County, Oregon* (1979) and *Geologic Mapping of the Weed Quadrangle, California* (1987), *Geology and Mineral Resources of Josephine County, Oregon* (1979), *Soil Resource Inventory, Siskiyou National Forest*, (1979) and *Soil Survey of Josephine County, Oregon* (1983) were used to determine rock and soil types in the area.

a. Sedimentary, Metasedimentary, and Metavolcanic Derived Soils

Soils developed from sedimentary, metasedimentary, and metavolcanic rock (Applegate Group and Rogue/Galice geologic formations) in this watershed tend to share some basic properties, but show a wide range of characteristics depending on site-specific lithology and geomorphology. Soil depth can vary from 20 to 60 inches. When these soils are found in the uplands, they are typically formed from colluvium. These soils tend to have moderate amounts of surface organic matter and leaf litter. Drainage is moderate to well-drained, and permeability is moderate to rapid. Surface erosion potential is generally slight to moderate, and increases to severe in proportion to slope. Soil turbidity potential can also be variable, ranging from low to high. Rock content is extremely variable and may or may not increase with depth, ranging from 3 - 60% in surface horizons and 10 to 85% in subsurface layers. Productivity on these sites is moderate to high. In fact, Josephine and Pollard soils have the highest site index rating (a measure of productivity) in the county and constitute more than 5,000 acres in the watershed.

b. Ultramafic Soils

Ultramafic rocks, such as peridotite and serpentine, with peridotite less resistant to weathering at surface conditions than serpentine, often weather to lateritic soils (red soils high in iron and aluminum content). Peridotite soils have low productivity with sparse vegetative cover and little duff or litter to protect soils from surface erosion. These areas are often referred to as red flats or red barrens. Ultramafic areas are characterized by gentle to moderate slopes, deep red soils, rocky inclusions and outcrops, and plant species endemic to serpentine minerals. Soils vary in depth from shallow to deep (10 to 60") and have moderate to good drainage. Permeability is slow due to clayey subsoil, which may result in seasonally perched water tables. These soils have very little organic matter in surface layers or undecomposed surface litter. Of all the soil types in the watershed, ultramafic soils can have the greatest rock content throughout the soil profile, ranging from 40 to 80%.

Reflecting the chemistry of the parent materials, ultramafic soils have low levels of calcium, high magnesium, and high concentrations of toxic heavy metals such as nickel and chromium. Therefore, plant communities on ultramafic soils are limited to species that can tolerate the unusual chemical makeup of serpentine and peridotite. Soil surface layers range in texture from clay loam to extremely stony clay loam. The subsoil horizons range in texture from cobbly to extremely cobbly clay. Textures in serpentine soils are generally high in clay and coarse fragment content compared to soils developed from metamorphic parent materials. Productivity is generally low in these soils though one soil (Cornutt) is moderately productive due to greater soil depth and mixed mineralogy that is only partially serpentine. Because of high clay content and lack of vegetative cover (including protective duff and litter), serpentine soils are susceptible to surface and gully erosion. Serpentine soils have low load bearing capacity, especially when saturated, and therefore commonly lack stability and are susceptible to mass movement (debris slides, cut and fill slope failures). These soils are also quite susceptible to damage from mechanical disturbance and compaction due to the clay content and lack of organic matter (duff and litter layer) at the surface. Runoff from bare soil generally has high turbidity and high amounts of suspended sediment, which can have a direct impact on stream water quality.

c. Granitic Soils

Much of the granitic rock in the area is deeply weathered or decomposed to form deep, sandy soils with low cohesion and are subject to surface erosion. Most areas have one to three inches of partially decomposed or un-decomposed leaf litter, good to excessive drainage and moderately rapid permeability. Site productivity is moderate. Soil turbidity potential is low. Rock content in surface layers ranges from 45-60% and may increase or decrease with depth to 20-70% rock fragments. Granitic soils occur only on National Forest land in this watershed; none are mapped on BLM portions.

d. Alluvium

The alluvial soils occurring along the major river and stream corridors are among the deepest in the watershed. Several processes have combined to create the deep, sediment-filled valley, which is unique in the Klamath Mountain. These include fault movement creating temporary dams in the Illinois River, glaciation, rapid stream cutting and deposition from tectonic uplift, and severe climatic changes. Because the sediments have experienced limited transport, rock content in the soils can be high; however, the high gravel and cobble content does not appear to adversely affect drainage or create droughty conditions. Alluvial soils also can have the greatest amount of organic matter and stability (due to slight slopes), lowest erosion hazard, lowest turbidity potential and greatest productivity.

2. Data Gap

There is no survey of slides for BLM and other lands in this watershed.

3. Recommendations

• Manage roads to reduce their contribution to erosion processes such as landslides, surface erosion, stream diversion, and gully formation. Minimize or avoid new road construction on granitic or serpentine soils.

• Decommission unnecessary roads as identified through the interdisciplinary process. To minimize soil disturbance or gully formation, evaluate the appropriateness of ground disturbing restoration techniques such as scarification and ripping. Evaluation should include parameters such as slope gradient, aspect and soil type.

• Numerous recent failures are associated with older landslide forms. Map ancient and inactive erosional forms to help guide future management decisions.

• On granitic and ultramafic soils, minimize or avoid soil disturbance by using appropriate and site-specifically determined logging systems, road location and design, prescribed fire, silvicultural, and restoration techniques.

• Monitor fire effects on ultramafic soils to determine short and long term erosion hazards following burning.

J. Key Question T-10: Botanical Resources

T-10. What are the historic conditions, existing conditions and trend for botanical resources of concern in the watershed? What can be done to restore and maintain desired conditions?

1. Characterization of the Botanical Resources (Step 1)

a. Landscape overview

1) High Species Diversity

The Upper Illinois River watershed is an excellent representation of the Klamath-Siskiyou Mountains Ecoregion, long recognized for its plant diversity and very complex vegetation patterns. The complex geological processes have created a mosaic of parent materials. The presence of extensive deposits of ultramafic soils adds much to the complexity of vegetation patterns.

Another contributing factor to plant diversity for this Ecoregion is the placement between the California Floristic Province and the Pacific Northwest Province, resulting in species from these two regions at the limits of their range. Its' relative isolation from other mountain ranges and periods of aridity throughout its geologic history has left the Ecoregion harboring numerous relic species (paleoendemics). Paleoendemics are ancient species with very restricted habitats that once were more widespread. The Klamath-Siskiyou Ecoregion has the greatest concentration of species endemic to serpentine in western North America (Coleman and Kruckeberg 1999). Globally, the biodiversity of the Ecoregion has been ranked as outstanding among the world's temperate coniferous forest ecoregions (Della Sala et. al 1999).

The species diversity in this watershed is related to the diversity of the soils, and the plants adaptation to the effects of frequent fires.

2) High Concentration of Rare Plants / Rare Plant Surveys

This watershed has long been visited by both amateur and professional botanists who have contributed sightings. None the less, a majority of the Upper Illinois River watershed has not been surveyed and a complete plant inventory has not been prepared for this watershed.

Approximately 35% of BLM lands which occupy the lower elevations of the watershed have been surveyed. However this represents only 3% of the total watershed. These surveys found 89 populations of sensitive species.

Six of the rarest species have had general surveys of their potential habitat and Draft Management Guides (Conservation Plans) completed. Additional populations will be discovered with more intensive surveys.

b. Sensitive Plants

A wide variety of habitat conditions maintain the sensitive species presently occurring within the watershed. Many sensitive plant species are serpentine endemic found only on ultramafic soils. The watershed shows 18% ultramafic soils at the 2nd order scale soil surveys. Table T-21 lists species name, status, and habitat requirements for the rare plants (Federal C2 or higher, ONHP List 2, CNPS 1B or higher) documented in the watershed.

Table T-20: Habitat Requirements for Sensitive Plant Species in the Upper Illinois River Watershed, Oregon and California Lands (Federal C2 or higher, ONHP List 2, CNPS 1B or higher)

Species	Status	Habitat Requirements
Allium campanulatum Sierra onion	sensitive	Open, dry mountain slopes. Grizzly Peak and Indian Creek area. Coast Range mountains. Klamath Mountains.
Arabis macdonaldiana (inc. A. serpentinicola) McDonald's rock-cress	Endangered	On barren to shrub-covered, shallow, rocky, serpentine soils and Jeffrey pine woodlands . At 500-4,000 feet elevation. Red Mtn., Rough and Ready Creek, Josephine Creek, East Fork Illinois River.
Arabis modesta Rogue Canyon rockcress	sensitive	Rocky walls, bluffs and damp banks or slopes at 500 to 1,500 feet elevation. Known from Rogue Canyon, Taylor Creek Gorge, Rough and Ready Creek and Klamath River.
Arctostaphylos hispidula Howell's manzanita	sensitive	Dry rocky ridges and gravelly soils, often on serpentine. Shrub communities or sparse forest. Curry and Josephine Counties in Oregon and northwestern California.
Arnica viscosa Shasta arnica	sensitive	Found on high elevation subalpine to alpine, open, talus slopes. Southern Oregon Cascades and Klamath Mountains.
Aster vialis Wayside aster	sensitive	Is found in coniferous forests at elevations ranging from 500 feet to 5,100 feet. Typically occurs on relatively dry upland sites dominated by *Pseudotsuga menziesii*.
Bensoniella oregana Bensonia	sensitive	Relatively deep soils in moist meadows, and along streamsides at 3,000 to 5,000 feet. Upper slope sites and ridge saddles with northerly aspects. Siskiyou National Forest and Humbolt County, California.
Botrychium crenulatum Scalloped moonwort	sensitive	Moist grassy places on the margins of wetlands at higher elevations. In Oregon known from the Wallowa Mountains and scattered locations in a number of western states.
Calochortus greenei Greene's mariposa lily	sensitive	Open, dry, sunny slopes on heavy clay, adobe soils. Also, areas with rocky surface texture, shallow soils profile and poorly developed humus layer at elevations ranging from 2,100 to 4,550 feet.
Calochortus howellii Howell's mariposa lily	sensitive	Serpentine soils, dry rocky slopes. Low to middle elevations often on *Ceanothus* covered slopes or in open Jeffrey pine savannah. Endemic to the Illinois Valley.
Calochortus umpquaensis Umpqua mariposa lily	sensitive	Serpentine soils, dry rocky slopes. Low to middle elevations often on *Ceanothus* covered slopes or in open Jeffrey pine savannah. Endemic to the Illinois Valley.
Calochortus persistens Siskiyou mariposa lily	sensitive	Serpentine soils, dry rocky slopes. Low to middle elevations often on *Ceanothus* covered slopes or in open Jeffrey pine savannah. Endemic to the Illinois Valley.
Camassia howellii Howell's camas	sensitive	Tends to grow on serpentine in open places, in heavy but not necessarily deep soil. Dry or vernally wet meadows.
Camissonia graciliflora Slender-flowered evening primrose	sensitive	Open or shrubby slopes, generally clay soils, grasslands, oak woodlands at elevations below 2,600 feet.
Cardamine nuttallii var. *gemmata* yellow-tubered toothwort	Species of Concern sensitive	Gravelly serpentine soils on ridges, Jeffrey pine forests, near *Darlingtonia* bogs. Grows on disturbed sites, in sunny and shaded areas. Siskiyou Mtns. of Josephine and Curry Cos.
Carex gigas Siskiyou sedge	sensitive	Serpentine endemic. Vernally or perennially wet serpentine above 5,000 feet . Generally grows in open, sunny sites with little cover. Habitat often appears dry by flowering time.
Carex interior Inland sedge	sensitive	Serpentine endemic. Vernally or perennially wet serpentine above 5,000 feet . Generally grows in open, sunny sites with little cover. Habitat often appears dry by flowering time.
Carex livida Pale sedge	sensitive	Serpentine endemic. Vernally or perennially wet serpentine bogs at elevations ranging from 1,300 to 1,800 feet . Generally grows in open, sunny sites with little cover. Some of these wetlands dry out by mid summer.

Table T-20: Habitat Requirements for Sensitive Plant Species in the Upper Illinois River Watershed, Oregon and California Lands (Federal C2 or higher, ONHP List 2, CNPS 1B or higher)

Species	Status	Habitat Requirements
Carex serratodens Saw-toothed sedge	sensitive	Calcareous seep in Douglas-fir forest. Josephine, Jackson, and Douglas Cos.
Castilleja schzotricha Split-hair Indian paintbrush	sensitive	On decomposed granite or marble at elevations ranging from 5,000 to 6,000 feet on north aspects, red fir forests. In Oregon along the Siskiyou crest at Red Mtn., Dutchman Peak, Observation Peak, and Lake Peak. In California, located in Klamath Mtns. and the Red Buttes Wilderness.
Chaenactis suffrutescens Shasta chaenactis	sensitive	Dry, open areas at elevations ranging from 2,400 to 6,500 feet. Klamath Range.
Chlorogalum angustifolium Narrow-leaved amole	sensitive	Open, dry places, heavy soil in grasslands and woodlands at elevations below 1,500 feet. California inner coast ranges. In Oregon known from an area between Gold Hill and Central Point.
Cimicifuga elata Tall bugbane	sensitive	In moist shady woods at elevations ranging from 4,300 to 5,400 feet. Moderate slopes and north to northeast facing. The forest canopy is 75%. *Abies concolor* is the dominant species with a sparse shrub layer of *Ribes* spp., *Rosa* sp., and *Rubus parviflorus*.
Clarkia heterandra Small-fruit clarkia	sensitive	Shady sites, woodland, ponderosa pine stands at elevations ranging from 1,500 to 5,500 feet.
Cupressus bakeri Baker's cypress	sensitive	Mixed-evergreen forests, dry, brushy or open slopes, flats, usually rocky ground, often on serpentine soils at elevations ranging from 3,800 to 6,000 feet. Klamath Range and Siskiyou Mtns. Nearest sites to forest Steve Peak and Miller Lake.
Cypripedium fasciculatum Clustered lady's slipper	sensitive	Open coniferous forest, sometimes with Pacific dogwood on north facing slopes at elevations ranging from 1,000 to 6,000 feet. Elder Creek, Grayback Creek, Illinois River, Allen Gulch.
Cypripedium montanum Mountain lady's slipper	sensitive	Moist areas, dry slopes. Mixed-evergreen, coniferous forest at elevations ranging from 300 to 7,000 feet. Waldo Mountain road, Elder Creek.
Delphinium nudicaule Red larkspur	sensitive	Moist talus, wooded rocky slopes at elevations below 7,800 feet. Elder Creek.
Dicentra pausiflora Few-flowered bleeding heart	sensitive	Rocky places at higher elevations. Youngs Peak.
Draba carnosula Mt. Eddy draba	sensitive	On rock facing, rocky serpentine outcrops at higher elevations.
Draba howellii Howell's whitlow-grass	sensitive	North-facing rock crevices, above 4,000 ft. In Oregon known from southern Josephine Co. and one site in Curry Co.
Epilobium oreganum Oregon willow-herb	Species of Concern sensitive	Wet, gently sloping stream banks, meadows, & bogs, generally on ultramafic soil. 1,500-7800 feet elev. Klamath Ranges of CA & OR.
Epilobium siskiyouensis Siskiyou willow-herb	sensitive	North facing rock crevices and slopes on serpentine soils at elevations ranging from 5,500 to 8,200 feet
Erigeron cervinus Siskiyou daisy	sensitive	Rocky places or crevices in solid rock. Streambanks; seeps/vernally wet sites. Meadows, pine and fir woods
Erigeron petrophilus Cliff daisy	sensitive	Rocky places or crevices in solid rock. Streambanks; seeps/vernally wet sites. Meadows, pine and fir woods
Eriogonum hirtellum Klamath Mtn. buckwheat	sensitive	Talus slopes and dry serpentine soils in open areas amidst Jeffrey pine - incense cedar and Brewers spruce - red fir forests at 2,000 to 5,500 feet elevation in Del Norte and Siskiyou Counties, Klamath Mtns.
Eriogonum lobbii Lobb's buckwheat	sensitive	Gravelly ridges and talus slopes at moderate to high elevations. Not generally found on serpentine soils. Klamath Mtns.
Erythronium hendersonii Henderson's fawn lily	sensitive	Dry woodlands, meadows, open fields at elevations ranging from 900 to 5,280 feet. Klamath Range.
Erythronium howellii Howell's fawn lily	sensitive	In open woods, often on serpentine soils or in ecotonal areas. South end of Illinois Valley, Josephine Co., OR south to Trinity Mtns., CA.
Eschcholzia caespitosa Slender California poppy	sensitive	Dry flats and brushy slopes below 3,500 feet elevation.
Festuca elmeri	sensitive	Generally in transition areas between oak woodland/grassland and Douglas-fir at elevations ranging

Table T-20: Habitat Requirements for Sensitive Plant Species in the Upper Illinois River Watershed, Oregon and California Lands (Federal C2 or higher, ONHP List 2, CNPS 1B or higher)

Species	Status	Habitat Requirements
Elmer's fescue		from 2,350 to 4,350 feet.
Frasera umpquaensis Umpqua frasera	sensitive	Open woods or at edges of meadows. In mid to upper elevation true fir dominated forests or mixed conifer forests at 4,000 to 6,000 feet elevation, generally in partial shade or openings.
Fritillaria glauca Siskiyou fritillaria	sensitive	Gravelly serpentine slopes and ridges. Southern Douglas Co. south through the Siskiyou Mtns. of Josephine and Curry Cos. in OR.
Fritillaria purdyi Purdy's fritillaria	sensitive	Gravelly serpentine slopes and ridges. Inner north coast range of California and Josephine County, OR.
Gentiana newberryi var. *newberryi* Newberry's gentian	sensitive	Subalpine wet meadows between 3,500 to 6,500 feet elevation. Sanger Peak area and Red Buttes wilderness.
Gentiana plurisetosa Klamath gentian	sensitive	Wet mountain meadows between 3,900 to 6,200 feet elevation. Josephine Co. in Oregon to Del Norte, Siskiyou and Trinity Cos. in CA.
Gentiana setigera Waldo or Mendocino gentian	Species of Concern sensitive	Serpentine wet meadows and bogs, seeps on slopes at low elevations. Del Norte Co., CA. Siskiyou Mtns. OR.
Hastingsia atropurpurea Purple-flowered rush-lily	Species of Concern sensitive	Wet meadows, rocky seeps, serpentine *Darlingtonia* bogs at lower elevations, often in open areas on gentle slopes. Limited range in Josephine Co.
Hastingsia bracteosa large-flowered rush-lily	Species of Concern sensitive	Wet meadows, rocky seeps, serpentine *Darlingtonia* bogs at lower elevations, often in open areas on gentle slopes. Limited range in Josephine Co.
Hazardia whitneyi ssp. *discoidea* Whitney's haplopappus	sensitive	Dry brushy slopes on serpentine soils at any elevation. Klamath Mtns. in Coos, Curry and Josephine Cos.
Horkelia hendersonii Henderson's horkelia	sensitive	Grows on gravelly alpine scree on slopes and summit ridges principally from 6,000 to 7,500 feet elevation. The high elevation granitic-type rock substrate is limited in distribution.
Iliamna bakeri Baker's globe-mallow	sensitive	Mountain slopes at elevations ranging from 3,300 to 7,500 feet.
Iliamna latibracteata California globe-mallow	sensitive	Moist sites, streamsides in coniferous forests. Often on shady, disturbed ground at elevations ranging from 600 to 7,500 feet. Page Mountain. Douglas County Oregon to Humbolt County California.
Lewisia cotyledon var. *heckneri* Heckner's lewisia	Species of Concern sensitive	Granitic or serpentine rock outcrops, full sun or partial shade at 2,000-4,000 feet elevation. Kalmiopsis Wilderness and vicinity in Curry & Josephine Cos.
Lewisia cotyledon var. *purdyi* Purdy's lewisia	Species of Concern sensitive	Granitic or seprpentine rock outcrops, full sun or partial shade at 2,000-4,000 feet elevation. Kalmiopsis Wilderness and vicinity in Curry & Josephine Cos.
Lewisia oppositifolia Opposite-leaved lewisia	sensitive	Rocky, gravelly, moist areas on serpentine soils. Siskiyou Mtns. of southern Josephine & Douglas Cos. OR. Klamath Mtn. Ranges in California.
Lewisia leana Lee's lewisia	sensitive	Rock outcrops often on serpentine soils. Siskiyou Mtns. of southern Josephine & Douglas Cos. OR.
Lilium kelloggii Kellogg's lily	sensitive	Dry woods, gaps and roadsides in coniferous forests, redwood forests or brush fields below 3,500 feet elevation. Collier Tunnel. Del Norte and Humbolt Cos. in CA. and Curry Co. OR.
Limnanthes gracilis var. *gracilis* slender meadow-foam	Species of Concern sensitive	Sunny vernally wet meadows and stream edges, in valleys and low foothills, including serpentine soils, below 2,500 feet. Illinois Valley, Rogue River Valley of Josephine and Jackson Cos.
Lomatium cookii Agate desert-parsley	sensitive	Gravelly, serpentine slopes in coniferous forests and open areas at 3,000-6,000 feet elev. Siskiyou Mtns. and adjacent CA.
Lomatium engelmannii Englemann's desert-parsley	sensitive	Gravelly, serpentine slopes in coniferous forests and open areas at 3,000-6,000 feet elev. Siskiyou Mtns. and adjacent CA.
Lomatium tracyi Tracy's desert-parsley	sensitive	Open pine forests on serpentine at 1,500-4,500 feet elev. Siskiyou Mtns.
Lotus stipularis Stipuled trefoil	sensitive	Open pine forests, stream beds, ditches at elevations ranging from 600 to 4,000 feet. Klamath Range.
Lupinus tracyi Tracy's lupine	sensitive	Dry openings, edges of forest, or in open woods on granitic soils at moderate to high elevations. Often with the ground cover *Arctostaphylos nevadensis*.

Table T-20: Habitat Requirements for Sensitive Plant Species in the Upper Illinois River Watershed, Oregon and California Lands (Federal C2 or higher, ONHP List 2, CNPS 1B or higher)

Species	Status	Habitat Requirements
Meconella oregana White meconella	sensitive	Open ground and prairies on sandy, gravelly or serpentinized soil, often vernally moist. Some northern Oregon sites are adjacent to vernal seeps or slopes.
Microseris howellii Howell's microseri	Species of Concern sensitive	Found on slopes or flat ground with varying exposures, in rocky serpentine soils from 1,000- 3,500 feet elevation. Siskiyou Mtns.
Mimulus tricolor Three-colored mimulus	sensitive	Vernally moist depressions and clay soils at elevations below 2,000 feet. Historical sighting near Waldo by Al Hobart.
Mimulus jepsonii Jepson's monkeyflower	sensitive	Pine forest openings, generally granitic soils at elevations ranging from 3,600 to 7,200 feet. Layman Gulch and French Peak.
Monardella purpurea Siskiyou monardella	sensitive	Rocky, open slopes on ultramafic soils at 1,400-4,000 feet elev. Chaparral, woodland, montane forest. Curry and Josephine Cos.
Montia howellii Howell's montia	sensitive	Vernally wet sites, meadows at less than 1,200 feet elev.
Pellaea mucronata ssp. *mucronata* Bird's foot fern	sensitive	Rocky or dry areas at elevations ranging from 60 to 7,300 feet.
Perideridia erythrorhiza red-root yampah	Species of Concern sensitive	Vernally moist depressions in heavy poorly drained soils, below 5,000 feet elev. Josephine County sites on serpentine soils. Often grows in association with *P. oregana*.
Phacelia greenei Greene's phacelia	sensitive	Serpentine soils in coniferous forest at elevations ranging from 2,400 to 5,00 feet. Klamath Range.
Phacelia leonis Leo's phacelia	sensitive	Sandy flats, slopes, coniferous forest at elevations ranging from 3,600 to 6,600 feet. Klamath Range.
Pilularia americana American pillwort	sensitive	Vernal pools, mud flats,, lake margins, reservoirs. At less than 4,500 feet elevation.
Pinguicula vulgaris ssp. *macroseras* Horned buttewort	sensitive	Perennially wet seeps and bogs. Almost always in serpentine bogs in Oregon. Josephine and Curry Cos. in OR. Del Norte and Siskiyou Cos. in CA.
Plagiobotrys figuratus ssp. corallicarpus Coral seeded allocarpa	sensitive	Vernally moist, rocky, open areas in grassland meadows.
Plagiobotrys glyptocarpus Scultured allocarpa	sensitive	Moist places, grasslands, woodlands at elevation below 2,000 feet.
Polystichum californicum California shield-fern	sensitive	Woods, streambanks and canyons, to rocky open slopes in mixed evergreen forests. At elevations below 2,500 feet.
Raillardella pringlei Showy raillardella	sensitive	Bogs, fens, meadows (mesic), and streambanks at elevations ranging from 3,600 to 6,800 feet. Klamath Range. Trinity Alps, Scott Mountains.
Sanicula tracyi Tracy's sanicle	sensitive	Openings in coniferous forest, woodland at elevations ranging from 300 to 3,000 feet. Humboldt, Trinity and Del Norte Cos. in CA.
Salix delnortensis Del Norte willow	sensitive	Streambeds, streambanks, and gullies on serpentine soils. Habitat may be dry in summer. Low elevation up to 1,500 feet.
Saxifragopsis fragarioides Joint-leaved saxifrage	sensitive	Rock crevices at elevations ranging from 4,500 to 9,900 feet. Klamath Range.
Scirpus pendulus Drooping bullrush	sensitive	Marshes, wet meadows, and ditches at elevations ranging from 2,400 to 3,500 feet.
Scirpus subterminalis Water bullrush	sensitive	In quiet, relatively shallow water. Lakes, ponds, marshes. Del Nortem Humboldt and Plumas Cos. in CA. Whiskey Lake.
Sedum laxum ssp. *heckneri* Heckner's stonecrop	sensitive	Dry rocky places. Metasedimentary outcropings or serpentine soils at elevations ranging from 300 to 5,500 feet.
Sedum moranii Glandular stonecrop	sensitive	Dry rocky places. Metasedimentary outcropings or serpentine soils at elevations ranging from 300 to 5,500 feet.
Senecio hesperius Siskiyou butterweed	Species of Concern sensitive	Endemic to the Illinois Valley, found on serpentine soils at lower elevations, on gentle to moderate slopes. Generally in open Jeffrey pine savannah.
Sidalcea malvaeflora	sensitive	Open meadows or grassy places, at elevations below 2,500 feet. Coast Ranges. Del Norte and

Table T-20: Habitat Requirements for Sensitive Plant Species in the Upper Illinois River Watershed, Oregon and California Lands (Federal C2 or higher, ONHP List 2, CNPS 1B or higher)

Species	Status	Habitat Requirements
ssp. patula Siskiyou checkerbloom		Humboldt Cos.and sw Oregon.
Silene hookeri ssp. bolanderi Bolander's catchfly	sensitive	Rocky knolls and slopes, often on serpentine soils at elevations below 5,000 feet. Josephine Co. OR and northwestern CA.
Smilax jamesiii English Peak greenbriar	sensitive	Lakesides, streambanks, alder thickets in montane coniferous forests at elevations ranging from 3,000 tp 7,500 feet.
Streptanthus howellii Howell's streptanthus	sensitive	Dry, rocky, serpentine slopes in open conifer/hardwood forest from 1,000 4,500 feet elevation. Del Norte Co., CA. Siskiyou Mountains, in OR.
Tauschiai howellii Howell's tauschia	sensitive	Dry, exposed ridges in granitic gravel and serpentine flats in coniferous forests. At high elevation ranging from 6,600 to 7,100 feet. Siskiyou Mtns.
Thermopsis robusta Robust false lupine	sensitive	Open places below 4,500 feet. Mixed evergreen forests, foothill woodland. Del Norte County.
Thlaspi californicum Kneeland pennycress		Serpentine outcrops at elevations ranging from 1,500 to 2,200 feet.
Triteleia laxa Ithuriel's spear	sensitive	Sunny places at low elevations. Open forests, woodlands, and grasslands on clay soils. Southern Curry and Jackson Cos. in Oregon.
Viola primulifolia ssp. *occidentalis* western bog violet	Species of Concern sensitive	*Darlingtonia* bogs on serpentine soils at lower elevations. Del Norte Co., CA. Curry and Josephine Cos., OR.
Wolfia borealis Dotted water-meal	sensitive	Fresh water at elevations below 3,400 feet.
Woldia columbiana Columbia water-meal	sensitive	Free floating in quiet water at elevations below 700 feet.

c. Survey and Manage Species

Table T-21: Survey and Manage Vascular Plants, Lichens, Fungi and Bryophytes Known or Suspected to Occur in the Watershed.

Species and Status	Habitat
Vascular Plants	
Allotropa virgata Sugar stick	Old-growth forest; dry well drained soils. Appears substrate specific to decaying fir. Elevation 250 to 10,000 feet. Elder Creek, Layman Creek, Allen Gulch
Eucephalus vialis Wayside aster	Coniferous forest at elevations ranging from 500 to 3150 feet. Occurs on dry upland sites dominated by *Pseudotsuga menziesii*, in canopy gaps and forest edges. Kingfish T.S. unit 5.
Cypripedium fasciculatum Clustered lady's slipper	Old-growth forest; dry or damp, rocky to loamy sites; 60-100% shade. Elevation 1,300 to 7,300 feet. Elder Creek, Allen Gulch
Cypripedium montanum Mountain lady's slipper	Old-growth forest; found on moist sites but may occur on dry sites in other parts of its range. Elevation 650 to 7,000 feet. Elder Creek.
Pedicularis howellii Howell's lousewort	Dry ridges, open-red fir forests, at elevations ranging from 4,500 to 6,500 feet. Bearcamp Ridge.
Bryophytes	
Buxbaumia viridis green bug moss Protection Buffer	Occurs on rotten wood and on mineral or organic soil, in cool, shaded locations. Floodplains and stream terraces. Elevation 3,500 to 5,000 feet.
Kurzia makinoana Liverwort Survey and Manage	Especially moist low elevation stream terraces. In our forest 60 miles inland. Elevation 300 to 1,200 feet.
Ptilidium californicum Pacific fuzzwort Survey and Manage	Grows on conifer bark and logs, requiring cool, moist conditions. Has been found on Brewer spruce and Chinquapin in our forest at elevations ranging from 3,000 to 6,000 feet.
Moss	

Table T-21: Survey and Manage Vascular Plants, Lichens, Fungi and Bryophytes Known or Suspected to Occur in the Watershed.

Species and Status	Habitat
Rhizomnium nudum Protection Buffer	On moist but not wet organic soils, sometimes among rocks or rotten logs, sometimes along streams, mostly in middle to high elevation forests.
Tetraphis geniculata Protection Buffer	Occurs on rotten wood, prefers the cut end of old-growth logs, in cool, humid, shaded locations at low to middle elevations. A closed canopy provides the best micro climate.
Ulota megalospora Protection Buffer	Grows on twigs and branches at low to middle elevations, 150 to 200 feet in the canopy, occurs most frequently on *Alnus rubra*.
Lichens	
Bryoria tortuosa Survey and Manage	Mostly on trees and shrubs but a few species occur on rock, soil and under water.
Fungi	
Aleuria rhenana Protection Buffer	Accumulated duff and humus in low to mid elevation mixed conifer or conifer-hardwood forests.
Bridgeoporus nobilissimus Noble polypore S & M and ext. survey	Pacific silver fir zone including *Abies amabilis, A. procera,* and possible *Pseudotsuga menziesii.*
Bondarzewia montana Survey and Manage	Late-Successional conifer forests, often associated with stumps or snags.
Otidea leporina Protection Buffer	Conifer duff
Otidea onotica Protection Buffer	Conifer duff. Occurring in Josephine county.
Otidea smithii Protection Buffer	Conifer duff.
Sarcosoma mexicana Protection Buffer	Dead conifer litter.

d. Noxious Weeds and Exotic Plants

Complete field surveys for noxious and exotic plants have not been conducted in the watershed but those past surveys that have been completed have shown several species of noxious weeds and common exotics presen. Table T-22 lists those that have been found.

Table T-22: Noxious Weeds

Species	Habitat
Bromus tectorum	cheat grass Disturbed areas.
Centaurea sp. Knapweed	Disturbed areas, meadows, roadsides.
Centaurea solstitialis yellow star-thistle	Disturbed areas, alongside roads, river corridor.
Circium vulgare bull thistle	Every road, landing seems to have at least one plant.
Cystisus scoparious Scotch broom	Old homesteads, mining areas, along roadsides, some campgrounds.
Elytrigia intermedia intermediate wheat grass	Introduced grass for revegetation purpose.
Holcus lanatum velvet grass	Introduced grass for feed and revegetation purpose.
Isatis tinctoria	Happy Camp Road. Disturbed areas. Spread by contaminated maintenance equipment.

Dyer's woooad	
Lathyrus latifolius everlasting peavine	Has invaded seeps, springs, meadows, and streams around culverts.
Hypericum perforatum Klamath weed	Along roads, landings, meadows, skid trails and plantations.
Rubus discolor Himalayan blackberry	Patches along roadsides, disturbed areas, homesteads, seeds carried by birds.
Taraxacum officinale dandelion	Meadows, a few scattered plants.
Trifolium repens white clover	Introduced wildlife species to improve habitat.
Verbascum thapsus mullein	Introduced with cattle feed, spread to plantations. Has become an important wildlife food source.

e. Watch and Review Species (ONHP list 3 & 4 and CNPS list 3 & 4)

Table T-23: Watch and Review Species	
O.N.H.P. List 3	
Adiantum jordanii	California maiden-hair
Ammania robusta	Ammannia
Asarum caudatum	White-flowered wild-ginger
Aster brickellioides	Brickellbush; rayless leafy aster
Astragalus gambelianus	Blackish milk-vetch
Brodiaea californica	California brodiaea
Callitriche marginata	Winged water starwort
Cardamine nuttallii var. *dissecta*	Dissected toothwort
Cardamine nuttallii var. *covilleana*	Coville's toothwort
Carex barbarae	Santa Barbara sedge
Carex serpentinicola	Serpentine sedge
Epilobium luteum	Yellow willow-herb
Helianthus bolanderi	Bolander's sunflower
Hieracium greenei	Greene's hawkweed
Juncus kelloggii	Kellogg's rush
Leucothoe davisii	Sierra laurel
Linanthus bakeri	Baker's linanthus
Mertensia bella	Oregon bluebells
Navarretia leucocephala	White-flowered navarretia
Navarretia tagetina	Marigold navarretia
Poa rhizomata	Timber bluegrass
Ribes divaricatum var. *pubiflorum*	Straggly gooseberry
Silene californica	California pink
Silene lemmonii	Lemmon's campion
Streptanthus glandulosus	Common jewel flower
Triteleia ixioides ssp. *scabra*	Foothill pretty face
O.N.H.P. LIST 4	
Arabis aculeolata	Waldo rock-cress
Arabis koehleri var. *stipitata*	Koehler's rock-cress
Balsamorhiza sericea	Silky balsamroot
Cardamine nuttallii var. *gemmata*	Purple toothwort
Cypripedium californicum	California ladyslipper
Cypripedium montanum	Mountain ladyslipper
Darlingtonia californica	California pitcher plant
Dicentra formosa ssp. *oregana*	Oregon bleeding heart
Dichelostemma ida-maia	Firecracker brodiaea
Eriogonum pendulum	Long-stalked eriogonum
Euonymus occidentalis	Western wahoo
Hieracium bolanderi	Bolander's hawkweed

Kalmiopsis leachiana	Kalmiopsis
Lewisia oppositifolia	Opposite-leaved lewisia
Mimulus douglasii	Douglas's monkeyflower
Mimulus kelloggii	Kellogg's monkeyflower
Minuartia californica	California sandwort
Montia diffusa	Branching montia
Phacelia verna	Spring phacelia
Poa piperi	Piper's bluegrass
Polystichum lemmoni	Lemmon's sword fern
Sanicula peckiana	Peck's snakeroot
Scribneria bolanderi	Scribner's grass
Sedum spathulifolium ssp. *purdyi*	Purdy's stonecrop
Smilax californica	California smilax
Thlaspi montanum var. *siskiyouense*	Siskiyou Mountain pennycress
Triteleia crocea var. *crocea*	Yellow brodiaea
Vancouveria chrysantha	Yellow vancouveria

Table T-24: Rare Plants Lists for Illinois Valley Ranger District -
California Lands (6/99)
Based on: Region 5 Sensitive Species List - Revised 1998. U.S. Forest Service, 1998.
Inventory of Rare and Endangered Plants of California. California Native Plant Soc. 1994.

Scientific Name	**Common Name**
CNPS LIST 2	
Arabis aculeolata	Waldo rock-cress
Asarum marmoratum	marbled wild-ginger
Asplenium trichomanes ssp. *trichomanes*	Maidenhair spleenwort
Boschniakia hookeri	Small groundcone
Carex leptalea	Flaccid sedge
Carex practicola	Meadow sedge
Castilleja miniata ssp. *elata*	Siskiyou indian paintbrush
Erigeron bloomeri var. *nudatus*	Waldo daisy
Eriogonum nudum var. *paralinum*	Del Norte buckwheat
Horkelia congesta ssp. *nemorosa*	Josephine horkelia
Lomatium martindalei	Coast Range lomatium
Monotropa uniflora	Indian pipe
Rubus nivalis	Snow dwarf bramble
Scirpus subterminalis	
CNPS LIST 3	
Galium oreganum	Oregon bedstraw
Selaginella densa var. *scopulorum*	Rocky Mountain spike-moss
CNPS LIST 4	
Allium siskiyouense	Siskiyou onion
Antennaria suffrutescens	Evergreen everlasting
Arctostaphylos hispidula	Howell's manzanita
Arctostaphylos nortensis	Del Norte manzanita
Arnica cernua	Serpentine arnica
Arnica spathulata	Klamath arnica
Calamagrostis foliosa	Leafy reed grass
Carex gigas	Siskiyou sedge
Castilleja hispida ssp. *brevilobata*	Short-lobed Indian paintbrush
Collomia tracyi	Tracy's collomia
Cupressus nootkaensis	Alaska cedar

Cypripedium californicum	California ladyslipper
Darlingtonia californica	California pitcher plant
Dicentra formosa ssp. *oregana*	Oregon bleeding heart
Epilobium rigidum	Siskiyou Mtns. willowherb
Erigeron cervinus	Siskiyou daisy
Eriogonum ternatum	Ternate buckwheat
Erythronium citrinum var. *citrinum*	Lemon-colored fawn lily
Erythronium howellii	Howell's fawn lily
Gentiana plurisetosa	Klamath gentian
Horkelia sericata	Howell's horkelia
Iliamna latibracteata	California globe mallow
Iris bracteata	Siskiyou iris
Iris innominata	Del Norte County iris
Lathyrus delnorticus	Del Norte pea
Lilium bolanderi	Bolander's lily
Lilium kelloggii	Kellogg's lily
Lilium pardalinum ssp. *vollmeri*	Vollmer's lily
Lilium pardalinum ssp. *wigginsii*	Wiggin's lily
Lilium rubescens	Redwood lily
Lilium washingtonianum ssp. *purpurascens*	Purple-flowered Washington lily
Listera cordata	Heart-leaved twayblade
Lomatium howellii	Howell's lomatium
Lupinus lapidicola	Mt. Eddy lupine
Lupinus tracyi	Tracy's lupine
Lycopus uniflorus	Northern bugleweed
Melica spectabilis	Purple onion grass
Minuartia howellii	Howell's sandwort
Perideridia gairdneri ssp. *gairdneri*	Gairdner's yampah
Piperia candida	White-flowered rein orchid
Pityopus californicum	California pinefoot
Pleuropogon refractus	Nodding semaphore grass
Poa piperi	Piper's bluegrass
Poa rhizomata	Timber blue grass
Pyrrocoma racemosa var. *congesta*	Del Norte pyrrocoma
Salix delnortensis	Del Norte willow
Sanicula peckiana	Peck's snakeroot
Saxifraga howellii	Howell's saxifrage
Sedum laxum ssp flavidum	Pale yellow stonecrop
Sedum laxum ssp. *hecknerii*	Heckner's stonecrop
Senecio macounii	Siskiyou Mtns. ragwort
Tauschia glauca	Glaucous tauschia
Thermopsis gracilis	Slender false lupine
Trifolium howellii	Howell's clover
Triteleia crocea var. *crocea*	Yellow triteleia
Vancouveria chrysantha	Yellow vancouveria
Veratrum insolitum	Siskiyou false-hellebore

f. Unique Plants Communities and Key Indicator Species

1) Ultramafic

The Soil Survey map of the East Fork Illinois watershed shows large areas of ultramafic soils. The watershed has two types of key habitats in this soil type: wet and dry serpentine that may be suitable habitats for several species on the sensitive plants list as well as species endemic to the watershed. The key indicator species for serpentine savannah are: Waldo, Rogue Canyon and McDonald's rock-cress, purple toothwort, Bloomer's daisy, Engelmann's desert-parsley, rigid willow-herb, Siskiyou fritillaria, Howell's camas, Howell's fawn-lily, Howell's microseris, Howell's mariposa lily, Howell's streptanthus, Peck's snake root, Purdy's lewisia, Siskiyou butterweed, Siskiyou monardella, Howell's mariposa lily, Umpqua mariposa lily, yellow-tubered toothwort, and Bolander's hawkweed.

The key indicator species for serpentine wetlands are: Oregon willow herb, Waldo gentian, *Darlingtonia californica*, Del Norte willow, large-flowered rush lily, Inland sedge, Pale sedge, Siskiyou sedge, and western bog violet. Ephemerally wet serpentine soils can also harbor such species as opposite leaved lewisia and slender meadow foam. These species all inhabit ultramafic sites, which have soil mineral imbalances that prevent dense sites from growing; therefore the plants are found in forest openings or even barrens.

Both wet and dry serpentine areas are sometimes incidentally disturbed or destroyed by road building, skid trails, mining, recreational vehicles or side effects from these activities. Although portions of the project area has been impacted by past activities, most of the suitable ultramafic habitat for serpentine endemic plants is intact or, if disturbed, is still within the tolerance limits of the species of concern.

2) Riparian Habitats

Riparian habitats throughout the watershed may be suitable habitat for Bensonia, slender paintbrush, California greenbriar, California lady's slipper, California globe mallow, clustered lady's slipper, Del Norte willow, Oregon willow-herb, slender meadow-foam, scalloped moonwort, Cook's desert-parsley, Siskiyou daisy, and western bog violet. Perennial riparian habitat is abundant in the watershed in the form of rivers, streams, spring-fed seeps, meadows, and valley bottom grasslands. Riparian habitats have also been disturbed through mining, skid trails, and recreational vehicle use.

3) Rock Outcrops

Dry serpentine/non-serpentine rock outcrops are common throughout the watershed and appear to be suitable habitat for few-flowered bleeding heart, Howell's whitlow-grass, McDonald's rock-cress, Howell's manzanita, Howell's mariposa lily, Englemann's dessert-parsley, Howell's microseris, Siskiyou monardella, Howell's streptanthus, and Heckner's stonecrop.

Moist rock outcrops are suitable habitat for opposite-leaved lewisia, Siskiyou daisy, joint-leaved saxifrage, and Lee's lewisia. Some rock outcrops have been affected by road building, mining, and other past disturbances. A few may have been used as rock sources for road material.

4) Forested Habitats: Old-Growth and Mature Forest

The watershed has areas that have been logged in the past. The area has changed from its historic state and includes the effects from timber harvesting, mining and fire suppression. Most of the impacts are related to mining, timber harvesting, recreation and road building for timber harvesting and mining purposes. Purple toothwort, clustered lady's slipper, Mountain lady's slipper, Howell's manzanita, Tracy's lupine, and wayside aster prefer forested habitat. This habitat type although not pristine is still well distributed and plentiful throughout the watershed.

g. Recognition of Outstanding Resource Value

Research by master and PhD candidates
Published papers
High number of visitors viewing botanical resources, local and regional media articles on significance of area.
The recently published Conservation Plan for the Klamath-Siskiyou Ecoregion culminates a large effort to bring the Ecoregion to the forefront of national conservation efforts.

h. Special Land Allocations: Botanical and Research Natural Areas

Approximately 1,962 acres of BLM administered lands are designated in the RMP as a part of the Illinois Valley Botanical Emphasis Area. This designation recognizes the exceptionally high representation of sensitive plants. The RMP states that actions including timber harvest will be allowed if they do not conflict with the habitat needs of these species. As stated above, the habitat quality of many sensitive species in the watershed is unknown.

The 656 acre French Flat Area of Critical Environmental Concern (ACEC) is located on BLM land. The area encompasses the best remaining examples of the full array of valley bottom plant communities. These communities include tufted hairgrass-California oat grass wet meadow, ponderosa pine-white oak/wedgeleaf savanna, ponderosa pine-black oak-madrone woodland, Jeffrey pine-manzanita-bunchgrass savanna and low elevation mixed conifer forest. The site supports one federal candidate species, Cook's desert parsley, and several sensitive species including Howell's microseris, Howell's mariposa lily, Siskiyou butterweed, slender meadowfoam, Howell's fawn lily, and opposite leaved lewisia. Currently, the main management issue for French Flat ACEC is indiscriminate recreational vehicle activity in the area. The BLM officially closed the road into French Flat through the Federal Register in 1992. Gating and fencing has since been installed, however four wheel vehicles continue to breach the closures leaving portions of the ACEC heavily damaged.

Approximately 400 acres on BLM administered and 25 acres of National Forest lands have been identified as having the potential for Research Natural Area (RNA) recognition. This area is in the vicinity of Allen Gulch and extends west towards the Waldo Hill lookout. This RNA encompasses both unique forested and serpentine habitats. The forested portion consists primarily of the Late-Successional tanoak-Douglas-fir-canyon live oak/poison oak plant community. It is characterized by large diameter tanoak, although is not the only form of tanoak present. Sensitive species as clustered lady's slipper, mountain lady's slipper, and Howell's fawn lily occur in forested portions. Also the

Survey and Manage, candystick, occur in numerous populations there.

The serpentine portion of the potential RNA combines wet and dry serpentine habitats. The wet serpentine area has not been adequately described to plant association level. It encompasses a unique combination of shrub and herbaceous species not found in other portions of the watershed. Current issues in this area include mining and potential thinning activities.

i. Important Processes

Geology - important consideration with, weed eradication, road revegetation, road maintenance, road decommissioning, and development.

Fire - needed for habitat improvement and to decrease overcrowding by more aggressive species and duff accumulation.

Rare pollinators - Data Gap, very little information known. Study on pollinators is underway at several sites in the forest.

Water table - Data Gap, ideal level of water table needed for optimum habitat quality on Darlingtonia fens is unknown.

Habitat requirements - Data Gap, detailed habitat requirements for many rare or sensitive plant species are unknown.

j. Species Management Guides/Conservation Plans (drafts only)

Table T-25 lists the 6 species with completed Forest Service draft Species Management Plans. Finalization is needed for all listed species. Species Management Guides provide biological information and management recommendations. The biological information commonly includes plant description, taxonomy, distinguishing characteristics, range and distribution (with maps), population biology, habitat description, and threats (natural and human related). The management section often gives status review, population objectives, monitoring needs, recommendations for maintaining species viability, sometimes designating "selected" populations.

Table T-25: Species Management Guides/Conservation Plans		
Species	**Author(s)/Organization**	**Year Written**
Arabis macdonaldiana MaDonald's rock-cress	A recovery plan for the California populations was developed. Contracted: John W. Willoughby.	1984
Cardamine nuttallii var. gemmata Purple toothwort	Peter Zika, Oregon Natural Heritage Program	1994
Epilobium oreganum Oregon willow-herb	James Kagan, Oregon Natural Heritage Program	1994
Lomatium cookii Cook's desert parsley	Jamas Kagan, Oregon Natural Heritage Program	1994
Microseris howellii Howell's microseris	James Kagan, Oregon Natural Heritage Program	1988
Monardella purpurea Siskiyou monardella	James Kagan, Oregon Natural Heritage Program	1994
Pedicularis howellii Howell's lousewort	Barbara Williams, Klamath National Forest	1999

A conservation Agreement for serpentine fen species is currently being reviewed by both the Forest Service and BLM. The Agreement is a cooperative effort between these agencies and the Fish and Wildlife Service. It recommends conservation and management measures for several sensitive species including Waldo gentian, large flowered rush lily, western bog violet and Oregon willow-herb. The Agreement is meant to ensure that these species do not become listed in the future. A conservation strategy for these could be developed at the same time. The Conservation Strategy will lay the guidelines for management and monitoring of these species at a more detailed level.

2. Identification of Issues and Key Questions (Step 2)

a. Concerns Related to Botany

The following questions and statements frame the most important botanical concerns in the watershed:

- What vascular plant species presently occur in the East Fork Illinois Watershed?

- What non-vascular plant species, such as lichens, bryophytes, and fungi occur in the East Fork Illinois Watershed?

- What is the floristic richness of the analysis area?

- Maintaining species viability, especially for species with very limited ranges. For land disturbing activities and minerals development consider cumulative effects and timely floristic surveys.

- What are the effects of fuels accumulation, fire frequency or lack of fire activity on rare plants?

- The lack of biological and habitat requirement information for most rare plants species (data gap)

- Development in unique habitats (buildings, water withdrawal, farming) especially along the river corridor.

- Off-highway vehicles are having serious impacts to *Darlingtonia* bogs, meadows, and riparian areas. Because rare plants occur throughout serpentine habitats, any off-road use is a concern. Serpentine soils are shallow and easily impacted with damage lasting decades or more.

- What Noxious Weeds and other non-native species - including non-native grasses - exist in the watershed? (data gap)

- Revegetation of serpentine soils after human-related disturbances and habitat restoration.

- What are the culturally-significant plants in the watershed? Are any of them at risk because of management activities or because of lack of management activities? Are any of these species limited in abundance?

- Revegetation with native species is key to maintaining a healthy relationship with soil micro organisms. At present there are sufficient quantities of native seeds to revegetate any soil disturbance in this watershed.

3. Description of Current and Reference Conditions (Steps 3 & 4)

The current conditions on federal lands in the East Fork Illinois watershed reflect a history of multiple use including mining, recreation, timber harvest and botanical collecting. To determine conditions and effects of past projects on current sensitive and endemic plants and their habitats is at best an educated guess. In some locations on BLM lands, the hydraulic mining of the 1930s completely obliterated some serpentine areas. Mining tailings are still present where vegetation has not reestablished to the level of adjacent non-mined areas.

Effects to plants and suitable habitat include soil disturbance that may render the habitat unsuitable for the rare plants. Depending on the degree of disturbance and the species in question, soil disturbance can have both positive and negative effects. Light disturbance may favor seedling establishment in openings on favorable soils; several seed bearing species should be able to colonize these openings unless out competed by weeds or unless the soil is repeatedly disturbed. Heavy soil disturbance, especially churning and compaction, is incompatible with maintenance of suitable habitat for rare plants as they will neither survive nor colonize churned up or compacted soils. Road beds and stream sides will revegetate over time if left undisturbed for long periods. Soil disturbance also disrupts mycorrhizal relationships which are considered important to plant survival in serpentine environments (Jimerson 1995).

Soil disturbance also invites weed infestation, especially in areas along roads where weed seeds can be easily brought in on vehicles and equipment. Once established, weeds can out compete native plants and prevent restoration of native vegetation on the site. There are several areas that show the presence of weeds.

Wet areas that may provide habitat for water loving plants are protected by standard project design criteria protecting perennial water or spring-fed seeps. However, localized short term adverse effects on riparian habitats may occur when the riparian areas are impacted by OHV and when rehabilitated, especially along the road segments.

Other effects on sensitive plants and their habitats could occur from timber harvests. Habitat requirements for survey and manage vascular plants, non-vascular plants, and fungi, in general, include Late-successional forest conditions where canopies are relatively closed. For example, a management recommendation for clustered lady's slipper is to maintain canopy closure at 60% or greater. Other recommendations include managing population sites to include areas large enough for maintenance of microclimates to conserve down woody debris and the duff layer and mycorrhyzal associations. To accomplish this active management will be necessary because these conditions are more dense than the reference conditions.

Fire exclusion and related impacts are discussed by most ecologists and scientists. The fire regime is a main component of successional processes. The natural fire return interval in the Jeffrey pine series was between 10 and 80 years with an average of 14 (See Table T-9). Fire suppression has increased the fuel loads which in turn may result in higher fire intensity and greater size burns. Any reintroduction of fire will have to consider these factors as well as the biology of the rare plants. Burning after the reproductive cycle has been completed is recommended. Monitoring the response of the rare plant species would be critical to their management. It will be critical to note which species do not respond to fire. Monitoring of the Cedar Log prescribed fire indicate that *Senecio hesperius* did not respond favorably. *Calochortus howellii* did not bloom after an area was burned at too close intervals in the Canyon Creek prescribed burn. However, Borgias and Beigel (1996) observed that the dominant species of serpentine savannas regenerated readily after wildfire.

4. Synthesis and Interpretation (Step 5)

In general vegetation growth, and encroachment, has occurred on serpentine rare plant habitat probably at a slower rates than other areas with better soils for more common plants. Wet meadows, wetlands, springs and riparian areas water table most probably has been affected by vegetation encroachment. Jimerson et. al. (1995) noted that in general, the diversity and cover of rare species appears to decline in serpentine environments where tree and shrub cover values are high.

Mining activities have changed the habitat along the river terraces and riparian areas and low elevation serpentine flats. Active restoration will be necessary if some of these areas (especially savannah habitats) are to be returned to historic vegetation communities.

Recreation activities have impacted unique habitats. Interpretation, public education, and restoration of the most used areas would help increase the enjoyment that people are seeking from these environments.

Fire suppression has decreased the size of meadows, serpentine savannas and openings in forested habitats. Prescribed burning could be used to reduce this encroachment. Fire suppression has increased canopy closure and layering which is to the benefit of some types of late seral dependant species.

Revegetation with non-native seed mixes has probably decreased the quality of the habitats for rare and native species. Efforts to research restoration of these areas could help to improve these habitats.

5. Data Gaps

• Sensitive plants population site conditions have not been assessed since first reported.

• Habitat quality for these sensitive species is unknown.

• To date, surveys for bryophytes, lichens and fungi have been completed on <5 % of NFS lands. Non-vascular plant surveys on BLM lands were begun in 2000.

• Noxious weed inventory - intensity of invasion.

• Lack of biological and habitat requirement information for most rare plants species.

• Draft Species Management Guides need to be updated and finalized.

6. Summary of Botany Recommendations (Step 6)

Noxious weeds: Eradication of some weeds will involve removal of those weeds and revegetation of those same sites. Priority locations include the Happy Camp/Waldo Road Highway corridor, especially the areas infected with knapweed, wild sweet peas, Dyers woad, and the scotch broom along several of the main roads in the valley.

Map weeds as projects are implemented to avoid weed competition and to diminish the threat to sensitive plant populations in the future in this area.

Revegetate along road corridors and around parking areas with native blooming wildflowers, as these areas are rehabilitated. Collect seed from local species. Work with local nurseries to provide native, genetically similar shrub species for restoration purposes.

Ultramafic soils areas have an excess of small to midsized shrubs and trees. Burn these areas to decrease these vegetation types and decrease the dead and accumulated duff. Burn in pockets or strips to create a mosaic pattern.

Maintain or increase large woody material levels to meet management recommendations for survey and manage bryophytes, lichens and fungi.

Maintain canopy cover in forested habitats consistent with the management recommendations for survey and manage vascular plants, bryophytes, lichens, and fungi.

Maintain openings in forested habitats to benefit California globe mallow, wayside aster, and McDonald's rockcress.

Forest Products: Identify key habitats and possible conflicts with rare plants, minimize impacts by avoiding these areas or limiting harvest amounts.

Avoid burning known sites of sensitive plants during prescribed or natural fire. Burn around population areas under very controlled, experimental conditions. Monitor results.

Research and develop effective restoration strategies for past mining areas, especially where tailings are present where it is necessary to revegetate these areas.

In places such as French Flat ACEC expand protection efforts to stop recreational vehicle trespassers.

Pursue evaluation of an RNA designation for those areas identified has having the potential for such a designation (BLM and FS lands).

K. Key Question T-ll: Potential Conflicts between Recommendations

T-11.What and where are the conflicts between various resources in terms of treatment recommendations? How can recommendation conflicts be mitigated or minimized?

Table T-26: Potential Conflicts Between Recommendations

Conflicts between Treatment Recommendations	How Conflicts may be Mitigated or Minimized
Decommissioning roads to improve water quality could create conflicts (at some locations) with recommendations to reduce stand densities and manage fire (prescribed and wild fire). The primary reason for this conflict is economics, *i.e.*, mechanical thinning of small trees with limited commercial value requires road access to facilitate treatments that are economically viable, and some roads are needed for effective fire management.	- Stand density treatments: May include multiple thinning treatments and prescribed fire, especially in areas where higher canopy retention is desired, such as in Riparian Reserves where shade for streams is important to improving water temperature. - Mechanical treatment of trees with small economic value: reduce stand densities before eliminating road access, especially in LSR and Riparian Reserves. Thin to a wide spacing, which facilitates rapid growth to a size that would contribute to the most rapid development of old growth forest habitat possible. - Treat roads to minimize adverse affects to water quality and aquatic habitats until the road can be eliminated. Mechanical treatment of trees with no economic value; road access reduces the cost of treatment, but not significantly so road access is not required. Thin to a wide spacing. - Prescribed and wildfire management; identify roads that are critical to success and treat these roads to minimize their adverse affects on water quality and aquatic habitats.
The goal of the Siskiyou Forest Plan is to maintain 20% of the area in pioneer seral/seed-sap-pole habitat for deer and elk is in conflict with land allocations in the watershed. Deer and elk (species associated with this habitat) are indicator species for other species associated with grass, forb, and shrub habitats. Only 14% of National Forest land is Matrix, and only about 10% of this is expected to be young openings with forage over time (assuming regeneration harvest when stands are 120 years old and successful fire exclusion). Therefore, based on land allocations, only 1% of National Forest land would be forage over the long term. On BLM, area control of 1/3 in each of early, mid and late seral stages.	·Improve the conditions for forage plants in small, mature, and old growth forest habitat by reducing stand densities and prescribed under-burning.
Recommendations in the Siskiyou Forest Plan to retain a minimum of 40% soil duff and litter (Standard and Guideline 7-4, pg. IV-44, 1989) may be a conflict with recommendations to under-burn and to burn hot enough to create suitable conditions for high quality forage. Essentially, soil duff and litter retention recommends low amounts of exposed mineral soil and conditions for high quality forage may require higher amounts of exposed mineral soil.	Research the source of this S&G; (i.e., Regional Guidelines), and confirm whether it is directed at prescribed fires in regeneration harvest areas or prescribed fires in all areas. Also, describe historic range of variability for soil duff and litter distribution and abundance prior to effective fire suppression. These are *DATA GAPs*.

Table T-26: Potential Conflicts Between Recommendations

Conflicts between Treatment Recommendations	How Conflicts may be Mitigated or Minimized
Recommendations to restore the distribution of mature and old growth forest habitat to reference conditions could be in conflict with the distribution of Late-Successional Reserve land allocations; i.e., the distribution of LSRs may not reflect historic distribution of mature and old growth forest habitat.	Historically, the distribution of mature and old growth habitat was patchier than the distribution of Late-Successional Reserves in the watershed. If mature and old growth habitat is restored in the entire area of these reserves, the distribution of mature and old growth may not be within the range of historic variation. Maintaining mature and old growth on dry aspects within Late-Successional Reserves may be difficult or impossible. In the short-term, retain mature and old growth habitat on federal lands as long as possible while meeting local community needs for forest commodities (e.g., timber from commercial thinning).
The recommendation to maintain old growth size trees; (>32" dbh) conflicts with timber management objectives in Matrix, and it may be in conflict with the restoration of giant (>45" dbh) trees in the watershed.	Although part of the definition for old growth forest includes trees greater than 32" dbh, trees larger than this are important to species that need large trees for nesting or denning; e.g., northern spotted owl and fisher (*Martes pennanti*). Impacts to species associated with large trees could be reduced if trees larger than 45" dbh are reserved from harvest until old growth has been restored within the historic range of variability in the watershed or the LSR and Riparian Reserve network is fully functioning. In some situations, the stand density of trees around 32" dbh. may need to be reduced to promote the development of trees over 45" dbh. Emphasize restoration in Riparian Reserves and Late-Successional Reserves and within plant series' with greater productivity (e.g., tanoak).
Meadow and pine/oak savanna recommendations may conflict with recommendations to restore Late-Successional Reserves and Riparian Reserves; e.g., restoration of old growth, maintenance of mature, and maintenance of all shade (in Riparian Reserves).	The Southwestern Oregon Late-Successional Reserve Assessment supports restoration and maintenance of these habitats in Late-Successional Reserves. Furthermore, the goal of the ACS is to maintain and restore physical and biological processes within their natural range of variability and these habitats are natural parts of riparian systems and provide processes that support biological diversity/ecological resilience in the watershed. Therefore, these habitats should be maintained and restored wherever they are found.
The reference condition of 50% canopy closure in mature and old growth and recommended thinning or prescribed fire recommendations in Riparian Reserves may be in conflict with maintaining all shade producing trees of perennial streams in 303D listed streams (for water temperature).	Minimize potential for losing shade trees. Develop more large crowned trees more rapidly and use multiple thinning prescriptions, from no treatment to light thinning to wider spacing around certain species (e.g., pines and shade intolerant hardwoods). Mitigation could include some buffering of perennial streams with shade providing trees and/or planting rapid growing hardwoods, like willow, where needed (planted species should be consistent with plant series).
Recommendation to avoid burning certain known sensitive plant sites may conflict with recommendations to restore natural fire regime.	Avoid direct ignition of the individual plants, allow fire to creep through buffers. Fire is a natural part of this ecosystem and organisms should be adapted to its affects; however, extra care should be taken to minimize impacts to organisms with low population levels.

Table T-26: Potential Conflicts Between Recommendations

Conflicts between Treatment Recommendations	How Conflicts may be Mitigated or Minimized
Recommendations to selectively remove "diseased" trees in harvest treatments may conflict with wildlife recommendations to have a significant amount of the large trees with deformities such as cavities, large limbs, and witch's brooms (from mistletoe). Cavities are often promoted by fungi that can impact the value of timber. Cavities in green trees are very valuable to wildlife; e.g., northern spotted owl, because they can last much longer than cavities in a snag that will fall sooner than most green trees. Some fungi promote cavities in green trees (e.g. *Phelinus pini*).	Manage "disease" within natural range of variability. Leave mistletoe infected trees where their impact to smaller trees is reduced; e.g., near the bottom of units. Grow other species of trees in the potential impact area around mistletoe-infected trees. Leave more mistletoe infected trees in units where they are not likely to impact timber; e.g., in stands treated with commercial thinning prescriptions. Leave trees with "pathogens" that have high benefits for wildlife (e.g., *Phelinus pini*) and lower risk to timber value than other diseases (e.g. root diseases that are long lived in soils or stumps).
Maintaining an appropriate distribution of age classes or seral stages in Matrix (which includes regeneration harvest) conflicts with the recommendation to maintain and restore old growth and interior mature and old growth forest habitat.	*National Forest Land:* Avoid harvest of old growth habitat and minimize impacts to interior mature and old growth habitat and its connectivity for as long as possible in Matrix while supplying timber to local economies. Schedule harvest to maintain large blocks of mature habitat in Matrix. *BLM land*: Be guided by the 15% late-successional forest retention standard and guide.
Recommendations to reduce fuel levels and restore the historic fire regime conflict with S&M management recommendations for certain species. These management recommendations include the protection of certain areas from fire.	Study the affects of fire on these organisms and adjust management recommendations accordingly. Build fire-line and use hand ignition around occupied sites on prescribed fires; these mitigations will appreciably increase costs for prescribed burning.
"Sanitization" of Port-Orford cedar helps to maintain mature and old growth forest in Riparian Reserves over the short and long terms. However, not treating this disease could prevent attainment of these maintenance and restoration objectives over the long term.	This is a relatively small impact to Riparian Reserves (only adjacent to roads or only in infected areas) and is considered a long term benefit because treatment reduces the potential for mortality of other Port-Orford cedar in the rest of the drainage below the treatment areas. Leaving dead trees would provide long term down wood.

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APPENDIX A: Wildlife

I. National Forest Lands - Species of Concern

Table T-A-1a: National Forest Lands: Species of Concern Distribution and Abundance (current)

COMMON NAME	SPECIES OF CONCERN Reason	PRESENT: yes, no, or unknown	DISTRIBUTION: % of suitable habitat surveyed in watershed, FS	ABUNDANCE: % of watershed population surveyed, FS
Peregrine falcon	ESA-delisted	yes	< 1%	<1%
Bald eagle	ESA-delisted	no	<1%	0
Marbled murrelet	ESA-threatened	no	<5%	0
Northern spotted owl	ESA-threatened	yes	<25%	<25%
Olympic salamander	NFP-J2; additional analysis needed	unknown	< 1%	< 1%
Clouded salamander	NFP-J2; additional analysis needed	unknown	< 1%	< 1%
Tailed frog	NFP-J2; additional analysis needed	unknown	< 1%	< 1%
Common merganser	NFP-J2; additional analysis needed	unknown	< 1%	< 1%
Wolverine	R5&6-sensitive	unknown	< 1%	< 1%
Osprey	R6-mgmt. Indicator	potential	<1%	< 1%
Lewis' woodpecker	R6-mgmt. Indicator	likely	< 1%	< 1%
Acorn woodpecker	R6-mgmt. Indicator	likely	< 1%	< 1%
Red-breasted sapsucker	R6-mgmt. Indicator	likely	< 1%	< 1%
Williamson's sapsucker	R6-mgmt. Indicator	likely	< 1%	< 1%
Downy woodpecker	R6-mgmt. Indicator	likely	< 1%	< 1%
Hairy woodpecker	R6-mgmt. Indicator	likely	< 1%	< 1%
White-headed woodpecker	R6-mgmt. Indicator	yes	< 1%	< 1%
Northern flicker	R6-mgmt. Indicator	likely	< 1%	< 1%
Pileated woodpecker	R6-mgmt. Indicator	likely	< 1%	< 1%
Roosevelt elk	R6-mgmt. Indicator	yes	<70%	< 1%
Columbian black-tailed deer	R6-mgmt. Indicator	yes	<70%	< 1%
Black- backed 3-toed woodpecker	R6-mgmt. Indicator; NFP-J2; additional analysis	unknown	<1 %	< 1 %
Marten	R6-mgmt. Indicator; R5- sensitive	unknown	<1 %	< 1 %
Red-legged frog	R6-sensitive	unknown	<1 %	< 1 %
Western pond turtle	R6-sensitive	unknown	<1 %	< 1 %
Common kingsnake	R6-sensitive	likely	<1 %	< 1 %
California mountain kingsnake	R6-sensitive	likely	<1 %	< 1 %
Townsend's big-eared bat	R6-sensitive	unknown	<1 %	< 1 %
White-footed vole	R6-sensitive	unknown	<1 %	< 1 %
Certain mollusks	NFP-ROD; Survey & mg.	yes	<5%	< 1 %
Red tree vole	NFP-ROD-survey&mg.	likely	<1 %	< 1 %
Pallid bat	NFP-ROD-survey&mg.	unknown	<1 %	< 1 %
Silver-haired bat	NFP-ROD-survey&mg.	unknown	<1 %	< 1 %
Long-eared myotis	NFP-ROD-survey&mg.	unknown	<1 %	< 1 %
Fringed myotis	NFP-ROD-survey&mg.	unknown	<1 %	< 1 %
Long-legged myotis	NFP-ROD-survey&mg.	unknown	<1 %	< 1 %
Goshawk	R5-sensitive	Yes	<10%	< 1 %
Great Grey owl	NFP-ROD-survey&mg. R5-sensitive	unknown	<2 %	< 1 %

Table T-A-1a: National Forest Lands: Species of Concern Distribution and Abundance (current)				
COMMON NAME	SPECIES OF CONCERN Reason	PRESENT: yes, no, or unknown	DISTRIBUTION: % of suitable habitat surveyed in watershed, FS	ABUNDANCE: % of watershed population surveyed, FS
Del Norte salamander	NFP-ROD-survey&mg. R6-sensitive	yes	<5 %	< 1 %
Siskiyou Mountains salamander	NFP-ROD-survey&mg. R6-sensitive	unknown	<5 %	< 1 %
ESA = Endangered Species Act; NFP J2 = Northwest Forest Plan Appendix J2 / S&M species; ROD = Record of Decision for NFP; R6 = Region 6 Forest Service; R5 = Region 5 Forest Service; mgmt. Indicator = species used as indicators of effects from management practices.				

II. BLM SPECIES OF CONCERN

Table T-A-1b: BLM Lands: Species of Concern Distribution and Abundance (current)				
COMMON NAME	SPECIES OF CONCERN Reason	PRESENT: yes, no, or unknown	DISTRIBUTION: % of suitable habitat surveyed in watershed, BLM	ABUNDANCE: % of watershed population surveyed, BLM
Peregrine falcon	SS (SE)		< 1%	?
Bald eagle	SS (FT,ST)		<1%	0
Marbled murrelet		No	<4%	0
Northern spotted owl	SS (FT,ST)	??	<??%	<??%
Black salamander	SS (AS, SP)			
Clouded salamander	SS (AS, SC)		< 1%	< 1%
Tailed frog	SS (AS, SV)		< 1%	< 1%
Lewis' woodpecker	SS (AS, SC)		<1 %	< 1%
White-headed woodpecker	SS (AS, SC), BF		<1 %	< 1%
Pileated woodpecker	SS (AS,SC)		<1 %	< 1%
Great Grey owl	SS (AS, SC), BF	Yes	<14 %	< 1 %
Pygmy owl		Yes	<5 %	< 1 %
Flammulated owl	SS (AS, SC), BF			
Northern saw-whet owl	SS (AS)			
Northern goshawk	SS (SC)	No	<9 %	< 1 %
Loggerhead shrike	SS			
Mountain quail	SS			
Western bluebird	SS (AS, SC)			
Purple martin	SS (AS, SC)			
Western meadowlark	SS (AS)			
Pygmy nuthatch	BF			
Fisher	SS (AS, SC)		<1 %	< 1 %
Marten	SS (AS, SC)		<1 %	< 1 %
Red-legged frog	SS		<1 %	< 1 %
Western pond turtle	SS (SC)		<1 %	< 1 %
Common kingsnake	SS (AS, SP)		<1 %	< 1 %
California mountain kingsnake	SS (AS, SP)		<1 %	< 1 %
Sharptail snake	SS (AS, SC)			
Townsend's big-eared bat	SS (SC)		<1 %	< 1 %
Certain mollusks (S&M)	SM	Yes	<30 %	< 1 %
Red tree vole	SM	Yes	<7 %	< 1 %
Pallid bat	SM		<1 %	< 1 %

Table T-A-1b: BLM Lands: Species of Concern Distribution and Abundance (current)				
COMMON NAME	SPECIES OF CONCERN Reason	PRESENT: yes, no, or unknown	DISTRIBUTION: % of suitable habitat surveyed in watershed, BLM	ABUNDANCE: % of watershed population surveyed, BLM
Silver-haired bat	SM		<1 %	< 1 %
Long-eared myotis	SM		<1 %	< 1 %
Fringed myotis	SS (BS, SV), SM		<1 %	< 1 %
Long-legged myotis	SM		<1 %	< 1 %
Del Norte salamander	SS (SV), SM, BF		<25 %	< 1 %
Siskiyou Mountain salamander			<25 %	< 1 %
SS = Special Status (FE-federal endangered, FT-federal threatened, SE-state endangered, ST-state threatened, SC-state candidate, SV-state vulnerable, SP-state peripheral, and AS-assessment species); SM = Survey and Manage; BF = Buffer Species				

III. Habitats for Wildlife Species of Concern

Tables T-A-2 and T-A-3 identify major known habitat components that the species of concern require. Information summarized in these tables is from “Management of Fish and Wildlife Habitats of Western Oregon and Washington” (Brown et. al., 1985) and the Siskiyou Forest Plan. These tables depict species habitat associations for wildlife species of concern in the East Fork of the Illinois River ecosystem.

Table T-A-2: Wildlife Species of Concern, Habitat Associations

Wildlife Species of Concern (FS & BLM) Habitat Associations

COMMON NAME	GF	SD	PS	YF	MF	OG	CB	CR	DM	SN	TA	RI
Peregrine falcon	2	2			2	2		1		2	2	1
Bald eagle	1				2	2				1		1
Marbled murrelet					2	1						2
Northern spotted owl					2	1				2		
Olympic salamander			2	1	1	1					1	1
Clouded salamander	1	1	1	1	2	2			1	2	2	
Tailed frog	2	2	1	1	1	1			1		2	1
Common merganser					1	1			2	1		1
Wolverine							1		1		1	1
Osprey					2	2				1		1
Lewis' woodpecker	2	1	1		2	2			1	1		
Acorn woodpecker			2		2	2			2	1		
Red-breasted sapsucker			2	2	2	2				1		1
Williamson's sapsucker			2	2	2	2				1		
Downy woodpecker			2	2	2	2				1		1
Hairy woodpecker			2	2	2	1			1	1		2
White-headed woodpecker				2	2	1			2	1		
Northern flicker	1	2	2		1	1			1	1		2
Pileated woodpecker				2	2	1			1	1		2
Roosevelt elk	1	1	1	1	1	1						1
Columbian black-tailed deer	1	1	1	2	2	2			2			2
Black- backed 3-toed woodpecker			2	2	2	2				2	1	2
Marten			2	2	1	1	2	2	1	1	2	2
Red-legged frog	2			2	2	2						1
Western pond turtle	1	1							1			1

Table T-A-2: Wildlife Species of Concern, Habitat Associations

Wildlife Species of Concern (FS & BLM) Habitat Associations

COMMON NAME	GF	SD	PS	YF	MF	OG	CB	CR	DM	SN	TA	RI
Peregrine falcon	2	2			2	2		1		2	2	1
Common kingsnake	1	1	2	2					2		2	
California mountain kingsnake		1	1	1	2	2			2			1
Townsend's big-eared bat		2	1	2			1					2
White-footed vole		2	2	2	1	1			1			1
Red tree vole				2	2	2						2
Pallid bat	1		1	2	2	2	1	1		2		1
Silver-haired bat	2		1	2	2	1	2	2		1		2
Long-eared myotis			2	2	1	1	2		1			1
Fringed myotis	1	1			2	2	1	1		2		1
Long-legged myotis	2	1	1	2	1	1	1	1		1		1
Great Grey owl												
Del Norte salamander				1	1	1			2		1	
Siskiyou Mountains salamander			2	1	1	1			2		1	2
Northern goshawk				2	2	2			2	2		2
Loggerhead shrike							2					1
Mountain quail	2	1	2									2
Black salamander												
Fisher				2	1	1		2	1	1	1	2
Western bluebird	1	1	2	2	2	2				1		
Flammulated owl			1	1						2		
Northern saw-whet owl	1	2	2	2	2	1				1		2
Sharptail snake	1	1	1	1	2	2			1		1	
Purple martin	2	2	2		2	2				1		2
Western meadowlark	2											2
Pygmy nuthatch				2	1	1			2	1		
TOTAL NUMBER OF PRIMARY USERS	12	12	12	9	13	17	5	4	13	20	7	19
TOTAL NUMBER OF SECONDARY USERS	9	7	13	23	27	20	4	3	10	8	5	15
	GF	**SD**	**PS**	**YF**	**MF**	**OG**	**CB**	**CR**	**DM**	**SN**	**TA**	**RI**

GF=grass/forb, SD=shrub dominated, PS=pole sapling, YF=young forest, MF=mature forest, OG=old growth forest, CB=caves and burrows, CR=cliffs and rims, DM=down woody material, SN=snags, TA=talus, RI=riparian (includes all water habitats) 1= Primary Habitat 2= Secondary Habitat

There are 38 vertebrate wildlife species of concern identified in Table T-A-2 with their preferred habitats: grass/forb, shrub, seedling/sapling/pole, young forest, mature forest, old growth forest, caves & burrows, cliffs & rims, large down wood, snags, talus, and riparian/aquatic. Habitats with the most vertebrate species of concern using them as primary habitat are: old growth forest (20 species), snags (20), riparian/aquatic (19), large down wood (13), and mature forest (13).

Table T-A-3: Habitat Components for Species Associated with Late-Successional and Old-Growth Forest (from the NW Forest Plan).

Wildlife Habitat Associations with Late-Successional and Old Growth Habitats

Species/ Guilds	LS/OG (large saw/ old growth)	Riparian	Snags	Down Woody Material	Large Green Trees	Canopy Closure	Unique Habitats
Northern spotted owl (FSEIS 3&4, pg. 234+)	large patches	yes	yes	yes	yes	yes	
Marbled Murrelet (FSEIS 3&4, pg. 246+)	trees>32'd.b.h. w/nesting platforms				trees>32'd.b.h. w/nesting platforms		
Bald Eagle (FSEIS pg. 206+)	nest				nest trees		large water, i.e., rivers and lakes
Peregrine Falcon (FSEIS, pg. 254+)							cliffs; often forages in forest
Invertebrates: Arthropods (FSEIS, pg. 2-75)	extensive and inter-connected	yes	yes	yes	yes; diversity of old growth	yes; canopy structure	
Invertebrates: Mollusks (FSEIS, pg. 2-76)	LS/OG influences quality of moist habitats	moist forest, i.e.; springs, bogs, marshes					talus: basalt and limestone
Amphibians (FSEIS, pg. 2-76)	extensive and inter-connected. LS/OG influences quality of cool moist habitats	low sediment, cool water, and head-water streams		yes			
Birds (FSEIS, pg. 2-76&77)	large reserves	yes	yes	yes	green trees, large and small		
Bats (FSEIS, pg. 2-77)	yes	yes	yes	yes			
Mammals -other than bats- (FSEIS, pg. 2-77)	yes: some spp. Like fisher may need large unfragmented expanses of LS/OG	yes	yes	yes	yes	some, e.g.; fisher, marten, and tree voles	

Table T-A-4: Modeling Assumptions

Habitat Components	Current Condition; East Fork of the Illinois River	Historic/Reference Condition: East Fork of the Illinois River
	PMR pixel data: Size Structure Codes	Modeled PMR pixel data to pre-harvest condition : Size/Structure Codes
Non-Forest		
Grass/Forb		
Shrub Dominated		
Seed/sap/pole (< 9"dbh)	10, 11, 20, 23, 27, 30, 33, 35, 36, 37, 38	10, 11, 12, 20, 23, 24, 27, 30, 33, 35, 36, 37, 38
Young Forest (9-21" dbh)	12, 13, 24	13, 14, 15, 21, 22, 28, 39
Mature Forest (21-32" dbh)	14, 15, 16, 21, 22, 25, 28, 39	16, 25
Old Growth (> 32" dbh)	17, 18, 19, 26, 29, 31, 32, 34	17, 18, 19, 26,29, 31, 32, 34
Interior Older Forest (Mature and Old Growth patches larger than 20 ac.)	Combined Mature and Old Growth and subtracted 400 ft . from the outside edge of stands for ``edge effect.' The remaining area is ``interior habitat.'	Combined Mature and Old Growth and subtracted 400 ft. from the outside edge of stands for ``edge effect.' The remaining area is ``interior habitat.'

General modeling assumptions using PMR pixel data to develop ``pre-harvest condition' data -

Before timber harvest:

all current regeneration harvest areas were old-growth,
unmanaged forests of old-growth were old-growth,
unmanaged mature forests were young forests,
unmanaged young forests were pole forests, and
unmanaged seed/sap/pole forests remained the same.
Other unmanaged habitats, (i.e., water, rock, grass, shrub) remained the same.

It is difficult to model pre-harvest conditions for young and seed/sap/pole stands; therefore, PMR historic/reference information for these size classes has limited value.

For more precise information about these assumptions, see the data dictionary for this data.

APPENDIX B: Wildland Fire Management

I. Fire Management Hazard, Risk, and Value At Risk Rating Classification Method and Assumptions and Planning

The Forest Service and Bureau of Land Management use slightly different criteria to evaluate Hazard, Risk and Values at Risk. While compatible, the relative ratings are not directly comparable between agencies. For example, a "high" hazard rating using one set of criteria may be a "medium" hazard using the other. The classification methods and assumptions for both agencies are described below. (See Maps 19 through 22)

A. BLM Administered and Non-Federal Lands

1. Hazard

Hazard rating is based on the summation of the points assigned based on six elements as follows:

1)	Slope:	<u>Percent</u>	<u>Points</u>
		0-19	5
		20-44	10
		45+	25
2)	Aspect:	<u>Degree</u>	<u>Points</u>
		316-360, 0-67	5
		68-134, 294-315	10
		135-293	15
3)	Position On Slope		<u>Points</u>
		Upper 1/3	5
		Mid-Slope	10
		Lower 1/3	25
4)	Fuel Model:	<u>Model</u>	<u>Points</u>
		Grass 1, 2, 3	5
		Timber 8	5
		Shrub 5	10
		Timber 9	15
		Shrub 6	20
		Timber 10	20
		Slash 11	25
		Shrub 4	30
		Slash 12, 13	30

5) Ladder Fuel Presence:
(Use when forest vegetation has DBH of 5" or greater (vegetation condition class 6). Exceptions are possible based on stand conditions.)

	Points
Ladder fuel absent.	0
Present on less than one-third of area; vertical continuity > or < 50%.	5
Present on one-third to two-thirds percent of area; vertical continuity is <50%.	15
Present on one-third to two-thirds percent of area; vertical continuity is > 50%.	25
Present on greater than two-thirds percent of area; vertical continuity is <50%.	30
Present on greater than two-thirds percent of area; vertical continuity is > 50%.	40

6) Summary Rating:

POINTS	HAZARD RATING
0-45	LOW
50-70	MODERATE
75-135	HIGH

2. Risk

Assigned based on human presence and use, and on lightning occurrence.

High rating when human population areas are present on or adjacent within 1/4 mile of the area; area has good access with many roads; relatively higher incidence of lightning occurrence; area has high level of human use.

Moderate rating when area has human access and experiences informal use; area is used during summer and fall seasons as main travel route or for infrequent recreational activities. Lightning occurrence is typical for the area and not notably higher.

Low rating when area has limited human access and infrequent use. Baseline as standard risk, mainly from lightning occurrence with only rare risk of human fire cause.

3. Value at Risk

Best assigned through interdisciplinary process. Based on human and resource values within planning areas. Can be based on land allocations, special use areas, human improvements/monetary investment, residential areas, agricultural use, structures present, soils, vegetation conditions, and habitat.

Examples:

High rating - ACEC, RNA, LSR, Special Status species present, critical habitats, recreation area, residential areas, farming, vegetation condition and McKelvey Ratings of 81, 82, 71, 72; vegetation condition of 4 and 5. Caves, cultural, or monetary investment present. Riparian areas.

Moderate rating - Granitic soils, informal recreation areas and trails. Vegetation and McKelvey Rating of 85, 75, 65.

Low rating - Vegetation condition class 1, 2, 3; and vegetation 5, 6, 7 with McKelvey Rating 4.

B. National Forest Lands

The Siskiyou National Forest Wildfire Prevention Analysis and Plan (1998) analyzed fire risk, hazard, and values at risk for lands within the National Forest boundary. It did not consider private lands or other federal ownership outside of the forest boundary. The plan identified five fire prevention compartments within the East Fork Illinois watershed. Fire Risk, Hazard and Value were assigned for each of these compartments. Ratings were somewhat subjective with an objective of making comparisons between compartments on the forest. Map 20A (Wildfire Risk Analysis) and Table T-B-1 display the composite rankings for the National Forest portion of the watershed (Risk / Hazard / Value). NOTE: The Hazard rating for compartment IV07 was changed from "Low" to "Moderate" to reflect the predominate Tanoak and Douglas-fir Series in the area. This change corrects an error in the original plan.

Table T-B-1: Wildfire Risk Analysis Summary Ratings (Risk/Hazard/Value)

Rating	Acres	Percent
HMH	1,164	3
MMH	29,995	82
LLL	5,387	3

The Wildfire Prevention Plan identified compartments with rankings of HHH, HMH, MHH and MMH as high priorities for hazardous fuels treatment on National Forest lands.

1. Hazard, Risk and Values at Risk for the East Fork Watershed

Fire risk and Values at Risk were taken directly from the Wildfire Prevention Plan for compartments within the East Fork Illinois watershed. Fire hazard was further refined to prioritize hazardous fuels treatments within the watershed.

a. Fire Hazard

From a fire suppression perspective, the wild land fuels management objective is to "identify, develop and maintain fuel profiles that contribute to the most cost-efficient fire protection and use program in support of forest plan land and resource management direction" (FSM 5150.2).

A standard analysis process (the NFMAS process) identifies the "most efficient level" of initial attack forces for a forest, based on the ability to suppress a wildfire on an average worst day (90th percentile weather conditions), given prevailing slope and the fuel profile. The initial attack organization for the Two Rivers Fire Zone is comprised of fire engines staffed by personnel using fire line hand-tools and the limited water the engines carry. Personnel using hand tools can safely, directly attack a fire with flame lengths less than 4 feet at the head or flanks. Higher intensity fires require bulldozers, aircraft or indirect attack to safely suppress. When flame lengths are greater than 4 feet, initial attack forces will have difficulty containing a wildfire.

Fire Hazard is measured by the ability of the Zone's initial attack organization to control a wildfire on an average worst fire weather day. See Fire Hazard Categories Table T-B-2.

Table T-B-2: Forest Service Fire Hazard Categories

Category	Parameters
High Hazard	Initial attack forces are unable to contain a fire start. Average flame lengths are over 8 feet.
Moderate Hazard	Initial attack forces are able to contain a fire but heavy equipment or air resources are the primary tools. Flame lengths are from 4 to 8 feet.
Low Hazard	Initial attack forces are able to control the fire with direct methods e.g. engines and hand tools Average flame lengths are less than 4 feet.

Fire Hazard was determined for lands within the forest boundary of the watershed by using a computer model called the BEHAVE Fire Behavior Prediction System. Topography was integrated by generating both slope steepness and aspect maps from topographic files in GIS. 90th percentile fire weather conditions were taken from the Onion Mountain weather station for the years 1977 to 1996. The combination of fuel models, 3 slope classes, and 90th percentile fire weather (adjusted for aspect and fuel model) predicted the fire behavior (flame lengths) and subsequent Fire Hazard (see Map 21).

b. Risk

Assessing the risk consists of evaluating the potential for wildfire ignition. Concentrations of lightning and human activities that could start fires were identified. A risk overlay was completed for the forest, identifying areas as low, medium or high risk of ignition. This rating was relative in nature and considered only the risk of one compartment as compared to another.

c. Values at Risk

Assessing values is a subjective process and is interdisciplinary in nature. Areas of obvious value, where wildfire could have an undesirable resource effect, are labeled as high. Areas with some value, but considered less in comparison, are labeled as medium. Everything else is considered low. The Siskiyou National Forest Land and Resource Management Plan was used to help assign values. Value ratings were based on management area allocations as shown below:

Table T-B-3: Forest Service Value Criteria

VALUE CRITERIA			
	Low	**Medium**	**High**
Wilderness (MA1)	X		
Back Country Recreation (MA6)		X	
Late-Successional Reserve (MA8)			X
Special Wildlife Site (MA9)		X	
Riparian Reserves (MA11)		X	
Retention Visual (MA12)		X	
Partial Retention Visual (MA13)			X
Matrix (MA14)			X

II. Fuel Models

Fire behavior is determined largely by weather, topography, and the fuel profile. Thirteen fire behavior fuel models (Anderson 1982) were developed to aid in the prediction of fire behavior (fire spread and intensity) for various fuel conditions. The criteria for choosing a fuel model to predict fire behavior primarily considers the fact that fire will burn in the fuel stratum that is most conducive to support the fire. Fuels can be classified into four groups (grasses, brush, timber, and slash) depending on what carries the fire. The difference in fire behavior among these groups is related to the amount of fuel, its distribution among the fuel size classes, and the depth of the fuel bed. Grasses and brush are vertically oriented fuel groups, and timber litter and slash are horizontally oriented.

Eight fuel models were identified in the watershed (see Table T-B-4, Fire Behavior Fuel Models, and Map 19 Fuel Model). For National Forest lands, vegetation conditions derived from satellite imagery data (interpreted by Pacific Meridian Resources), and the age and type of harvest for managed stands were used to determine fuel models. The fuel model descriptions are listed below:

Fuel Model 1 (Grass Group): Fire spread is governed by the fine, continuous, herbaceous fuels which are cured (or nearly cured). Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area. Annual and perennial grasses are included in this fuel model.

Fuel Model 2 (Grass Group): Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stem-wood from the open shrub or timber over-story, contribute to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands.

Fuel Model 5 (Shrub Group): The fire is generally carried by the surface fuels made up of litter cast by the shrubs and the grasses or forbs in the under-story. The fire is not generally very intense because surface fuels loads are light, the shrubs are young with little dead material and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify: sprouting hardwoods, ceanothus species, young plantations or manzanita. Stands maybe up to 6 feet high, but have poor burning properties because of live vegetation.

Fuel Model 6 (Shrub Group): Fire will carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 miles per hour at mid flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. This model covers a broad range of shrub conditions. The shrubs are older than fuel model 5, but do not contain as much fuel as model 4. Fuel situations include intermediate stands of ceanothus, huckleberry oak and dense plantations.

Fuel Model 8 (Timber Group): Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather, conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand.

Fuel Model 9 (Timber Group): Fires run through the surface litter faster than a Model 8 and have longer flame lengths. Closed stands of pines or other conifers or hardwoods may fall into this model. Concentrations of dead or down woody material will contribute to possible torching out of trees.

Fuel Model 10 (Timber Group): The fire burns in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb-wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. A forest type may be considered if heavy down material is present: examples are insect and disease-ridden stands, wind-thrown stands, over-mature situations with dead fall, and aged light thinning or partial-cut slash.

Fuel Model 11 (Logging Slash Group): Fire is fairly active in the slash and herbaceous material intermixed with the slash. The spacing of the rather light fuel load, shading from over-story, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands or hardwood stands are considered. Clear-cut operations generally produce more slash than represented here.

Table T-B-4: Fire Behavior Fuel Models, Current Conditions								
Fuel Model	**National Forest**		**BLM**		**Non-Federal**		**All Ownerships**	
	Acres	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
1	49	<1	988	20	4,806	30	5,843	10
2	423	1	-	-	-	-	423	<1
5	14,615	40	828	16	5,351	34	20,794	36
6	4,164	11	133	3	434	3	4,731	8
8	6,183	17	2,018	40	2,630	16	10,831	19
9	-	-	894	18	1,277	8	2,171	4
10	10,884	30	88	2	827	5	11,799	20
11	284	<1	-	-	-	-	284	<1
N/A	-	-	94	2	628	4	722	1
Total	36,602	-	5,043	-	15,953	-	57,598	-

APPENDIX C: Plant Series

A. Plant Series Extent

Vegetation series are used to display and describe the abundance, distribution, and diversity of plant communities in the watershed. Series are named after the species of trees that would dominate a site if there were no disturbances. Few sites in Southwest Oregon are dominated by such "climax" species due to frequent and pervasive past disturbance. Series is useful in characterizing the vegetation and estimating biological productivity (Atzet and Wheeler 1984).

Maps 9A and 9B, 10, 11 and 12 display the vegetation information by ownership within the East Fork Illinois Watershed. This is a broad scale estimate for most of the watershed. Accurate mapping of series and plant association groups is a *data gap* for National Forest lands. The most common plant series is the Tanoak Series, followed by the White fir, Douglas-fir, and Jeffrey Pine Series (see Table T-C-1) The mapping on National Forest lands includes a tanoak/Douglas-fir type where the two series were lumped when they could not be readily distinguished by aerial photo interpretation. Minor amounts of Mountain Hemlock, Red Fir and Oregon White Oak Series are also found within the watershed, but were not mapped on Forest Service administered lands. Douglas-fir is the dominant over-story tree in both the Tanoak and White Fir Series due to its fire resistant characteristics and repeated fires in the watershed.

Table T-C-1: Plant Series in the East Fork Illinois Watershed

Plant Series	Acres	% of Ownership	% of Watershed
WITHIN NATIONAL FOREST BOUNDARY			
Tanoak or Douglas-fir [1]	15,558	42	27
White Fir	14,539	40	25
Douglas-fir	3,487	10	6
Tanoak	1,784	5	3
Port-Orford-cedar	911	2	<2
Jeffrey pine	405	1	<1
BLM LANDS			
Douglas-fir	3,049	63	6
Jeffrey pine	1,336	24	2
Ponderosa pine	95	2	<1
Tanoak	442	9	<1
White oak	5	<1	<1
Riparian hardwood	19	<1	<1
Non-vegetated	97	2	<1
NON-FEDERAL OWNERSHIP			
Douglas-fir	3,607	23	6
Jeffrey pine	1,375	9	2
Tanoak	1,700	11	3
White oak	87	<1	<1
Non-vegetated	628	4	1
Non-forest Includes rural development and Cave Junction	8,431	53	15

[1] Could not be differentiated

B. Plant Series Descriptions

1. Douglas-fir Series

The Douglas-fir Series occurs on warmer, drier sites with moderately shallow soils. The series is replaced by the White Fir Series on cooler higher elevation sites and by Tanoak on moist lower elevation sites. Douglas-fir dominates the over-story with both sugar and ponderosa pine usually present. Productivity is somewhat lower than for tanoak, but often high. Fire exclusion has allowed an increase in tree density with a corresponding loss of pine species from insect attack. In the Elder Creek drainage, many stands on ultrabasic parent materials exhibit an under-story of incense cedar and Douglas-fir. Estimated mean fire return interval was 15 years.

2. Jeffrey Pine Series

This Series can be identified by the presence of Jeffrey pine. It only occurs on soils derived from ultrabasic parent materials. The Series is characterized by low site productivity. Douglas-fir and incense cedar are common under-story and over-story tree associates. A characteristic feature of the Series is an open over-story canopy of trees, with a shrub and grass under-story. Fire exclusion has probably had little effect on over-story trees, but under-story brush and trees have increased in density. Many of these under-story trees are depauperate.

3. Ponderosa Pine Series

Forests in the Ponderosa Pine Series generally average approximately 170 ft^2 per acre of basal area. This Series is relatively rare, as ponderosa pine does not often play the role of a climax dominant species (Atzet and Wheeler 1984). This Series tends to occupy hot and dry sites that burned frequently. Ponderosa pine regeneration is generally reduced with fire exclusion. Because of fire exclusion over the past 70 years, overall distribution of ponderosa pine has declined.

4. Port-Orford Cedar Series

This series occurs at mid to low elevations and tends to follow stream drainages. It is mostly riparian associated in the watershed and is usually discontinuous. POC root disease is the most significant disturbance to the series. Estimated fire return interval was 50 years. This is longer than adjacent upland series due to the moist environment.

5. Tanoak Series

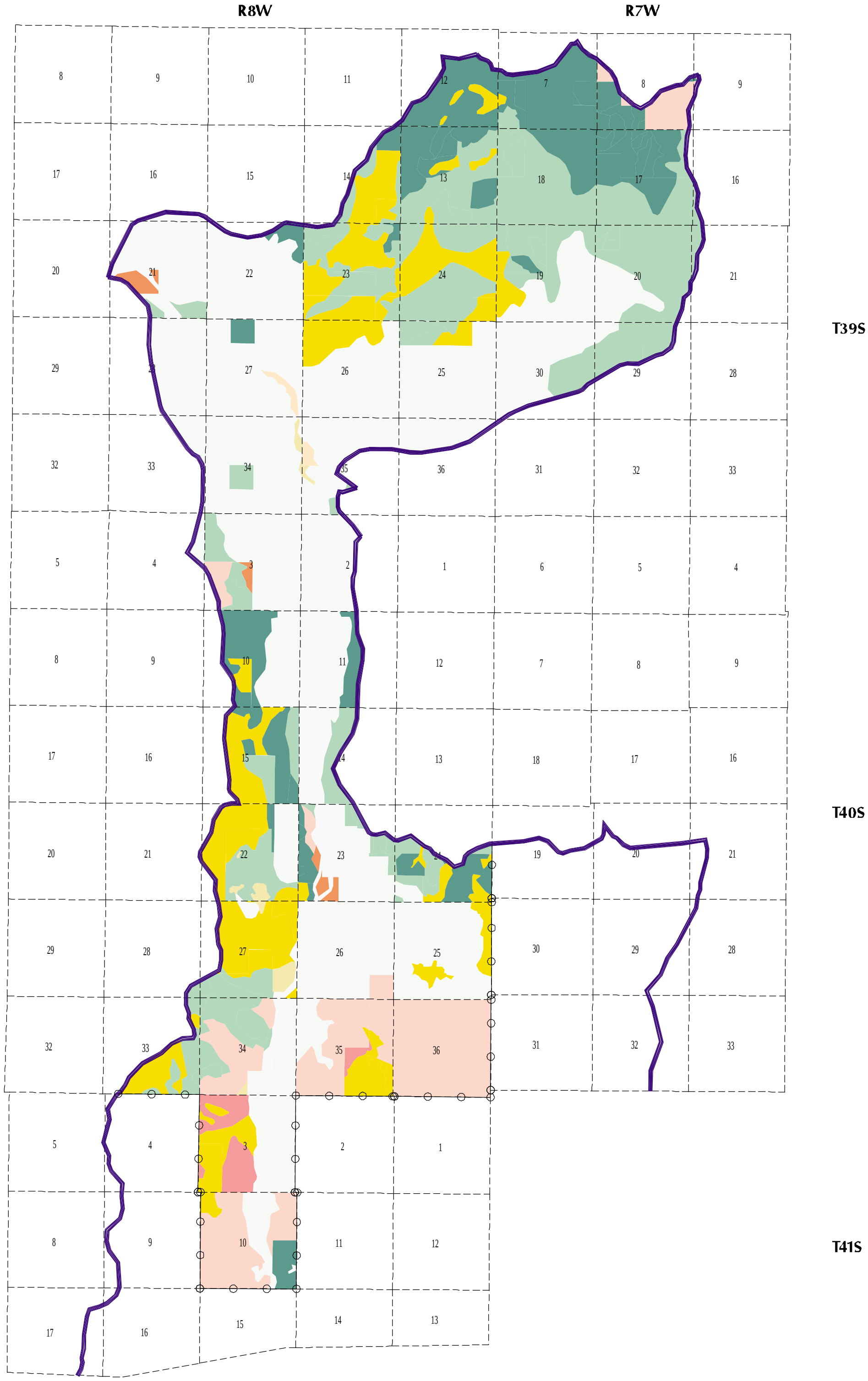
Tanoak areas tend to be those of deep productive soils below about 3,000 feet in elevation. The presence of tanoak often indicates higher site productivity. The distribution of tanoak is limited by the availability of summer moisture and cold winter temperatures. Tanoak sites are usually dominated by Douglas-fir and sugar pine. Fire exclusion has allowed tanoak to increase in density, diameter and height in most stands. Estimated mean fire return interval was 12 years (White et al. 1997).

6. White Fir Series

This series is located on cooler, higher elevation sites above about 3,000 feet in the watershed. It is rare on ultrabasic parent material. These sites are usually dominated by mixed conifer over-stories with a major component of Douglas-fir. Productivity is usually high. Fire exclusion has allowed white fir to increase both in the under-story and as a component of the over story. Estimated mean fire return interval was 25 years.

7. White Oak Series

This Series generally occurs at lower elevations and is characterized by shallow soils. Although Oregon white oak is usually considered a xeric species, it also commonly occurs in very moist locations such as flood plains, heavy clay soils and river terraces. On better sites, white oak is out-competed by species that grow faster and taller (Stein 1990). Average basal area is 46 ft^2 per acre. Water deficits significantly limit survival and growth (Atzet and McCrimmon 1990). White oak has the ability to be a climax species in that it can survive in environments with low annual or seasonal precipitation, droughty soils, and where fire is a repeated natural occurrence (Stein 1990). Fire events in this series are high in frequency but low in intensity (Atzet and McCrimmon 1990). Because of fire exclusion over the past 70 years, the overall distribution of white oak has declined.



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PLANT SERIES ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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John McGlothlin

LEGEND

- NON-VEG.
- NON-FOREST
- RIPARIAN HARDWOOD
- TANOAK
- TANOAK/ D.FIR
- W.OAK
- J.PINE
- P.PINE
- D.FIR/ PINE
- D.FIR
- WATERSHED BOUNDARY
- USFS BOUNDARY

N

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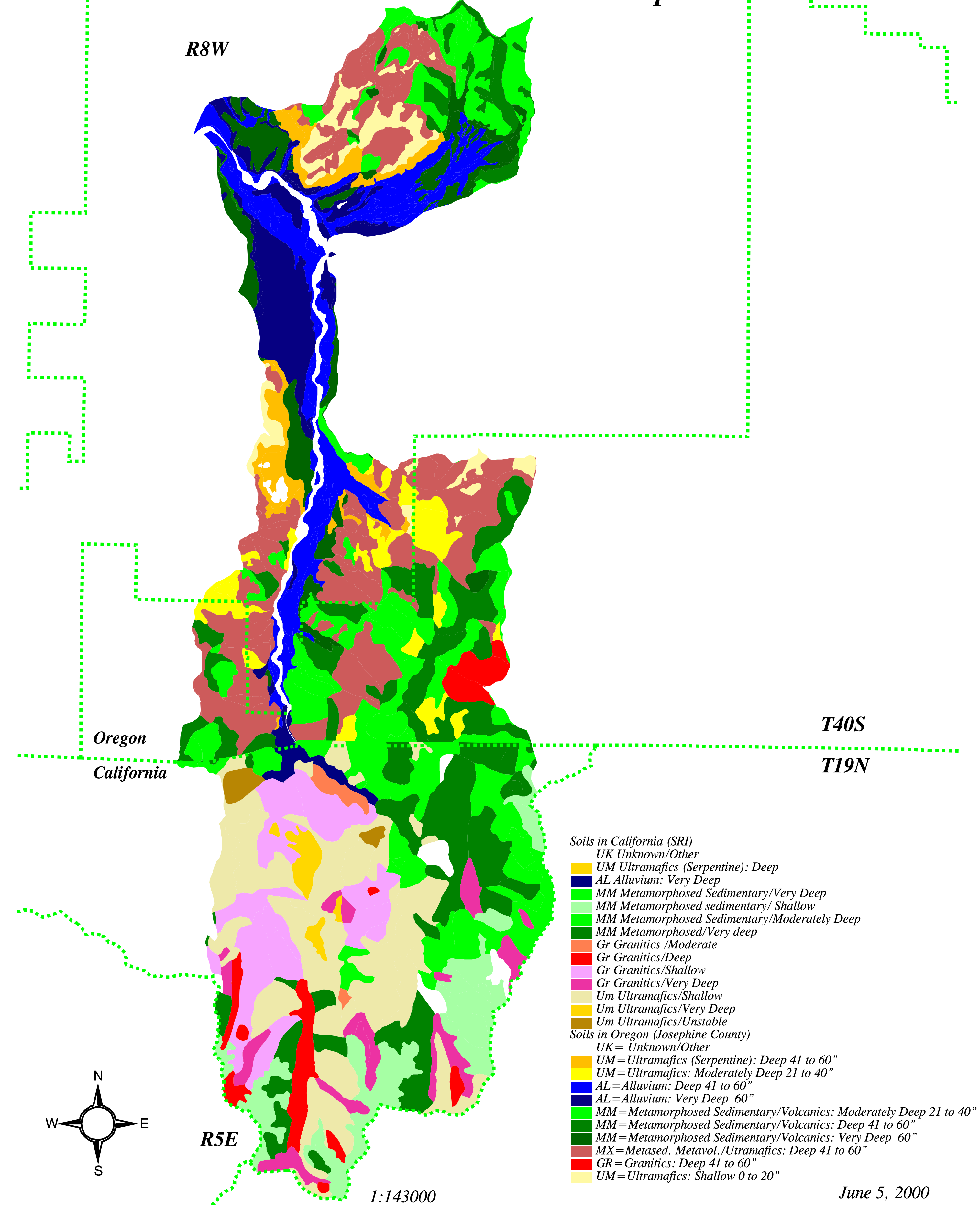
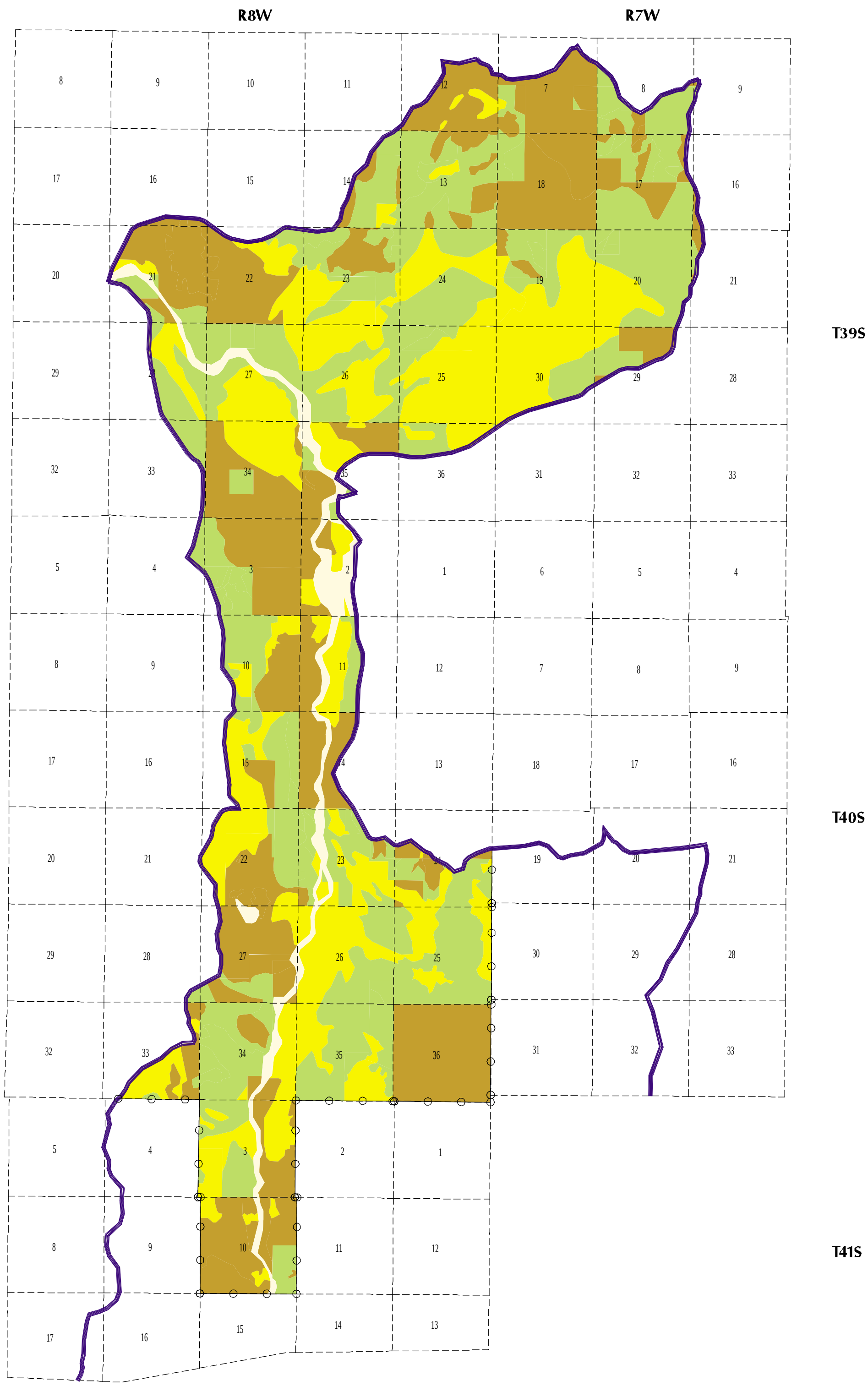
East Fork Illinois Watershed
Parent Material and Soil Depth





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FUEL MODELS FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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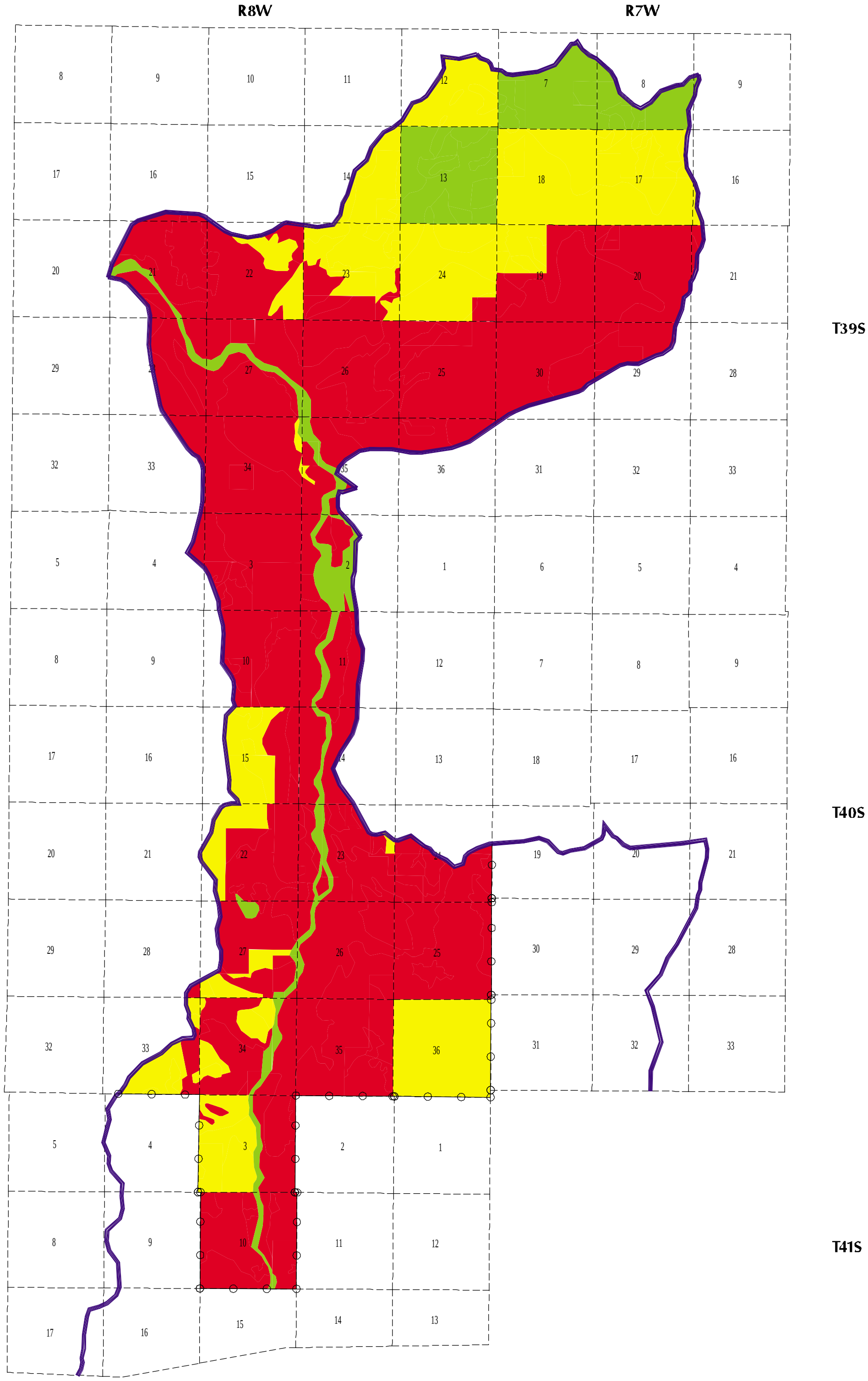
LEGEND

- GRASS AND GRASS DOMINATED
- CHAPARRAL AND SHRUB FIELDS
- TIMBER LITTER
- SLASH
- FUEL MODELING NOT APPLICABLE
- WATERSHED BOUNDARY
- USFS BOUNDARY

N



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FIRE RISK RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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LEGEND

- HIGH
- MEDIUM
- LOW
- WATERSHED BOUNDARY
- USFS BOUNDARY

N

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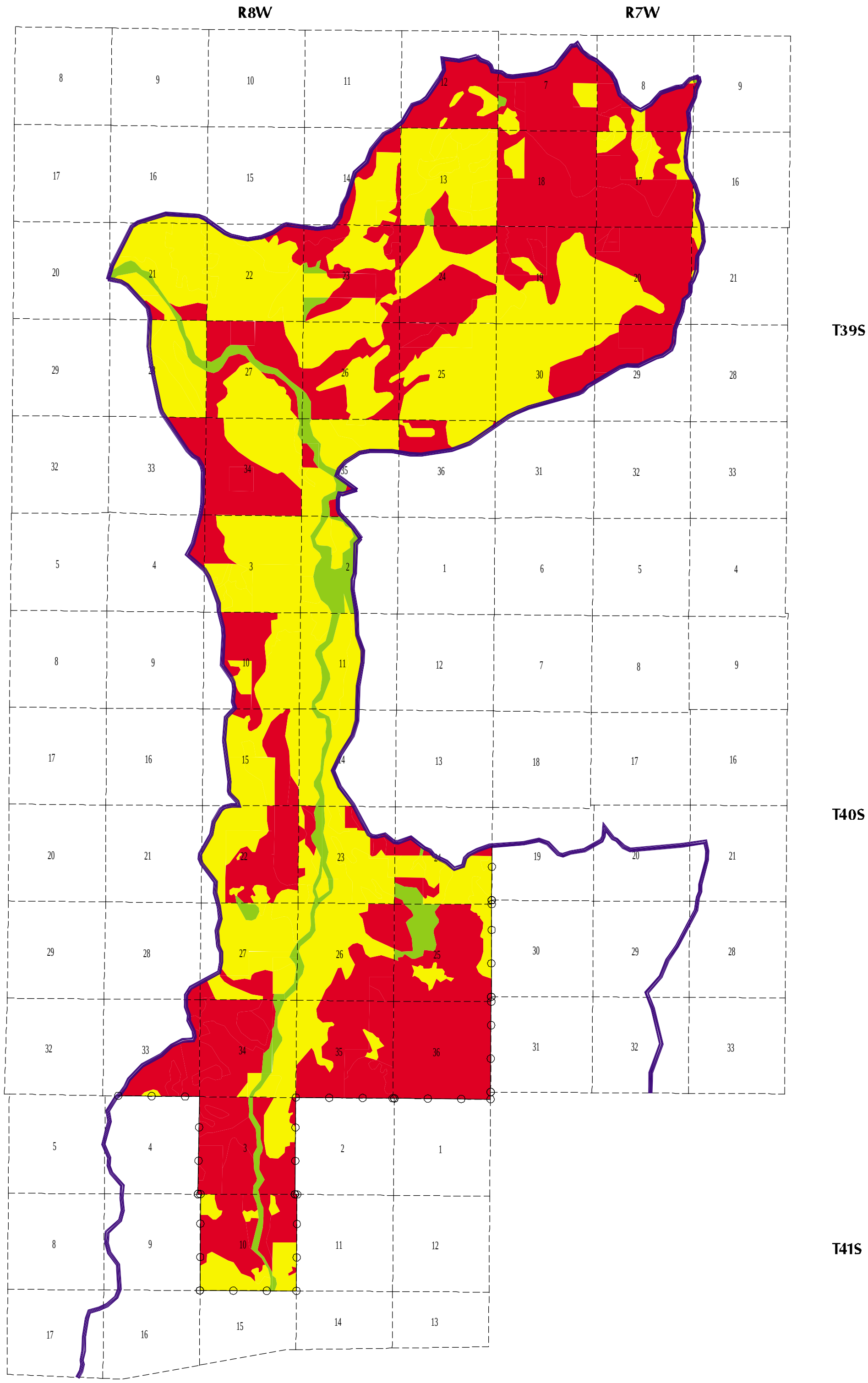

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FIRE HAZARD RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- HIGH
- MEDIUM
- LOW
- WATERSHED BOUNDARY
- USFS BOUNDARY

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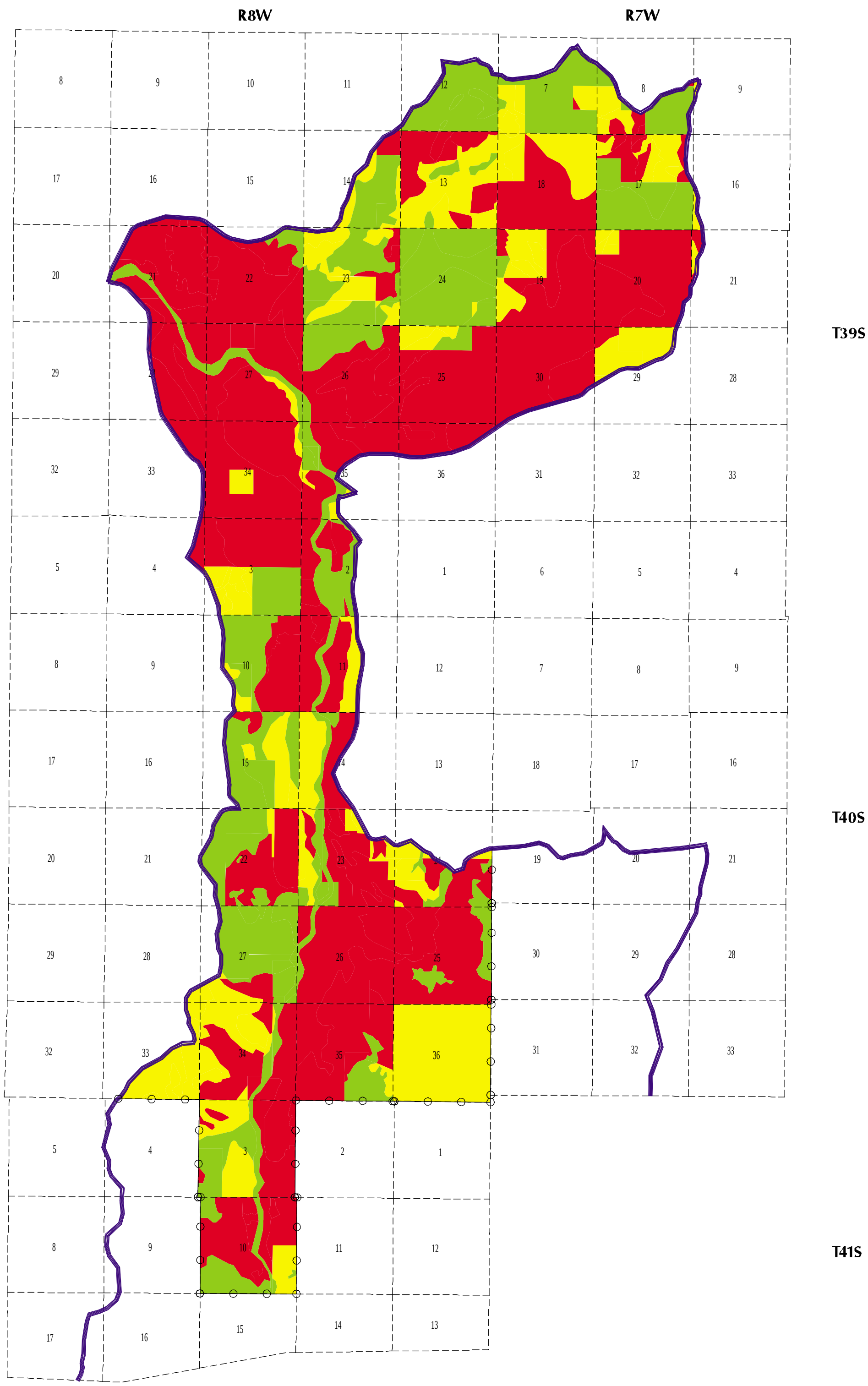

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FIRE VALUE RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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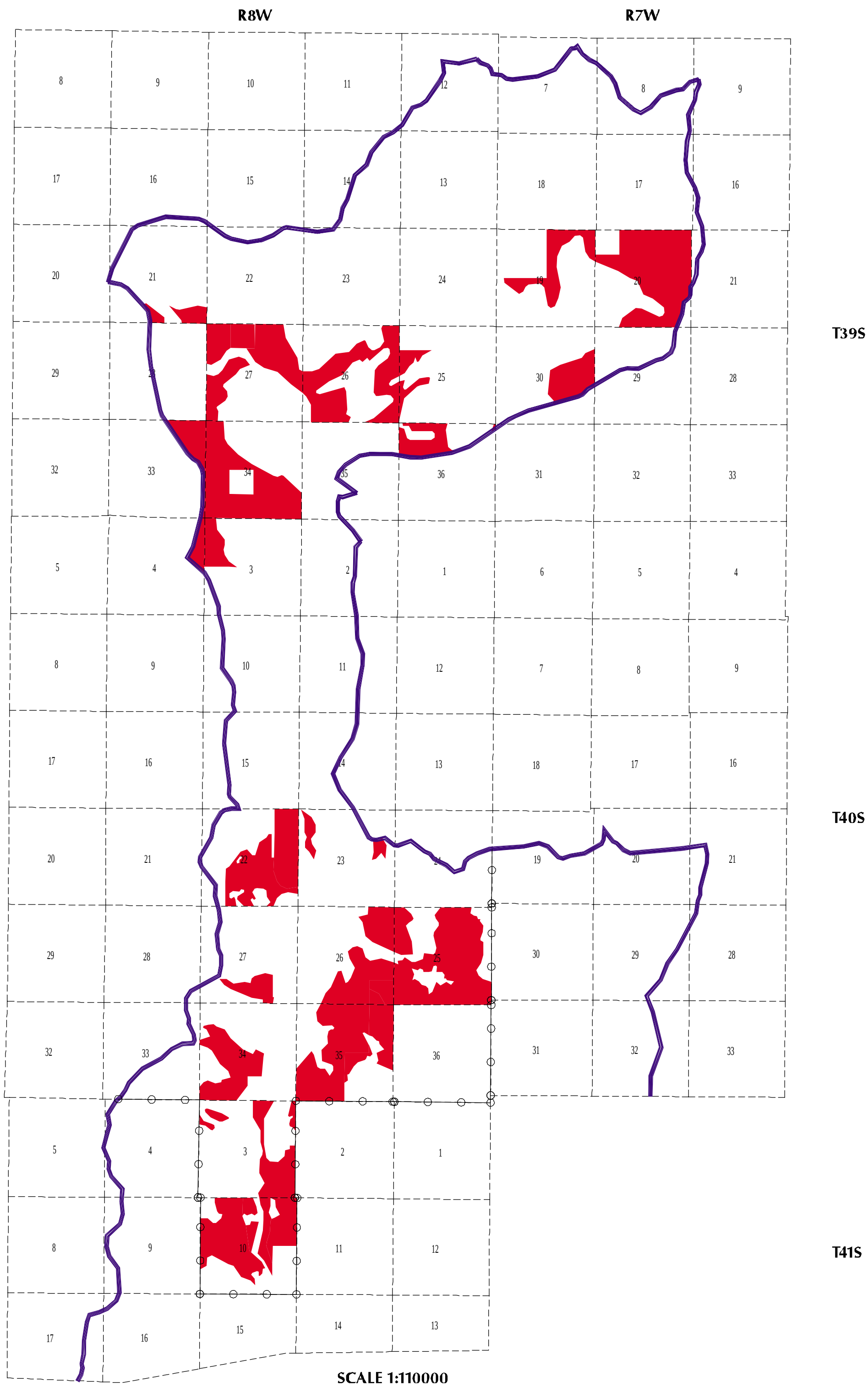
LEGEND

HIGH	WATERSHED BOUNDARY
MEDIUM	USFS BOUNDARY
LOW	

N



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POTENTIAL HIGH PRIORITY
HAZARD REDUCTION TREATMENT AREAS
OUTSIDE THE USFS BOUNDARY
IN THE EAST ILLINOIS WATERSHED

LEGEND

- Areas With High Ratings
- WATERSHED BOUNDARY
- USFS BOUNDARY

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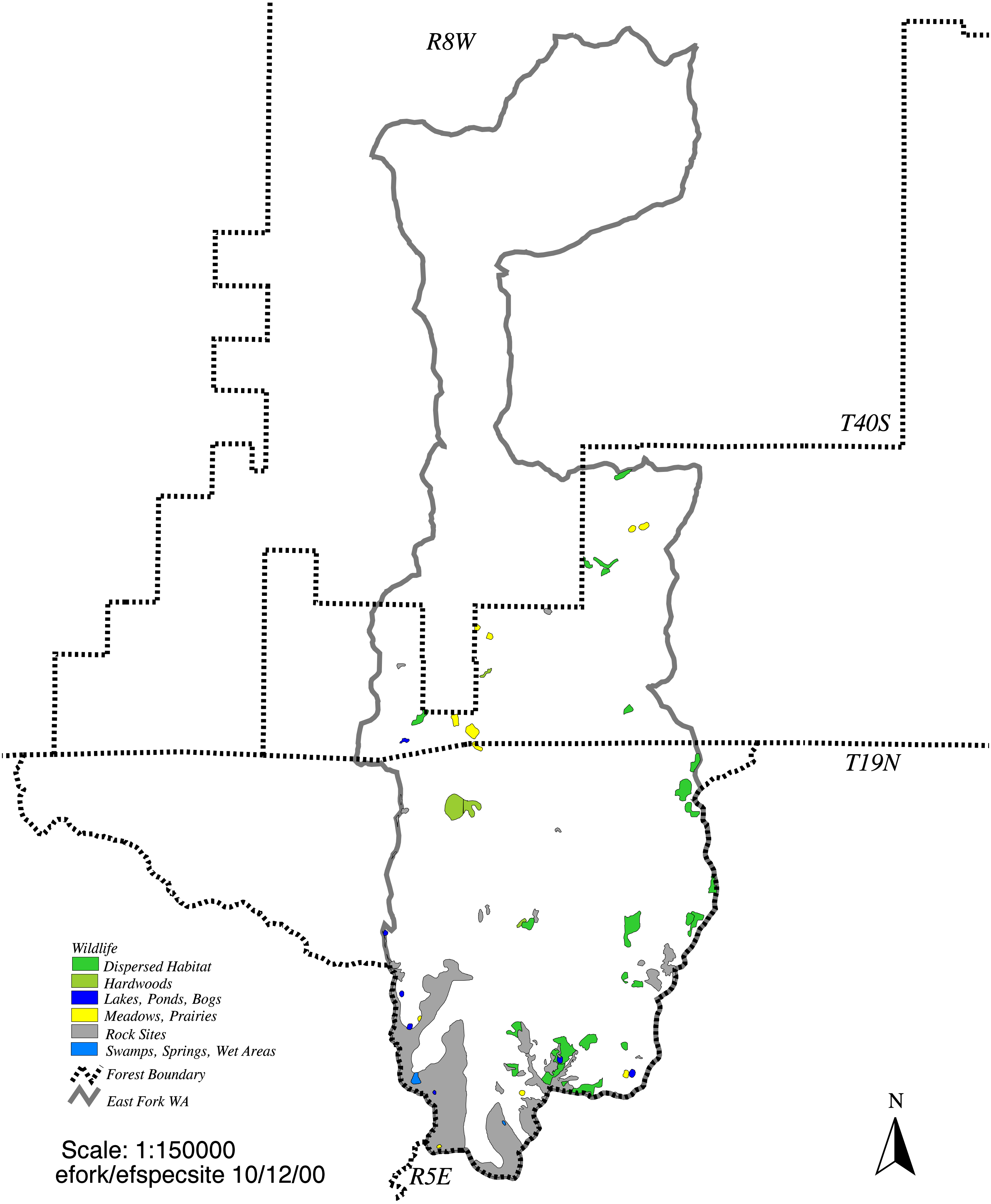
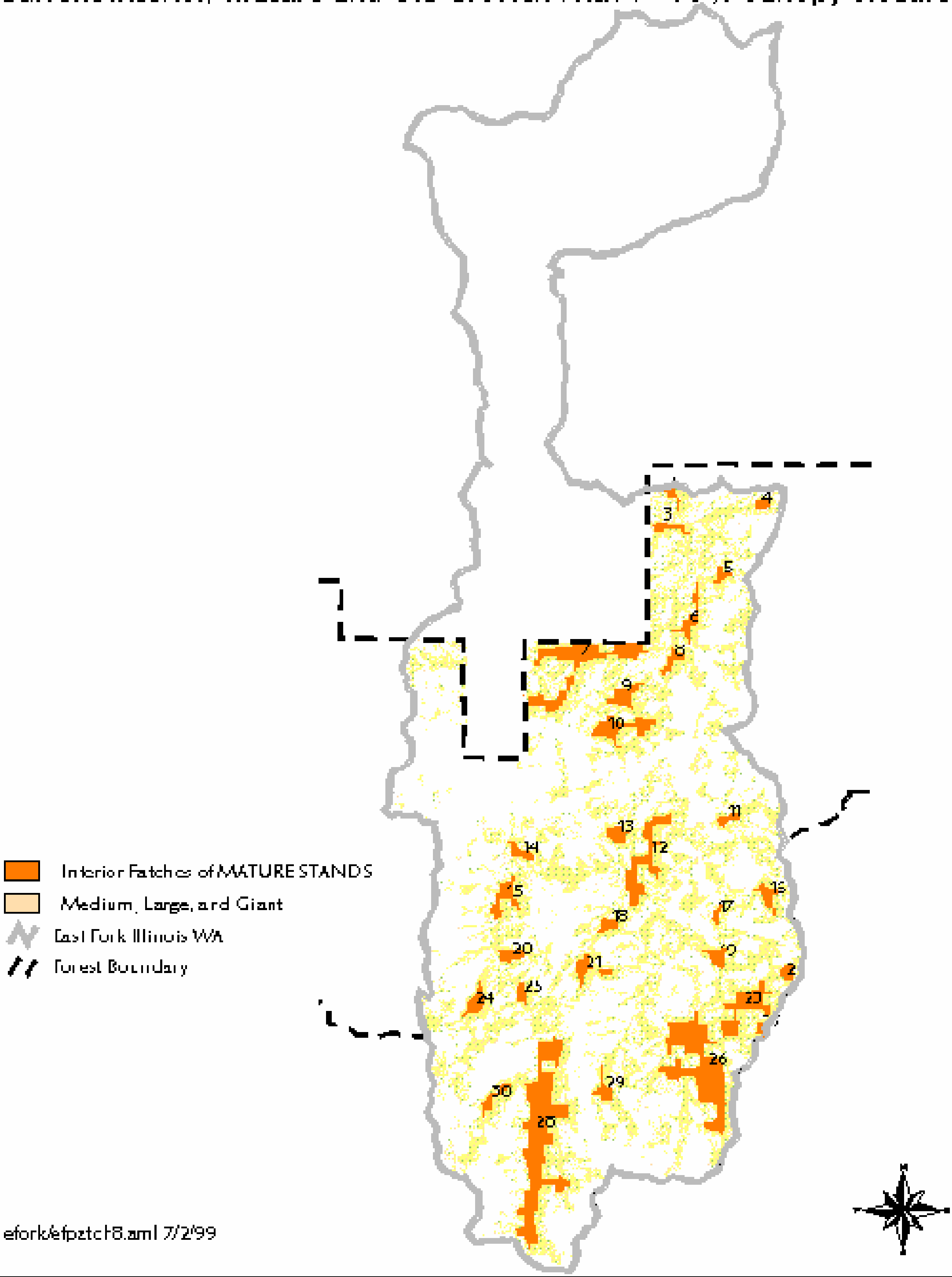
East Fork Watershed Analysis
Special Wildlife Areas



East Fork Watershed Analysis
Current Interior/ Mature and Old Growth with > 40% canopy closure



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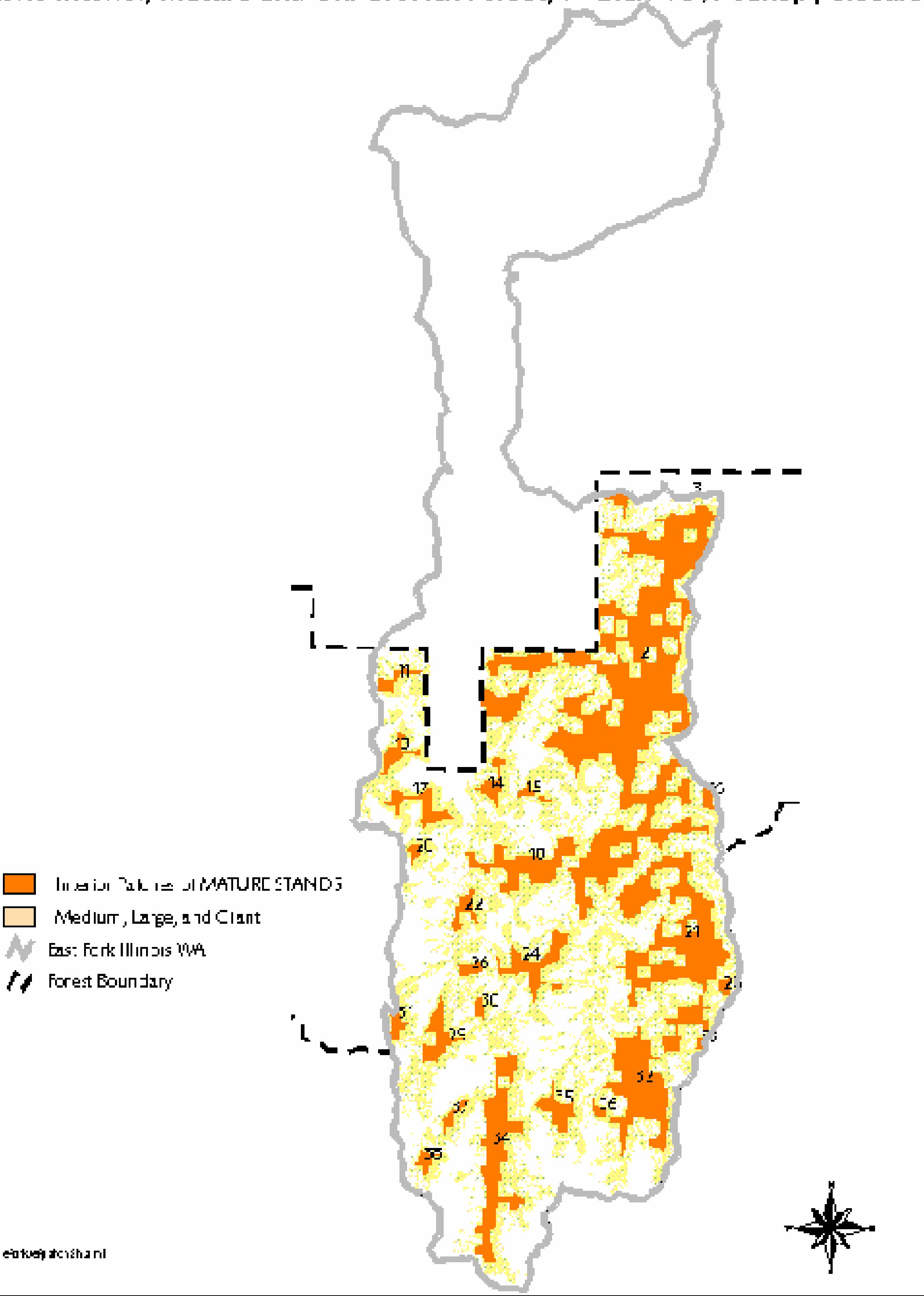
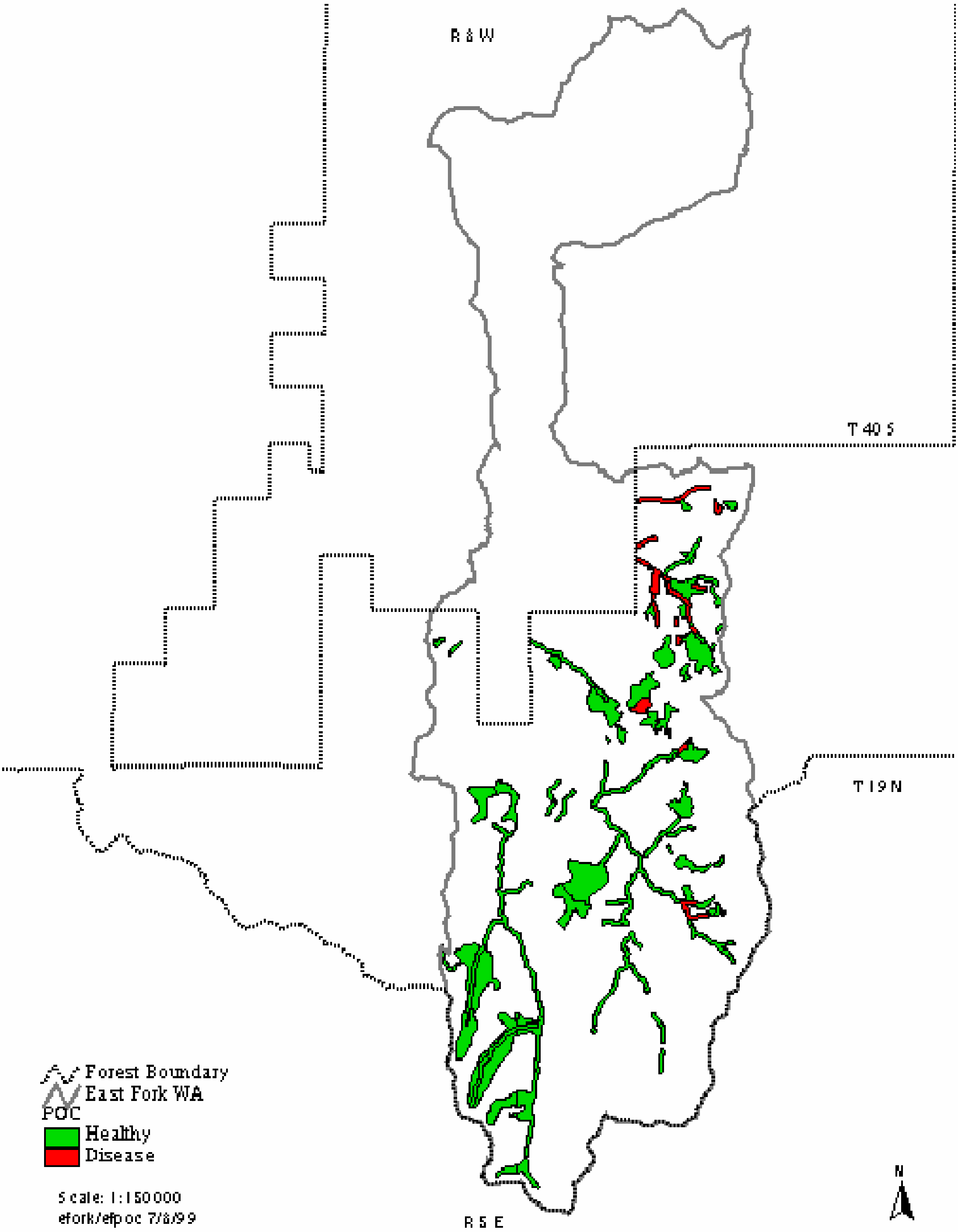
East Fork Watershed Analysis

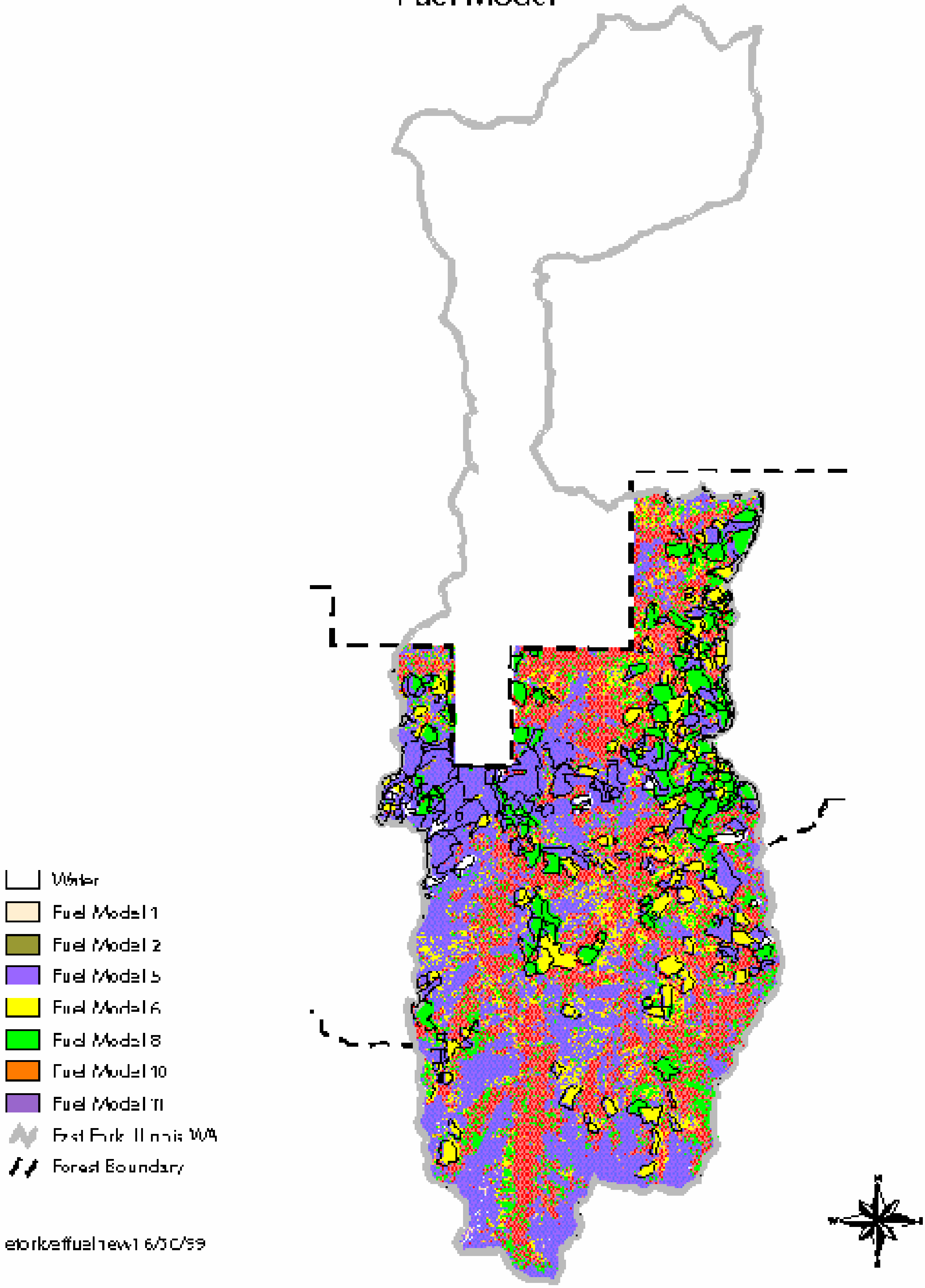
Historic Interior, Mature and Old Growth Forest, > than 40% canopy closure



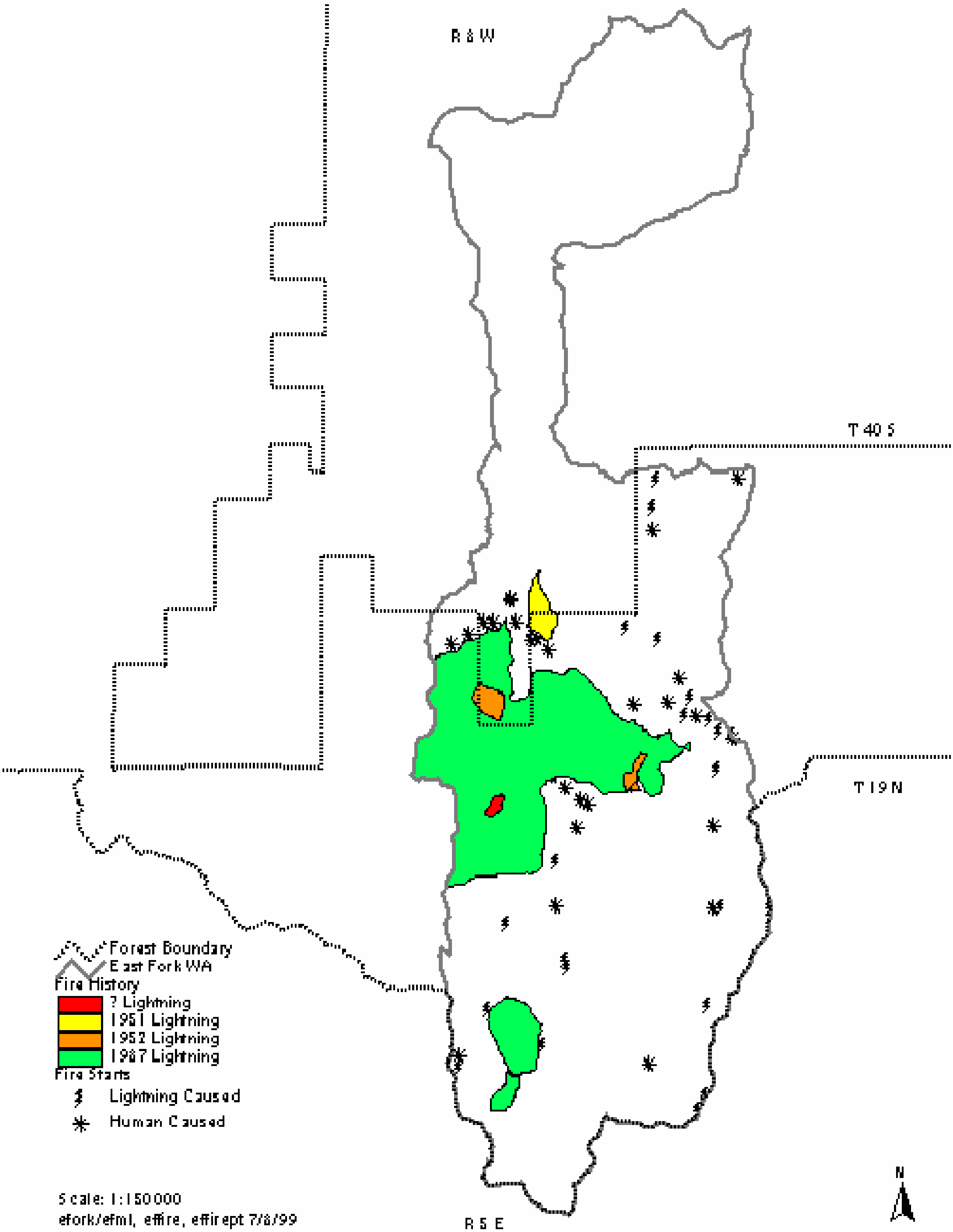
East Fork Watershed Analysis
Port Orford Cedar Detctions & Disease

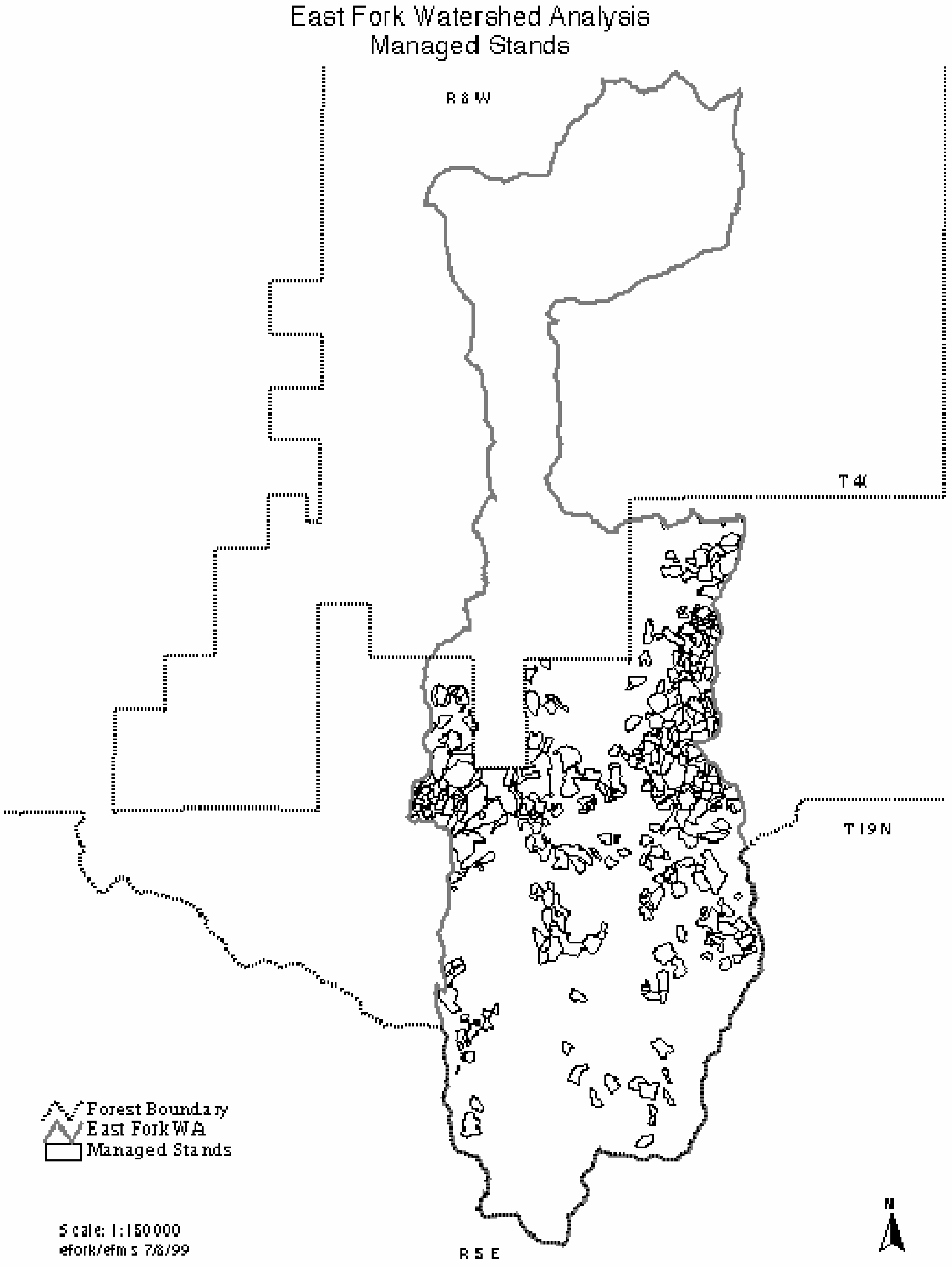


East Fork Watershed Analysis
Fuel Model



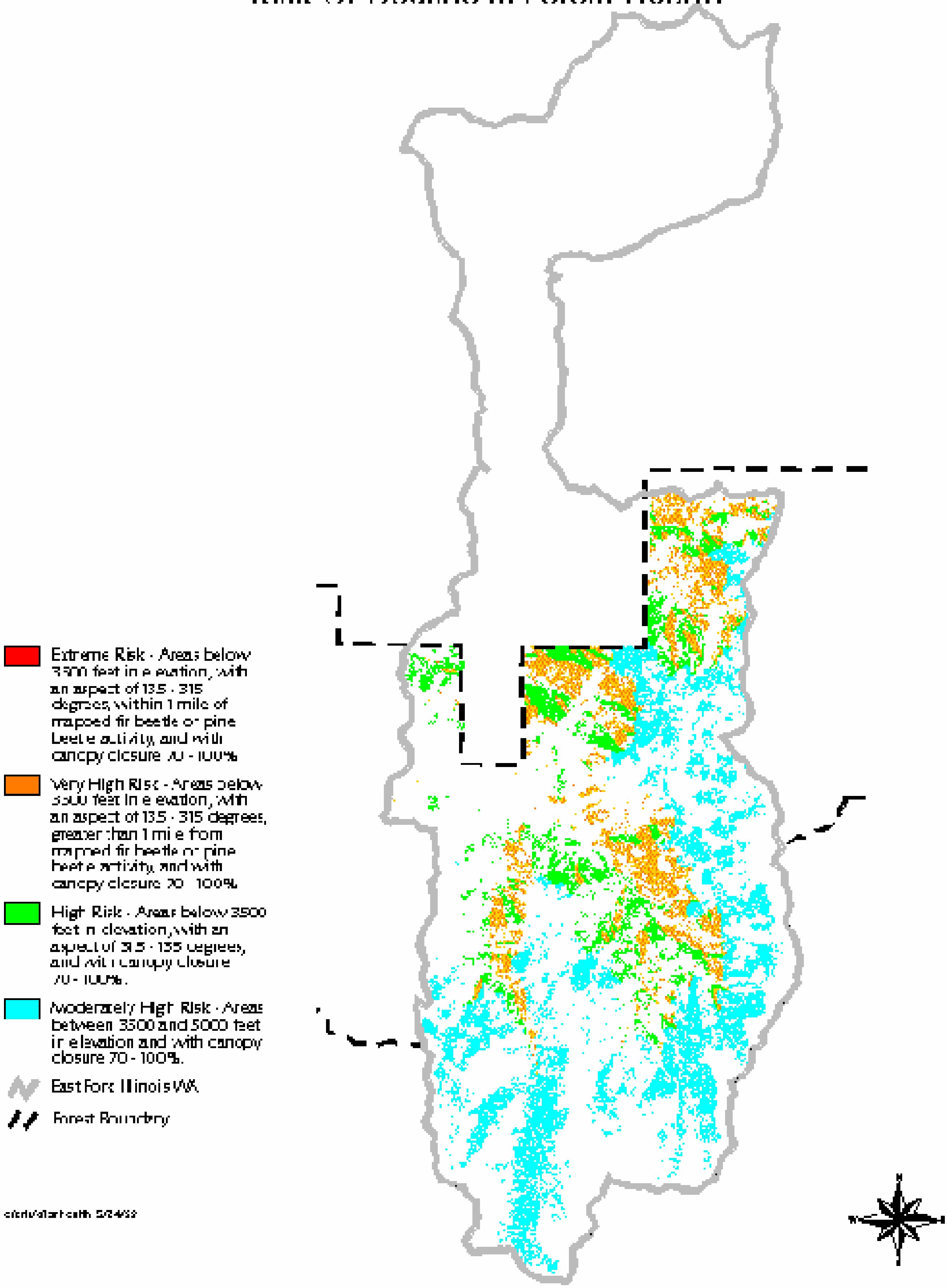
East Fork Watershed Analysis
Fire History



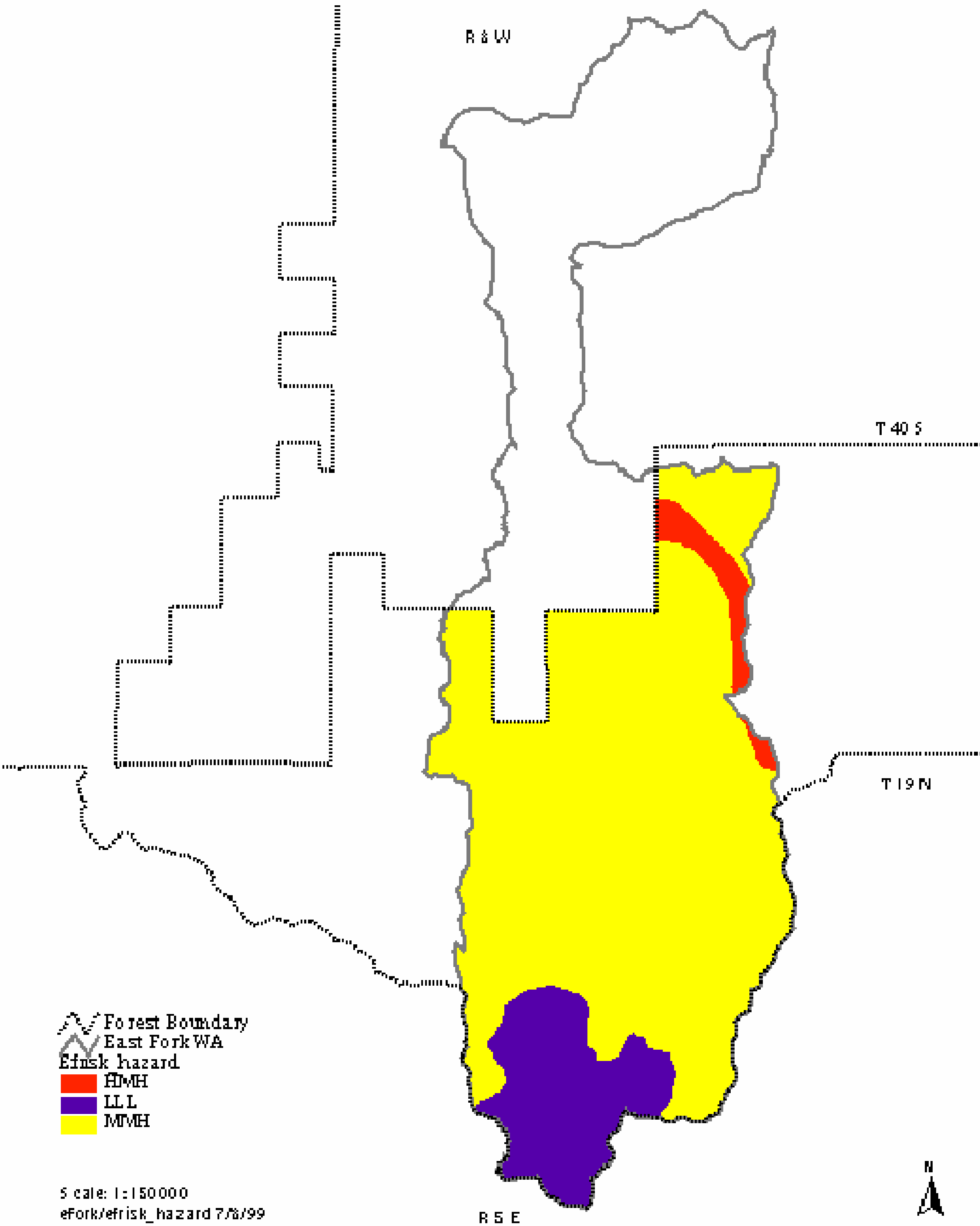


East Fork Watershed Analysis
Managed Stands
R 8 W
T 4(
T 19 N
R 5 E
Forest Boundary
East Fork WA
Managed Stands
Scale: 1:150000
efork/efms 7/8/99
N

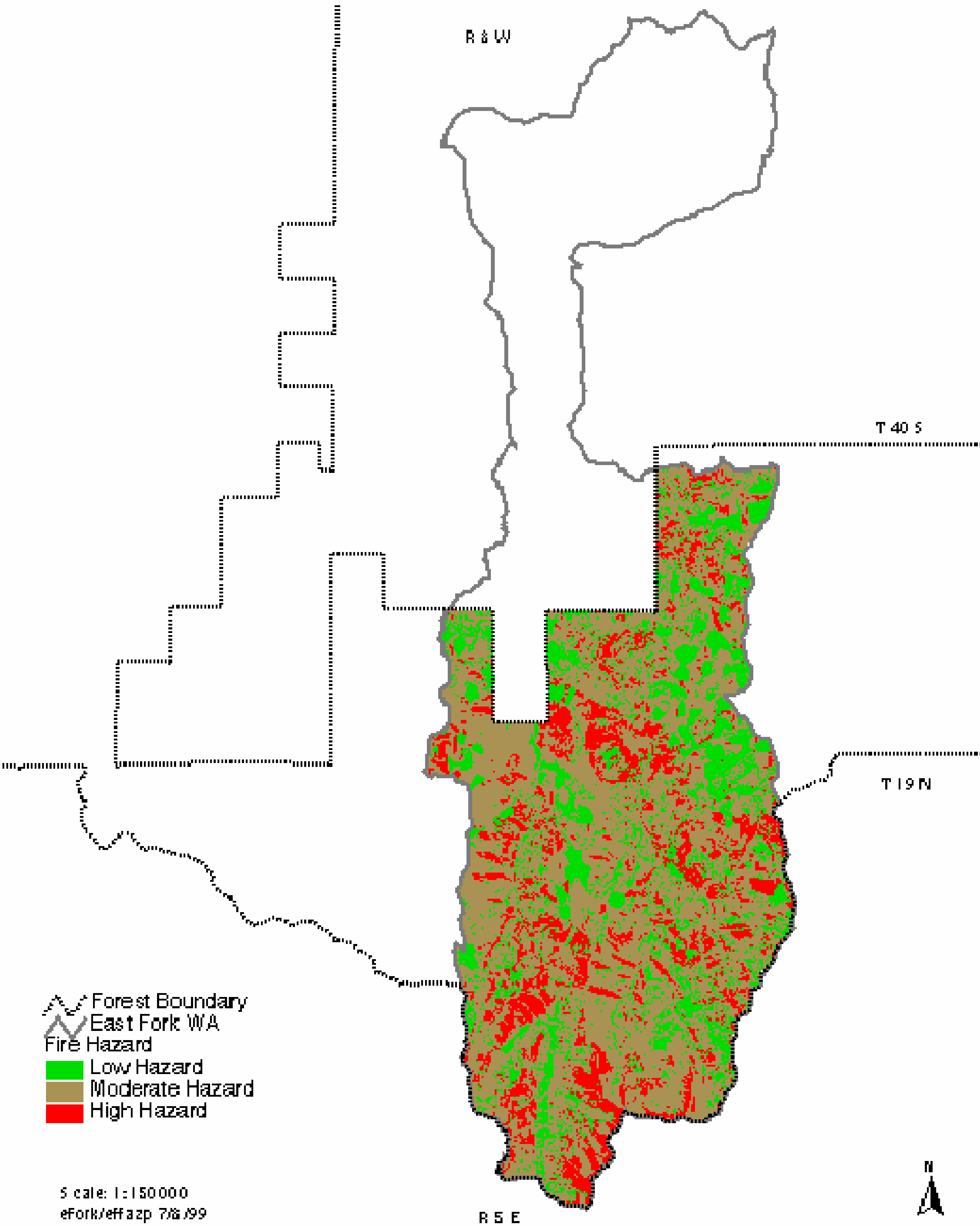
East Fork Watershed Analysis
Risk Of Decline In Forest Health



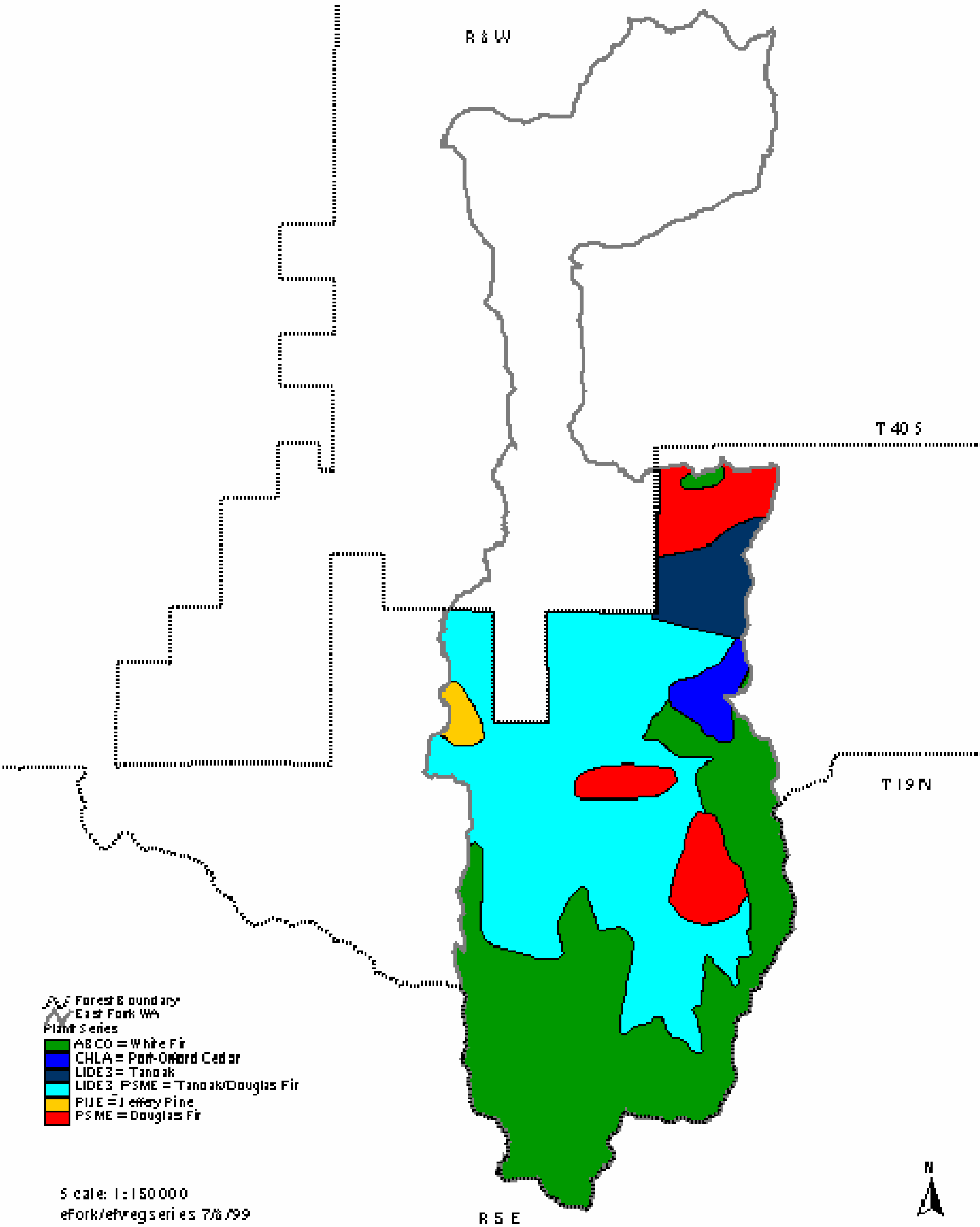
East Fork Watershed Analysis
Wildfire Risk Analysis Map

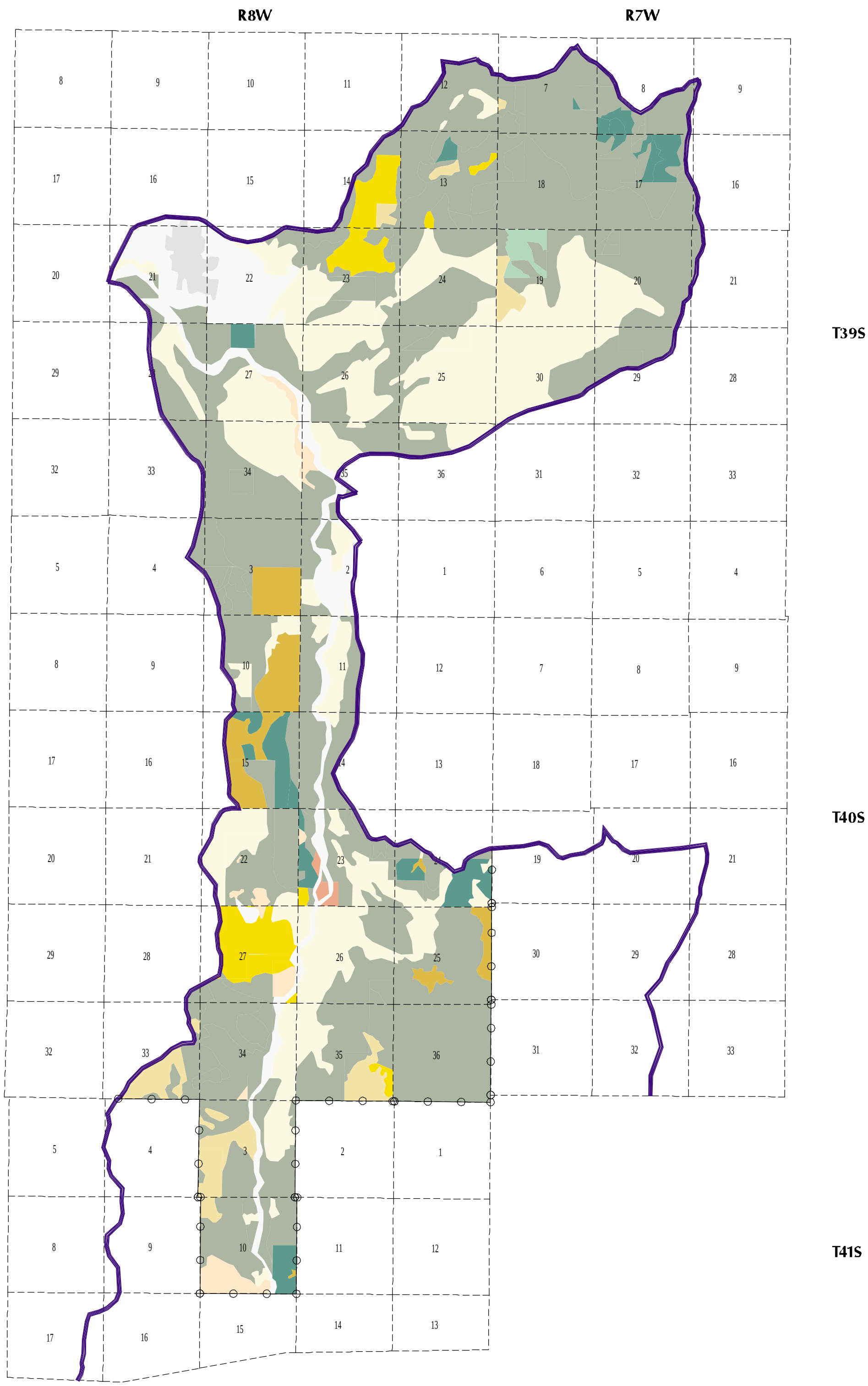


East Fork Watershed Analysis
Fire Hazard Levels



East Fork Watershed Analysis
Plant Series





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DOMINANT VEGETATION ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- NON-VEG.
- DEVELOPED, NON-VEG.
- DEVELOPED, VEGETATED
- GRASS
- SHRUB
- HARDWOOD
- HARDWOOD/ CONIFER
- P.PINE/ GRASS
- J.PINE/ GRASS
- J.PINE/ SHRUB
- D.FIR/ PINE
- D.FIR
- WATERSHED BOUNDARY
- USFS BOUNDARY

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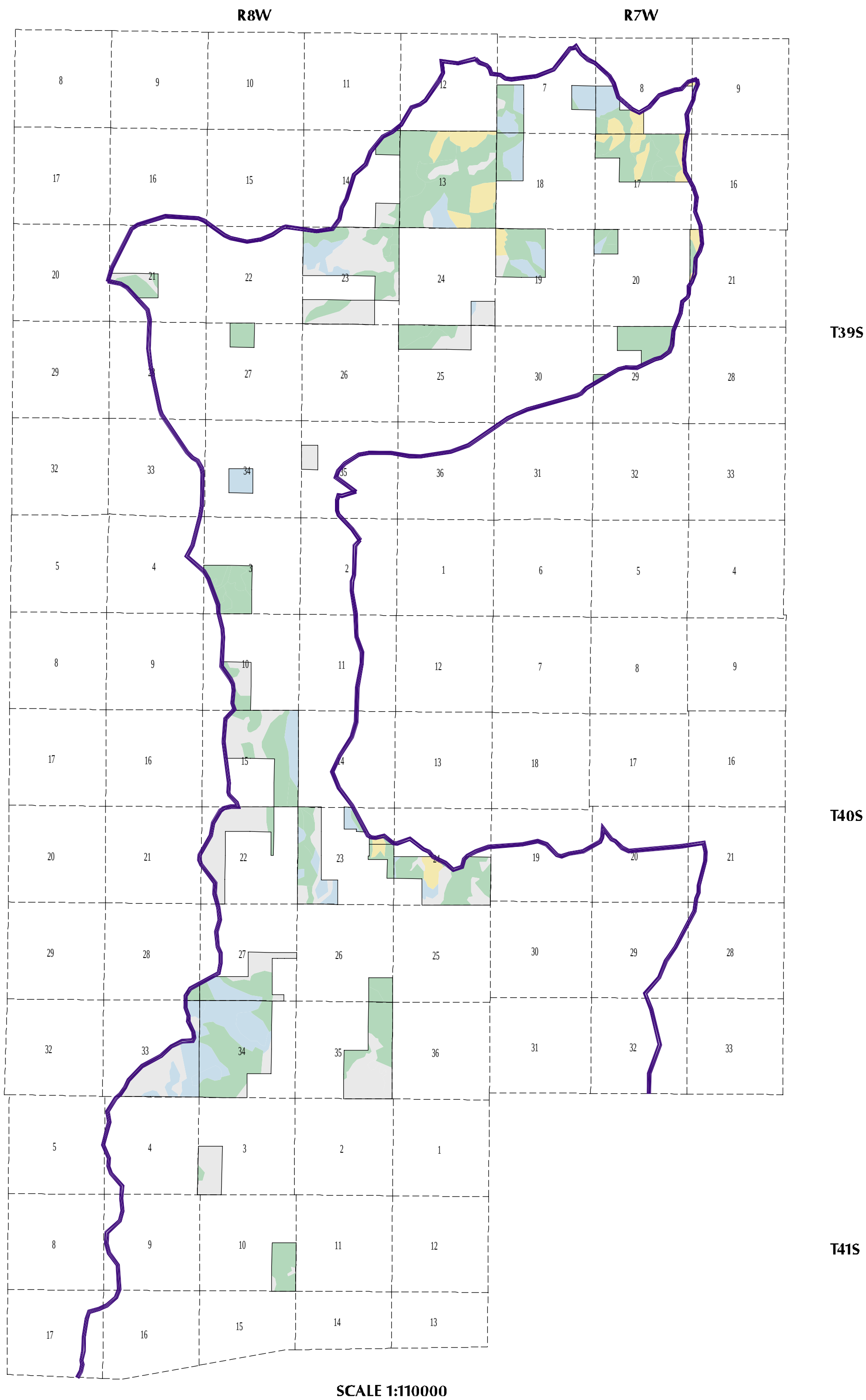

SERAL STAGES
ON BLM LAND
IN THE EAST ILLINOIS WATERSHED

LEGEND

- MATURE
- NOT APPLICABLE
- WATERSHED BOUNDARY
- MID
- EARLY

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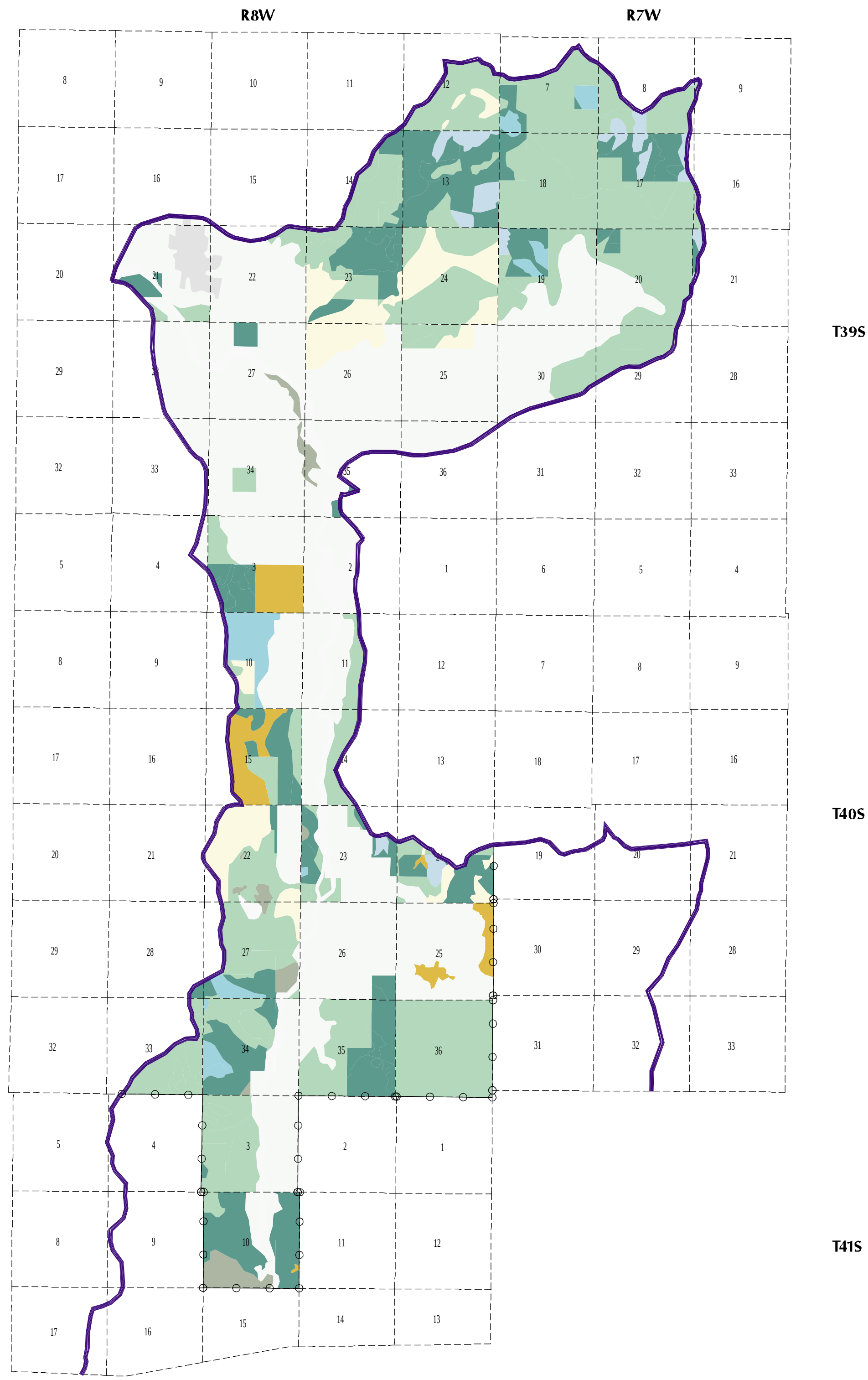

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VEGETATIVE CONDITION CLASS ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

August 1999

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LEGEND

NON-VEG.	GRASS	SEEDLING/ SAPLING	MATURE	WATERSHED BOUNDARY
DEVELOPED, NON-VEG.	SHRUB	POLES		USFS BOUNDARY
DEVELOPED, VEGETATED	HARDWOOD	MID-SERAL		

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EAST FORK OF THE ILLINOIS RIVER

WATERSHED ANALYSIS

AQUATIC MODULE

US FOREST SERVICE
Illinois Valley Ranger District

BUREAU OF LAND MANAGEMENT
Grants Pass Resource Area

JULY 2000

Aquatic Module

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I. INTRODUCTION

The East Fork of the Illinois River watershed is a 57,774 acre fifth field watershed (HUC #1710031101). That portion of it that is within California is a Tier 1 Key Watershed per the Northwest Forest Plan (NFP) designation.

The land ownership in this watershed is characterized by a combination of public lands (including federal wilderness land) and private lands. Also included are portions of the city of Cave Junction, the town of Takilma and agricultural lands. The East Fork of the Illinois River is a major tributary and contributor to the water quality and anadromous and resident fisheries of the main stem of the Illinois River.

II. GEOLOGY

A. Regional Setting

The East Fork Illinois River watershed lies within the Klamath Mountain geomorphic province which includes the Siskiyou Mountains of southwest Oregon and northern California. The Klamath Mountain province is a very old accretion of volcanic, ocean crust and sedimentary rocks that have undergone intense tectonic activity, altering their physical and chemical characteristics. They are widely considered to represent portions of an ophiolite suite (ancient sea floor and/or island-arc volcanic deposits). The structural pattern consists of arcuate bands of rocks trending northeast and convex to the west. The oldest rocks are to the east, with successively younger rock belts to the west. These are bounded by steep, east-dipping and high-angle faults along which older rocks are thrust over younger rocks. Older rocks include the metamorphosed volcanic and sedimentary rocks of the Applegate group and associated ultramafic peridotites and serpentine. Younger formations in the watershed include metamorphosed rocks of the Rogue and Galice Formations. These formations also have associated bodies of intrusive diorite and gabbro. Fossil-bearing, marine sedimentary rocks (sandstone and conglomerate) occur in the western part of the area, and lie, unconformable, over older rocks in the area.

Tectonic activity, including deep burial, uplift, faulting and shearing, concomitant with cycles of erosional processes, has influenced the underlying geomorphic setting. Present geomorphic structure and channel morphology reflect weathering and erosional processes produced from the last few million years of continued uplift, sea level changes, glaciation, and climatic changes. Geology in the watershed is highly diverse, with widely dissimilar rock types located adjacent to one another in complex faulted relationships.

Elevation ranges from 800 feet at the confluence of East Fork Illinois and main stem Illinois Rivers to 5,800 feet at Sanger Peak. Recent alluvial and colluvial deposits of low to moderate steepness dominate both glacially formed upper valleys and lower stream valleys. Steepness of mountain slopes is directly related to erosion resistance of underlying rock types (see Map 6: East Fork Watershed Analysis Percent Slopes). Stream channel morphology ranges from entrenched, deeply incised channels in narrow V-shaped canyons to moderately entrenched streams in broad U-shaped valleys created through glacial action. The course of major streams, such as the main stem East Fork Illinois River and Dunn Creek, are strongly influenced by northeast fault trends. Crosscutting fault trends, large landslide deposits (both ancient and recent), and differing resistance to erosion is reflected in stream channel offsets and diversions.

Four major types of geology are found within the watershed. Magnesium-rich serpentine and peridotite are found in large, discontinuous pockets. The oldest rocks in the watershed are of the Applegate group, divided between metavolcanics (pillow lavas, tuff, breccia, agglomerates and metagabbros) and metasediments (slatey siltstone, argillite, quartzite, phyllite, schist, chert, conglomerate and marble lenses). Metavolcanics occur in large discontinuous pockets and metasediments are found in north/south trending bands east of the river and in the far-eastern portion of the watershed. Galice Formation metasediments (younger than the Applegate metasediments), which include slaty siltstone, sandstone and shale, are found in the extreme southwest corner of the watershed. Minor amounts of gabbro are found in small scattered pockets primarily in the southeast and southwest corners of the watershed. A small granitic (diorite) intrusion occurs near the southeast corner of the watershed, near Page Mountain. The last major geologic component of the East Fork Illinois River watershed consists of alluvial clays, sands and gravels that form a wide band along both sides of the river corridor and constitute two ancient landslide deposits found in the southwest corner of the watershed.

Geology is mapped and discussed as Groups or Formations. The following section outlines a brief description of these rock types and a generalized slope stability description. (See Map 5: East Fork Watershed Parent Materials and Soil Depth). *Geology and Mineral Resources of Josephine County, Oregon* (1979), *Geologic Mapping of the Weed Quadrangle, California* (1987), *Geology and Mineral Resources of Josephine County, Oregon* (1979), *Soil Resource Inventory Siskiyou National Forest* (1979) and *Soil Survey of Josephine County, Oregon* (1983) were used to determine lithology and structural geology of the area. Aerial photographs from 1964 and 1996 were used to interpret and map land forms and stability features.

Applegate Group; 190-150 million years (Ras, Rav):

The Applegate Group consists of moderate to high-grade metamorphosed volcanic (pillow basalts, flow breccias, tuffs) rocks that have locally been intruded by diabase and gabbro. Metasedimentary rocks in the group include argillite, slaty siltstone, chert, tuffaceous sedimentary rock and conglomerate. Contact relationships are complex; both interbedded and faulted contacts are reported. For example, in a rock quarry on Page Mountain, lenses of argillite, greenstone and quartzite were noted either in the field or on quarry drill logs.

Rogue and Galice Formations; metavolcanic (Jrgv) and metasedimentary rocks (Jgs); 160-140 million years:

Volcanic rocks of Rogue and Galice Formations are typical of island-arc volcanoclastic sediments (fragmental textures) deposited in a marine environment. Within the watershed, they have been subjected to low-grade (greenschist) metamorphism. Basaltic dikes intrude along fracture planes throughout the Formation and form discontinuous but resistant ridges and rock outcrops. Sedimentary rocks of the Galice Formation consist of low-grade metamorphosed shales or slates with small amounts of sandstone or conglomerate.

Ultramafic rocks; peridotite and serpentine (Um):

Serpentine (metamorphic), peridotite (igneous), and partly serpentinized peridotite in the watershed are a portion of the Josephine ultramafic sheet. This sheet is believed to represent upper mantle material, or the lowest portion of an ocean floor (ophiolite) sequence, which was emplaced during major tectonic movement. Most of the ultramafic rocks show serpentinization. Narrow bodies and zones of more intense shearing may have complete alteration to serpentine minerals. Near Elder Creek, areas of green, slickensided serpentine are interspersed with reddish-brown peridotite outcrops and soil. The age of ultramafic rocks is uncertain, since there may have been several intrusions of serpentine via faults and fractures. They are most commonly associated with the Triassic Applegate Group.

Granitic Rocks; diorite (di):

The quartz diorite intrusion found at Page Mountain may be related to the Grayback Pluton, dated at 140 - 150 million years. Much of the material is deeply weathered and forms knobs and ridges of low relief. These poorly cohesive soils pose a high hazard for surface erosion, such as debris flows and gully erosion, especially from diversion of subsurface and surface water. The 1997 Forest Flood Report determined that the greatest potential for debris flows occurs in this rock and soil type.

B. Land Forms and Erosional Processes

Structurally, the area represents a long history of faulting, alteration, uplift and subsequent erosion. Although regional geology maps show large blocks of rock types or formations, more site-specific field mapping revealed numerous faults and fractures that juxtapose several differing rock types, often within a few square miles. For example, along road 4808060 in the Dunn Creek drainage, serpentinized peridotite is inter-fingered with metamorphosed volcanic rocks of the Rogue Formation, and cut by resistant dikes of greenstone. North of Crazy Peak, pods of granitic rock are exposed and interspersed with a melange of peridotite and highly sheared metasedimentary and metavolcanic rocks.

Physical and chemical alteration, increased weathering, concentration of groundwater, and deeper soil development often result from pervasive faulting and fracturing of underlying rock. Over eons of uplift, plate tectonics, and climate changes (including several episodes of glaciation), steep slopes have experienced locally extensive, deep-seated landsliding. Mapping from aerial photos of both recent and ancient landslide forms reveals that many recent failures are associated with the toes (deposits) and lateral margins of more ancient forms. Because of the location of slide deposits (often in steep, unstable inner gorges of streams) sediment from these failures can be delivered directly to a stream. In Dunn Creek, for example, ancient landslide deposits (with possible augmentation of glacial deposits) have coalesced along lower slopes. Over-steepened, unstable slopes were created as Dunn Creek and other creeks in the watershed cut through these older deposits, possibly in response to tectonic uplift, changes in sea level, or periods of greater precipitation and runoff.

Ancient landslide forms were also noted in areas underlain by ultramafic rock, especially in sheared serpentine or peridotite that have undergone intense fracturing and weathering. Where deeper soils have developed, they exhibit high porosity but low permeability. Extensive deposits of deep-seated rotational slides and earth flows can store groundwater and may have fens and bogs that develop in areas of high groundwater tables or springs. Seepage from these areas can contribute surprisingly cool water to creeks, even in summer months.

Unstable conditions can also develop along small tributary streams as soils collect and deepen in swales and channels in response to cycles of weathering, soil development, surface erosion and deposition. These areas of less consolidated material are prone to surface erosion from gully formation and soil creep. Past intensive (clear-cut) timber harvest and concentration of subsurface and surface water by roads also change stability parameters. Therefore, numerous landslides that occurred during the 1964 flood are related to changes in both natural events and management activities.

The most common types of erosion processes are debris slides, slumps (rotational failures), and debris flows. Occurrence and timing of these processes can be influenced by humans and/or nature. Debris slides are translational failures (occurring along discrete, parallel planes to the slope plane, as opposed to rotational failures) of debris along relatively narrow zones that break up into smaller blocks as they approach the toe of the slope (*SNF Resource Geology Manual*). An example of this process is the Chicago slide. Rotational slides are most common in deep, cohesive soils. The majority of rotational slides mapped in the watershed are sub- to inactive (Table A-1; See also Map 7: Landslide Points). Several excellent examples of rotational slides are located high on slopes above Dunn Creek.

Table A-1: Landslide Activity Level (modified from SNF Resource Geology Manual).

Landslide Definition	Activity Level	Relative Age
Currently active or active in recent past. May have fresh scarps, tension cracks, or leaning trees indicating recent movement. Unweathered hummocky terrain or terrace-like slopes may indicate recent movement.	Active	Recent Approximately 0 - 20 years
Periodically occurring movement, or landslide features more weathered than Level 1. Leaning or bowed trees with straight growth at the top may indicate no recent movement, or that the slide is temporarily dormant.	Sub-active	Recent Approximately 20 - 50 years
No indication of movement in recent past. Only oldest trees are bowed or bent. Landslide features are well-weathered and revegetated. Field evidence is difficult to interpret. Low probability of reactivation.	Inactive	Old Approximately 100 - 300 years
Ancient, usually large-scale features discernible only from topo maps or aerial photos. Field evidence is obscured by weathering, erosion, and vegetation. Very low risk of reactivation.	Ancient Inactive	Very old Approximately 300 + years

Debris flows differ from translational or rotational slides in that movement is not concentrated along discrete planes. Debris flows often occur in steep upland draws and can entrain or scour out more material as they advance, often going for great distances and causing significant deformation and disintegration of material along the way. Gutted stream channels are often the result of debris flows (*SNF Resource Geology Manual*). Numerous examples of both natural and management related debris flows occur within the Dunn Creek drainage.

Out of 74 recorded recent debris slides or debris flows on National Forest lands within this watershed, by far the majority of them (50) occurred within the Dunn Creek drainage, and most are associated with existing roads (see Map 7: East Fork Watershed Analysis Landslide Points). Within the Dunn Creek drainage, 40% of the slides occurred in either the headwaters or main stem of Dunn Creek. About 15% of the slides were in the North Fork (NF) of Dunn Creek, and 10%

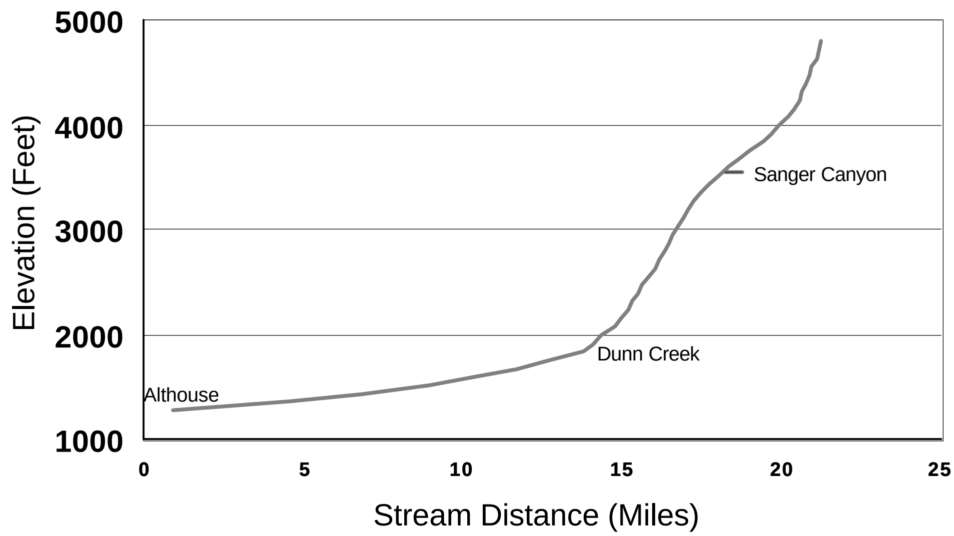
were in the main stem below NF Dunn Creek. Another area of significant past debris slide activity is Chicago Creek/Chicago Peak area, where 10 debris slides were recorded and where the largest slide resides. However, none of the sub-watersheds within East Fork Illinois River watershed seem to be immune to past mass wasting events; sliding activity is evident throughout the watershed. Approximately 90% of the recent mapped failures were not evident on pre-1964 aerial photos. This would indicate that the 1964 flood might have played a major role in mass-wasting events. However, the Longwood fire, timber harvest and road construction have also contributed to these erosion processes.

III. HYDROLOGY

A. Channel Morphology

East Fork Illinois River is characterized as having entrenched, confined streams in narrow V-shaped canyons, to moderately entrenched streams in broad U-shaped glaciated valleys with moderate to steep sided slopes in common association with alluvial terraces (Figure H-1).

Figure H-1: East Fork Illinois River Stream Profile
Beginning at Confluence of Althouse Creek.



The stream profile shows a flat gradient main stem, which steepens at the confluence of Dunn Creek, then flattens for a few miles in the vicinity of Chicago Creek and Sanger Canyon, terminating with a steep gradient within wilderness area. Flat portions on the stream profile, below Dunn Creek, are segments where areas of aggradation are expected. High peaks and upper valleys have been carved by glaciers, as evident by the hanging valleys, cirque lakes and moraines upstream of Sanger Creek. Whisky Lake is a unique feature ponded by a large moraine.

The inner canyon, with occasional generally limits stream width and channel alignment. Substrate is bedrock with large boulders, cobbles, and gravels. A wide shallow stream is generally observed in the wide valley bottoms throughout the main stem below Dunn Creek.

Main tributaries to East Fork Illinois River are Black, Chapman, Chicago, Dunn, Elder, Kelly, Khoeery, Little Elder, NF Dunn, Packers, Page, Perdin, Poker, Rattlesnake, Skag, and Tycer Creeks, Sanger Canyon, Allen, Bybee, Cedar, Long, and Scotch Gulches.

B. Historical and Existing Conditions

About 64% (36,688 acres) of this watershed is managed by Forest Service, and 9% (5,043 acres) by the BLM. The remaining 27% is primarily mixed private ownership and includes portions of the city of Cave Junction and the town of Takilma.

There are more than 350 miles of perennial and intermittent streams in the East Fork Illinois watershed and more than 16,250 acres of riparian reserves (44% of the land area) (USFS PMR data). Approximately 120 miles of these perennial and intermittent streams are on BLM and private lands, including approximately 35 miles of fish bearing streams.

Past mining included placer and lode mining for gold, platinum, copper, and chromium. Some of the historical mines are the Llano de Oro, Esterly, Queen of Bronze, and Waldo mines. Pit mines were common and their effects included removal or stockpiling of surface materials and the loss of vegetative cover. They were, and continue to be, sources for sediment delivery to the streams.

Current mining activity within the watershed includes 19 placer claims (none located on National Forest lands) and 11 lode claims (2 of which are located on National Forest lands) (BLM microfiche, November 1998). Mining is expected to continue. Most of the current mining is recreational and consists of small in-stream dredging operations or upland adits (small tunnels) or pockets (small hand diggings). Large mineral reserves and potential for future commercial recovery still exist, especially in lower East Fork Illinois River.

Mining in East Fork Illinois River watershed began in the 1850s. Areas such as Allen, Sailor, and Scotch Gulches were intensively mined (Ramp and Peterson 1979). Hydraulic mining results in increased sediment loading, entrenchment, lower sinuosity, and channel widening. A system of mining ditches was developed to bring water to hydraulic mine operations. One notable ditch still existing on BLM land within the watershed is Logan Cut, which transports water from East Fork Illinois River drainage to West Fork Illinois River drainage. Along with mining came settlements, road construction, and logging. Some of the initial (late 1800s) significant effects on water quality were due to mining and roads constructed for mining access. Many dredge ponds from mining operations remain on BLM and adjacent private land; Esterly Lakes are a few of the larger ponds. (See Social Module for more mining information.)

By 1940, agriculture, city and rural development land uses dominated the East Fork Illinois valley downstream of Page Creek. Timber harvest and road construction were soon to follow with clear-cut timber harvest on National Forest land beginning in 1948. The 1964 flood widened main stem channels and removed miles of riparian vegetation. The 1987 stand replacing Longwood Fire burned several miles of riparian vegetation on Forest Service Land. There have been no recent stand replacing fires on BLM lands.

A total of 8,552 acres or 23% of National Forest lands and 2,278 acres or about 50% of BLM lands within the watershed have experienced some type of timber harvest activity. Timber harvest and road construction significantly altered the landscape from 1960 through the 1980s. An estimated eight to 50% of the riparian acreage has been affected in any given sub drainage. The 1987 Longwood Fire along with the subsequent salvage was a stand replacement event that affected approximately 25% of National Forest lands within the watershed.

Approximately 331 miles of road are located within the watershed. National Forest lands include 144 (44%) miles, BLM lands 25 (7%) miles, and the remaining 162 (49%) miles are located on private lands. Many of these roads were built for timber harvest access.

Riparian Reserve interim widths for this watershed are those set by the NFP Standard and Guidelines C-30, and, ROD B-9. A site potential tree in the watershed ranges from 150 feet to 210 feet depending on the site. While no changes in the interim widths are recommended in the watershed analysis at this time, individual project planning and site specific analysis would be the context and basis for localized changes of these widths and is anticipated.

Siskiyou National Forest Land and Resource Management Plan (LRMP) guidelines for the East Fork Illinois River riparian reserves are under prescription B: maintain 85% of pretreatment effective canopy on Class I, II, and 70% on Class III streams. Additionally, no more than 11% of the Riparian Area acreage within the planning basin shall be entered per decade (MA11-6) on Forest Service lands. Selection harvest will be the dominant harvest system in riparian reserves on National Forest lands (LRMP IV-15). The BLM's RMP does not include standards and guides of this nature.

The Forest Service and the BLM both adhere to the standards and guidelines of the Northwest Forest Plan (NFP). The NFP guides activities in Riparian Reserves to promote the attainment of the Aquatic Conservation Strategy Objectives.

The current condition of streams and riparian areas within the watershed is generally described as being in various stages of recovery from effects of management and natural catastrophic events. Water temperatures are elevated above historic ranges. Instream water availability is below historic ranges. Stream channels are wider and shallower with less riparian vegetation. Population growth is expected to continue in the watershed which will continue to increase the water demand in the watershed.

National Forest and BLM lands in the matrix land allocation are, in particular, expected to continue to be the sites of various forest management activities including timber production. Within the riparian reserves, recovery of streams towards properly functioning conditions, can be accelerated by using riparian silvicultural techniques such as selective thinning from below, snag creation, leaving large wood on the ground or placing it in a channel. Road restoration options may include storm proofing, road reconstruction or relocation, and decommissioning. Management actions that can help encourage watershed recovery include riparian planting, in-channel restoration, and fish passage improvement. Current and future forest management on federal lands must be designed to meet the objectives of the Aquatic Conservation Strategy (NFP).

While presettlement conditions provide a point of reference for historical conditions, total restoration to these conditions is not possible. To totally restore water quality and channel condition to its' previous morphology, complexity, quality, quantity, and sediment transport regime, land uses and infrastructures such as major road systems would have to be removed and relocated.

KEY QUESTION #A-1: Large Wood

A-1. What are the past and current amounts of large woody material? What processes affect large wood supplies, and where do they occur?

Stream order may be used to classify a stream (Horton 1945). A small, un-branched tributary is a first-order stream; two first-order streams join to make a second-order stream. A third-order stream has only first and second-order tributaries. There is no consistent relationship between stream order and stream class. In general, most of the main stem tributary streams in the watershed are 3rd to 5th order streams (intermediate sized streams) with enough stream power to move and redistribute large wood. In intermediate sized streams, large in-stream woody material strongly influences the morphology of the stream channel and routing of sediment and water, and may be the principle factor in determining the characteristics of aquatic habitats (Franklin et al. 1981). (See Map 28: Stream Orders)

Natural deposits of large wood come from landslides, including debris flows, and direct fall from localized riparian tree mortality. Transport is dependent on stream flow during storm events. Harvest, including salvage, of mature riparian trees have depleted some stream segments of current and future supplies of large wood.

Although the overall historic quantity of large wood in the watershed is unknown, it is known that current levels are lower than levels documented in old growth forest stands. (Swanson and Lienkaemper 1976). Large wood was depleted within the watershed as a result of hydraulic mining, commercial timber harvest, floods, and urban development.

The Longwood Fire and related salvage activity affected current and future large wood supply of Long and Bybee Gulch tributaries. Approximately 50% of Bybee and all of Long Gulch have been depleted of current and near future supply of large wood.

Recommendation: Concentrate future in-stream large wood projects on 4th order or smaller streams. For those on higher order streams, use large whole trees with root wads attached to provide anchoring of the wood.

Recommendation: Apply silvicultural methods in the riparian reserves / riparian vegetation to increase the availability and long-term recruitment of wood of varying sizes (Jimerson 1989). This would improve channel complexity and stability, habitat complexity and productivity for fish, and sediment transport and storage dynamics. Large wood could be imported to streams and/or riparian reserves within Dunn Creek, Long Gulch, and Bybee Gulch tributaries. Other sites may be added after site-specific analysis.

Recommendation: Implement silvicultural methods in riparian reserves / vegetation to encourage the growth of large trees in primary conifer and secondary hardwood vegetation to provide a long-term balanced source of large wood and shade. These prescriptions would include planting and silvicultural practices, *e.g.*, girdling and thinning for density reduction, thinning from below Prescribed burning is also a tool for riparian treatment. Known priorities are on Dunn Creek, Long Gulch, Bybee Gulch, Little Elder Creek, and Elder Creek.

KEY QUESTION #A-2: Sediment Delivery

A-2. What processes deliver sediment and where do they occur?

Sediment delivered to a stream channel may be transported or stored depending on amount, particle size, timing of input and stream flow. Coarse materials transported through the stream changes channel equilibrium through aggradation or degradation. Increased sediment input may cause channel widening, abrading, storage of sediment on flood plains, in gravel bars, and within the channel, causing decreased pool area (Sullivan et. al. 1987).

Sluicing of sediments from one part of the drainage, and the deposition and accumulation of sediments to another part of the drainage, can alter fish habitat. Debris torrents (Dunn Creek), landslides (Chicago Creek slide), surface erosion (especially on lands affected by high intensity burns from the Longwood Fire, and on agricultural lands within the main stem's floodplain), and road-related surface erosion and failures all contribute to sedimentation. Eroding stream banks are also a source of sediment. Stream surveys that evaluate the extent of stream bank erosion have only been completed on portions of the lower East Fork Illinois (main stem) which are agricultural areas. The data indicate 66% of the stream survey area has actively eroding stream banks (ODFW 1994) which is a very high level.

Mining in the watershed has also resulted in increased sediment input to many tributaries. Past hydraulic mining denuded many stream banks which continue to erode. Ditches associated with past mining still exist throughout the watershed. These ditches intercept stream flow and often will fail along the ditch resulting in gully and rill erosion. The failures may be at streams, dry drainages of weak points along the ditches.

Stream sediment dynamics could be returned to a more natural balance by reducing erosion and sediment from roads and recreational trails. An overall reduction of road miles would reduce sediment supplied by transportation system. Total restoration of channel condition to pre-European settlement morphology, complexity, and sediment transport regime, would require removing and/or relocating valley bottom roads and roads occupying historic stream channel flood plains, and mining ditches.

Recommendation: Reduce accelerated and direct erosion from roads and other managed lands by decommissioning unneeded roads (returning those lands to a vegetated condition) and storm proofing "at risk" roads. Special attention for stabilization and restoration of vegetation should be given to slides, skid roads, landings, and other areas resistant to natural re-vegetation. This will restore soil permeability and decrease surface runoff. Where possible, mining ditches should be recontoured at stream draws to restore natural stream drainage.

Numerous opportunities to upgrade and provide additional drainage relief exist including such things as armoring and improving culvert inlet, outlet, and ditch line functions in areas that have been re-vegetated. All culvert replacements affecting or in riparian areas should meet 100 year event flow capacities.

Both the amount and location of disturbance determines what systems are at high risk of sediment delivery. The main stem of East Fork Illinois River below the confluence of Long Gulch is affected by infrastructure and federal, state, county, and private land management activities.

KEY QUESTION #A - 3: Water Quality

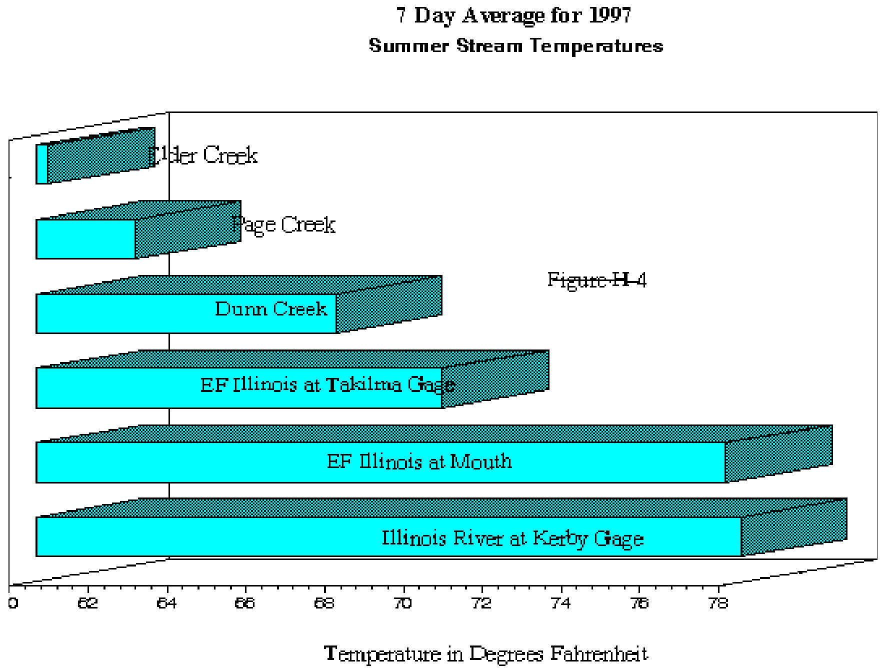
A-3. What is the past and current water quality? What is the expected water quality trend and what processes may affect it?

a. Stream Temperature

Solar radiation is the primary factor affecting summer stream water temperature (Brown 1980). Stream discharge or flow is a factor that may modify the impacts of incident radiation thereby affecting stream temperature (Brown 1980). Stream shading is the amount of solar radiation blocked from reaching the stream by vegetation or topographic features. Stream shade can be lost by natural processes (*e.g.*, fire, floods) or may result from human activities (*e.g.*, harvest, roads, mining). The 1964 flood removed large amounts of streamside vegetation from the main stem of East Fork Illinois River and Dunn Creek. National Forest lands in Long Gulch lost essentially all of its riparian vegetation from the 1987 stand replacement Longwood Fire.

Canopy cover and stream shading by riparian vegetation along headwater streams influences the temperature of fish-bearing streams (Amaranthus et. al. 1989). When under stress from water temperatures exceeding 70EF, salmonid fish populations may have reduced fitness, greater susceptibility to disease, decreased growth and changes in time of migration or reproduction. Growth begins to decline and eventually ceases as water temperature approaches the upper lethal limit of 75EF (Beschta et al. 1987). Summer peak stream temperature for East Fork Illinois River ranges from 73E to 81EF (Figure H-2).

Figure H-2: 7 Day Average Summer Stream Temperature.



The applicable State water quality standard for temperature is OAR 340-041-0365(2)(b)(A). Under this standard the seven day moving average of the daily maximum shall not exceed 64EF unless under a Oregon DEQ approved Water Quality Management Plan (WQMP).

The main stem of the East Fork of the Illinois River from the mouth to the California border is listed on the 1998 Oregon List of Water Quality Limited Water Bodies 303 (d)(1) as water quality limited due to summer stream temperatures (a 7-day average high stream temperature greater than 64EF). A WQMP for East Fork of the Illinois River is scheduled for development in the year 2000. Dunn Creek has been similarly listed for stream temperature from its confluence with East Fork Illinois River to its headwaters and will be included in the East Fork Illinois WQMP.

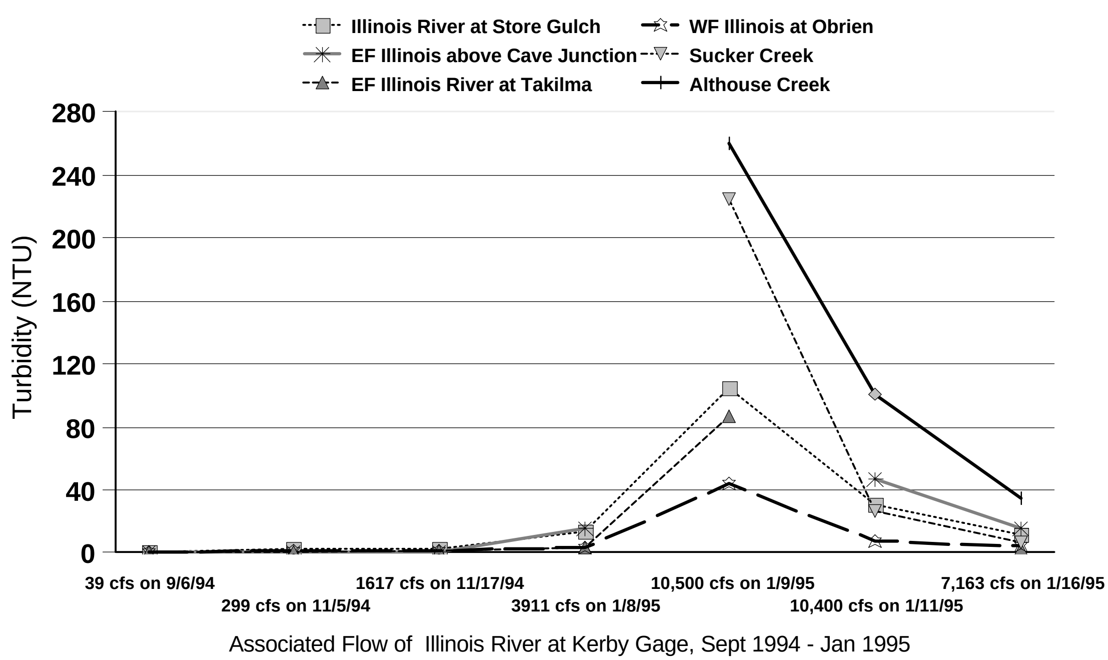
Low elevation streams within this latitude often have summer water temperatures that exceed state 303 (d) standards. An analysis of Lawson Creek on the Gold Beach Ranger District (Park 1993), for example, concluded that *historic* stream temperatures were above current state standards. It is expected that the East Fork Illinois River is similar to Lawson Creek in that pre-managed historic stream temperatures exceeded current state standards in the main stem from the mouth upstream to some unknown point in the drainage. However, it is suspected that the East Fork Illinois River currently has a temperature range higher than historic water temperatures due to: a) the amount of water withdrawals for domestic and irrigation use, b) the current vegetative conditions of some riparian reserves, c) mining, and d) the transportation system maintained throughout the main stem system. Alterations of riparian vegetation have been caused by road construction, timber harvest, mining, agricultural and urban development, wildfire, and flooding from storm events.

Recommendation: To reduce stream temperature implement riparian silvicultural techniques including thinning and planting to encourage mature riparian vegetation where appropriate. Maintain riparian health with low intensity under-burning at historic fire levels. Return abandoned transportation system within riparian reserves to vegetative-productive conditions. Implement better management of water withdrawals to minimize the effect on instream flow levels and water quality.

b. Turbidity

Turbidity is an indicator of suspended sediment or dissolved solids moving through the system. The relatively low levels of turbidity in both the East and West Fork Illinois River main stems are indicators of low to moderate amounts of fine suspended sediment and dissolved solids (Figure H-3).

Figure H-3: East Fork Illinois River Turbidity Measurements from Sept 1994 to Jan 1995.



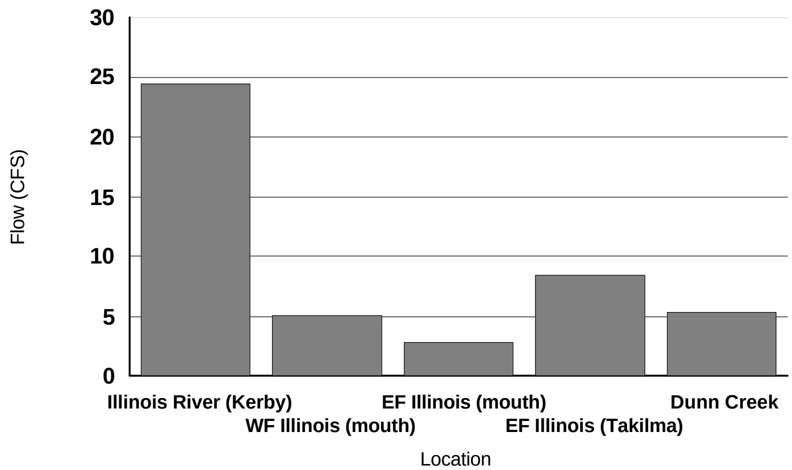
Turbidity was sampled and measured during the 1995 wet season. Figure H-3 compares two locations on East Fork Illinois River (one near the mouth and the other approximately 4 miles above the mouth) with sites on the main stem of the Illinois, West Fork (WF) Illinois, Althouse, and Sucker Creeks. When flows rise above 10,000 cfs, turbidity is 80 times background levels. Althouse and Sucker Creeks, tributaries to East Fork Illinois River, can have turbidity values 3 times greater than the East Fork Illinois River during storm related flows. Therefore, Althouse and Sucker Creeks contribute to increasing turbidity in the East Fork Illinois River. Similarly, WF Illinois River has half the turbidity values of East Fork Illinois River and is improving overall water quality for the parameter of turbidity in the Illinois River main stem.

c. Water Quantity

Droughts and floods have the potential to change the magnitude and frequency of stream flow. Southwest Oregon experienced a drought cycle from 1985 to 1992. Lower than average flows were recorded in East Fork Illinois River watershed during these years. The flood of 1964 had dramatic site-specific effects within the watershed.

The main stem of the East Fork Illinois River from the mouth to the California border was listed on the 1998 Oregon List of Water Quality Limited Water Bodies 303 (d)(1) as water quality limited for flow modification (Figure H-4).

Figure H-4: Illinois River Summer Low Flows for 1992.



Summer low flows are much lower than average winter low flows largely due to precipitation patterns in the Pacific Northwest. This is compounded by the seasonal demand for domestic water and agricultural water use. Most of the precipitation occurs between November and March. Records of East Fork Illinois River show the stream being dry during summer months downstream of large diversions and summer low flows dropping down to 3 cfs.

The demand for water use on the East Fork Illinois River exceeds the continuous flow requirements (Water Resources Dept 1999). Existing allocated in-stream water rights are as follows: on the mouth of the main stem of the Illinois River a continuous flow of 208 cfs; 80 cfs for the mouth of East Fork Illinois River; and 4.6 cfs for East Fork Illinois River at Takilma. These in-stream water rights are essential for providing water for fish, wildlife and recreation. Whether these in-stream water rights will be met depends on the precipitation in a given year and the priority date.

Communities in the Illinois Valley depend on water provided by East Fork Illinois River. The municipal water supply for Cave Junction comes from groundwater (1.6 cfs from wells). Surface water comes from East Fork Illinois River (3 cfs water right). Approximately 5,300 acres of agricultural land, predominantly pasture grass and hay, is irrigated within the East Fork Illinois River drainage area. Other consumptive uses include domestic, municipal, and industrial use.

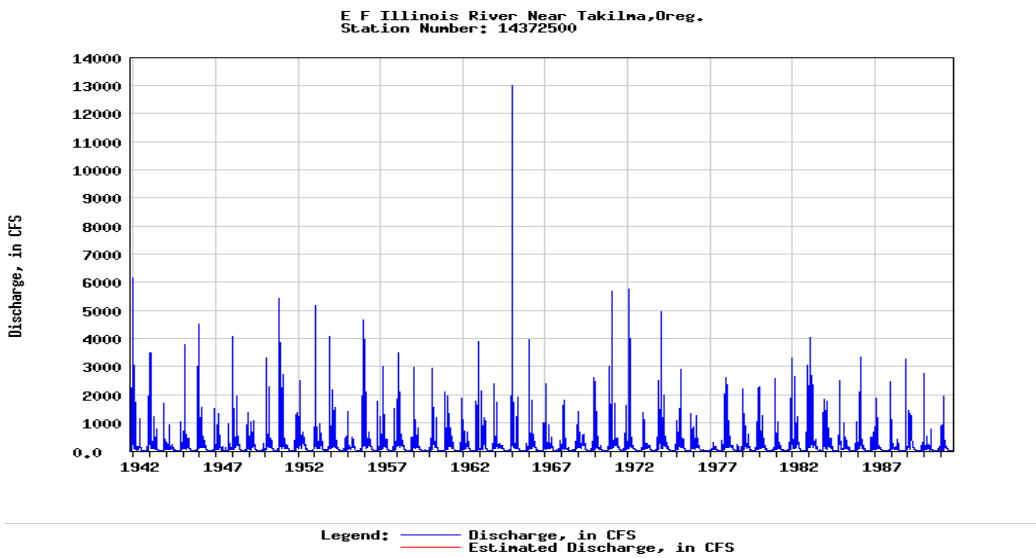
There has been no significant change in water rights for East Fork Illinois River watershed since 1983. In 1983, 578 cfs of a total of 699 cfs in water rights were mining water rights (typically winter season use). In 1999, 597 cfs of a total of 698 cfs in water rights were industrial water rights (mining not separated from other industrial).

There are four gravel push-up dams in the East Fork Illinois River watershed. These gravel push-up dams are fish barriers during low flow (ODFW 1999). Use of these dams is less efficient than other means of water withdrawal because they remove water from the stream, send it through a system of ditches where evaporation and warming occurs. Water is then withdrawn from the ditches and the rest is returned to the stream.

Josephine County's estimated growth during the past decade was 15% (USDA 1996). With continued population growth the demand on East Fork Illinois River as a supplier of domestic water source will also grow.

A gaging station was established in 1926 in Takilma. The drainage area for this gage is 42.3 square miles. A maximum discharge of 15,700 cfs (14.9' gage height) occurred Dec. 22, 1964 (100 yr flood) (Figure H-5).

Figure H-5: Historical Streamflow Daily Values for EF Illinois River near Takilma



Normal winter stream flow and velocity of the East Fork Illinois River is moderate due to the estimated average of 45 to 100 inches of rainfall during non-drought years. Winter flows range from 100 to 4,000 cfs during one to four year storm events. Typical average winter stream flows are insufficient for moving bedload sediment through the lower reaches of due to its current widened and flattened condition. Aggradation is common on localized low-gradient reaches. Summer flows occasionally go subsurface in these areas. The stream head-cuts and braids through islands of sediment and recovering vegetation until a major storm event, like the 1964 flood, widens the channel and moves sediments and streamside vegetation downstream.

Increases in water yield (low and peak flows) can be associated with forest management activity. Road surfaces and cut slopes intercept water, and road ditches act as intermittent streams transporting water more rapidly than natural subsurface processes. This can change timing and increase the size of peak flows. The potential for effects from increased peak flows are greatest in areas where road density is high and roads are located in riparian reserves.

The effects of roads on the hydrology in the watershed can be inferred from work done by Megahan (1988). Megahan measured subsurface flow interception by roads constructed on steep granitic slopes in Idaho and found that prior to logging, the total volume of water intercepted by roads averaged about 35% of the total runoff for perennial study watersheds. This runoff is estimated to be 7 times the amount of accelerated, direct runoff from roads, which is caused by precipitation (rain and snow melt) falling directly on roads. Post logging subsurface flow intercepted by the road was estimated to exceed direct road runoff by a factor of 18.

The actual effect that harvest and road construction has had on timing of peak flows the within East Fork Illinois River watershed is unknown. However, any changes in the flow resulting from management activities would most likely occur on small streams directly below areas that have been heavily managed. If any changes from historic stream-flow timing and quantities have occurred, they are likely to continue because of the amount of acres in recovering managed stands and miles of road in proximity to streams (excess runoff, stream confinement, and accelerated water velocity).

Within federally managed lands, Chicago, Dunn and Elder Creeks are the drainage areas most affected as they have the highest road densities in conjunction with high harvested acres. Although Long Gulch has the most affected riparian system, these effects are primarily due to the stand replacement Longwood Fire in combination with from harvest and roads. It is not currently possible to separate the effects of wildfire from those of past management activities in Long Gulch.

Historic mining ditches continue to affect water quantity in the East Fork Illinois River watershed due to diversion and evaporation. These ditches continue to intercept water from perennial and intermittent streams and transport it out of the drainage and watershed. Logan Cut, a ditch originally created to transport water from East Fork to West Fork Illinois, is still intact and continues to transport water out of East Fork Illinois River watershed.

The transient snow zone in this watershed extends from 2,500 to 4,000 feet elevation. Approximately one-third of the East Fork Illinois River watershed lies within the transient snow zone.

Increases in water yield are associated with large wildfires (Amaranthus et. al. 1989) and timber harvest. Both reduce the level of evapotranspiration by reducing the amount of live vegetation thereby increasing runoff and stream flow. The 1987 Longwood fire may continue to affect tributary summer flows in Longwood and Bybee Gulch.

<u>Recommendation</u>: In conjunction with the DEQ, complete a water quality management plan for the East Fork Illinois River watershed. (Tentatively scheduled for completion in 2003.) Encourage push-up dam removal and support the use of other more efficient methods of water withdrawal, such as infiltration galleries and direct pumping.

<u>Recommendation:</u> Further evaluate the hydrologic effects of roads and other openings in the transient snow zone area.

KEY QUESTION #A-4: Channel Morphology

A-4. Has channel morphology changed from historic conditions? What are the expected trends?

Channel morphology has changed from historic conditions. Mining in the 1850s heavily impacted portions of the watershed. Hydraulic mining in EF Illinois River watershed altered channel morphology. Lateral stability changed due to removal of riparian vegetation. Floodplain connectivity was lost and sediment load increased. After mining activity declined in the watershed, much of the landscape had time to begin restoring itself. The next major disturbance came with timber harvesting which began in earnest in the late 1940's. While aerial photos from 1940 do not depict presettlement conditions, they do provide historic information about the watershed conditions at that point in time. (see Social Module).

A comparision of aerial photograph taken in 1940, 1964, and 1996 confirms that a general widening of the channel has occurred on the main stem of the East Fork Illinois from the mouth to Sanger Canyon, and also on the main stem of Dunn Creek from its confluence with the East Fork Illinois River to its headwaters. This was primarily due to debris flows generated during the 1964 flood that caused channel scouring and deposition, and removal of streamside vegetation. Because stream morphology is highly dependent on large wood, the trend since 1964 towards full recovery is hampered by a lack of current and future large wood supply on 4th order and smaller streams. Partial recovery is also limited by the current transportation system where it encroaches or confines 5th and 6th order streams. This is because stream morphology is highly dependent on flood plain connectivity, confinement, and sinuosity. Flood events of a magnitude similar to the 1964 flood will occur in the future and similar results are predicted.

The channel of Chicago Creek has been altered at and above the mouth due to combined effects of flood, timber harvest, and road management. Aerial photographs from 1964 confirm the stream has become wider and shallower in the vicinity of Chicago Slide. The vicinity of Chicago slide was noted on historic photos as a steep, unstable slope, possibly underlain by poorly consolidated glacial deposits. Lower slopes have hummocky terrain and benches. Road construction may have undercut unstable slopes and diverted ground and surface water. The recent failure may be attributed to natural instability, compounded by road construction and the sudden aggravation of the 1964 flood. Numerous small debris slides and debris flows off the road system are also evident on the 1964 aerial photos. Slides are currently aggravated by storm event high flows in a tributary that has naturally flashy run off due to the predominately rocky nature of its headwaters. The expectation is that the slides will continue to be aggravated by high flow events until soils are eroded to bedrock.

The reaches of the East Fork Illinois River, from the mouth up to Long Gulch and all the confluences with each of the tributaries, have been appreciably altered by roads, agriculture land, and housing developments. Continued population growth should be anticipated in the watershed. These will continue to provide increasing pressure on the watershed’s systems and resources in the future.

GENERAL QUESTION #A-1: Historic Disturbance Patterns

A-1. What are the historic disturbance patterns for the watershed? How have management activities affected these patterns? In what way and how has the watershed responded to these disturbances?

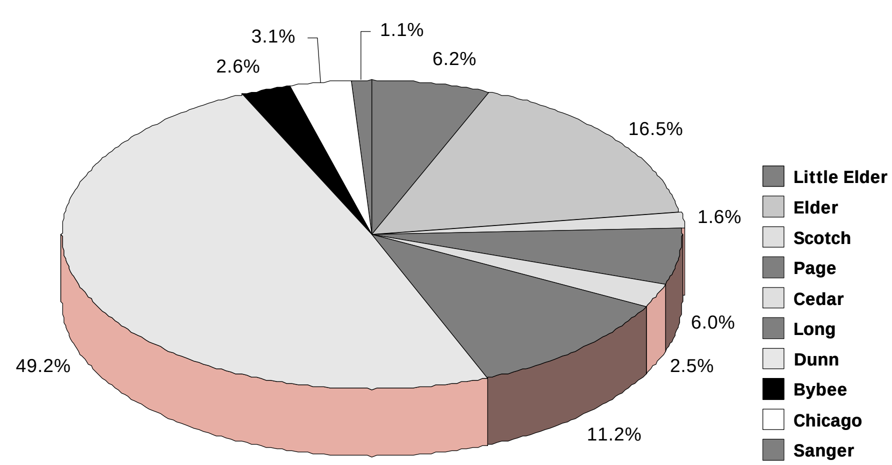
a. Disturbance

Natural components of forest ecosystems that may have been affected by land management activities are flood, wildfire, disease, and insects. Disease and insect control using pesticides, and wildfire control by suppression, may have altered processes that naturally helped shape watershed health. Upland silviculture techniques, which often included treatment of riparian areas on ephemeral swales and seasonal and perennial low-order streams, created even-aged stands that are more susceptible to high rates of loss from wildfire and insect epidemics. Unmanaged stands that have been protected from wildfire and insect loss may exhibit high amounts of ladder or ground fuels and higher levels of organic matter and biomass, especially in their riparian areas. There may be a higher than expected abundance of fuels in the headwater areas of the East Fork Illinois River watershed, especially where fire has been excluded. Approximately 3/4 of the watershed has not had an appreciable fire event for over 100 years. This is well beyond the natural fire return interval for the vegetation types and systems in the watershed.

Wildfire suppression may have increased the risk of disease and insect epidemic. Overall risk of catastrophic wildfire, disease, and insect epidemic, has increased in this watershed (with the exception of the Longwood Fire area) and continues to increase with time. A catastrophic fire, disease or insect epidemic in a tributary could reduce riparian shade and resulting in temporary summer water temperature increases.

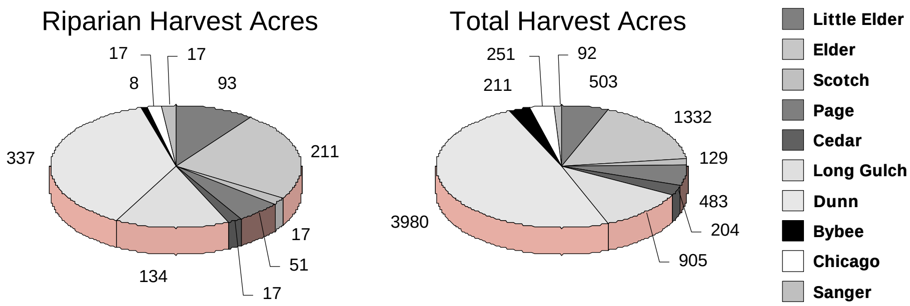
Harvest and transportation systems (roads and landings) are a disturbance factor (Figure H-6). Long Gulch, Dunn, Elder, and Little Elder Creeks have been the primary areas for timber harvest on National Forest lands in the watershed.

Figure H-6: Percent of Timber Harvest by Subwatershed on National Forest Lands



Timber harvest has occurred on approximately 11% of the riparian reserves on National Forest lands.

Figure H-7: Acres Harvested Within Subwatersheds



*Long Gulch acres reflect stand replacement fire and managment effects

There have been significant mining effects on sediment budget, water quality, and channel morphology for some portions of East Fork Illinois River watershed (e.g., Allen Gulch, Scotch Gulch, and Esterly Lakes).

Floods are responsible for sudden changes in stream morphology and riparian structure. Management activity can affect the way a watershed reacts to storm events as it pertains to the interception and release of precipitation, sediment production and timing of stream flow. The 1964 flood event is responsible for much of the current conditions within riparian corridors along the main stem of the East Fork Illinois River. Included are localized slope instability, sediment loading, and lack of channel complexity. Significant mass wasting and extensive slope failures were triggered by the 1964 flood event. Many of these areas continue to fail or ravel, and are chronic sediment contributors. The 1964 flood moved existing large wood deposits out of the system while adding some new deposits, mostly from debris flows and slope failures.

Increases in water yield (low and peak flows) can be associated with forest management activities. Road surfaces and cut slopes intercept water, and road ditches act as intermittent streams transporting water more rapidly than natural subsurface processes. These can combine to change the timing and levels of peak flows. The potential for effects from increased peak flows are greatest in areas where road density is highest and located in riparian areas.

The extent that harvest and road construction has had on timing of peak flows during storm events is unknown. However, it is expected that there have been effects due to the amount of harvest and road construction in small streams in the watershed. Any changes from historic stream-flow timing and quantities are likely to continue.

Recommendation: Reduce fuel hazard (mechanical, manual, prescribed fire treatments) in riparian reserves. Reestablish the natural fire return interval. Restore large trees in areas most likely to deliver large wood to fish-bearing streams.

The following are brief summaries of drainage conditions within the entire East Fork Illinois watershed. Refer to Table A-2 for specific drainage information.

Table A-2: Management Effects on Perennial and Intermittent Riparian Reserves (RR)										
Sub - Drainage (Analysis Areas)	Perennial Stream Miles	Intermittent Stream Miles	Road miles w/in RR per Stream Mile	Road Crossings per Stream Mile	[g] Riparian Harvest/ Early Seral or Seedling / Sapling	[i] Riparian Affected by Mgmt (%)	Drainage Area (mi^2 and acres)	[h] Road miles (miles and Road Density)	[j] Total Harvest (acres and percent)	Harvest in Past Decade (acres)
[a]Allen Gulch	5	2	0.54	1.71	0.15 mi 5.5 ac	DATA-GAP	2.05 mi^2 1,311ac.	10.85 mi 4.8 mi/ mi^2	DATA-GAP	0
Bybee Gulch	1.6	0.7	0	0.44	0.2 mi. 8 ac.	25%	0.64 mi^2 412 ac.	1.28 mi 2.0 mi/ mi^2	211 ac. 51%	90 ac.
Cedar Gulch	[k]4.3	[k]2.2	[k]0.22	[k]0.77	0.4 mi. 17 ac.	40%	1.14 mi^2 731 ac.	1.6 mi 1.4 mi/ mi^2	204 ac. 28%	0
Chapman Gulch	4.4	14.1	0.25	1.47	1.0 mi 0.0 35.8 ac.	DATA-GAP	3.97 mi^2 2,542 ac.	17.94 mi 4.8 mi/ mi^2	DATA-GAP	0
Chicago Creek	4.7	5.5	0.25	0.78	0.4 mi. 17 acres	38%	2.13 mi^2 1,369 ac.	7.25 mi 3.4 mi/ mi^2	251 ac. 18%	90 ac.
Dunn Creek	66.2	61.3	0.17	0.56	4.0 mi. 337 ac.	31%	25.8 mi^2 16499 ac.	52.45 mi 2 mi/ mi^2	3980 ac. 25%	0
[b] EF Illinois below Chapman	5.0	5.7	0.24	1.5	0	DATA-GAP	3.55 mi^2 2,274 ac.	18.77 mi 5.3 mi/ mi^2	DATA-GAP	0
[c] EF Illinois Lower	12.4	5.3	0.25	1.24	0	DATA-GAP	8.45 mi^2 5,411 ac.	41.17 mi 4.9 mi/ mi^2	DATA-GAP	0
[d] EF Illinois Scotch to Dunn	7.8	5.5	0.19	1.5	0	DATA-GAP	2.32 mi^2 1,482 ac.	11.3 mi 4.9 mi/ mi^2	DATA-GAP	0
e EF Illinois Bybee to Chicago	8.9	9.5	0.05	0.11	0.5 mi. 19 ac.	DATA-GAP	3.8 mi^2 2,429 ac.	9.9 mi 2.6 mi/ mi^2	160 ac. 7%	20 ac.
[f] EF Illinois Upper	16.3	17.4	0.03	0.03	0	5%	7.45 mi^2 4,766 ac.	1.94 mi 0.3 mi/ mi^2	3 ac. <1%	2
Elder Creek	[k]18.5	[k]16.0	[k]0.29	[k]1.04	2.5 mi. 211 ac.	48%	6.08 mi^2 3,888 ac.	23.31 mi 3.8 mi/ mi^2	1332 ac. 34%	17
Kelly Creek	7.4	14.4	0.20	1.56	0.3 mi. 6.9 ac.	DATA-GAP	4.16 mi^2 2,662 ac.	16.52 mi 3.8 mi/ mi^2	DATA-GAP	0
Khoeery Creek	3.8	6.4	0.38	3.14	0	DATA-GAP	2.68 mi^2 1,713 ac.	14.51 mi. 5.3 mi/ mi^2	DATA-GAP	0
Little Elder Creek	[k] 9.5	[k] 7.4	[k]0.21	[k] 0.89	1.1 mi. 93 ac./ 0.38 mi 13.8 ac.	43%	3.56 mi^2 2,279 ac.	8.63 mi. 2.4 mi/ mi^2	503 ac. 22%	20
Long Gulch	4.5	3.2	0.17	0.91	[l]3.2 mi 134 ac.	[m]100%	1.64 mi^2 1,055 ac.	3.98 mi. 2.4 mi/ mi^2	905 ac. 86%	0
Page Creek	11.1	14.4	0.12	0.51	0.6 mi. 51 ac.	25%	3.39 mi^2 2,170 ac.	4.16 mi. 1.2 mi/ mi^2	483 ac. 22%	0
Sanger Canyon	3.5	4.2	0.08	0.26	0.4 mi. 17 ac.	23%	1.78 mi^2 1,143 ac.	0.86 mi. 0.5 mi/ mi^2	92 ac. 8%	0
Scotch Gulch	[k] 5.4	[k] 4.8	[k] 0.21	[k] 0.30	0.4 17 ac.	32%	1.56 mi^2 1,000 ac.	3.51 mi. 2.2 mi/ mi^2	129 13%	0
Tycer Creek	7.2	15.7	0.28	2.66	0.6 mi. 22 ac.	DATA-GAP	3.73 mi^2 2,389 ac.	19.01 mi 4.2 mi/ mi^2	DATA-GAP	0

Table A-2: Management Effects on Perennial and Intermittent Riparian Reserves (RR)										
Sub - Drainage (Analysis Areas)	Perennial Stream Miles	Intermittent Stream Miles	Road miles w/in RR per Stream Mile	Road Crossings per Stream Mile	[g] Riparian Harvest/ Early Seral or Seedling / Sapling	[i] Riparian Affected by Mgmt (%)	Drainage Area (mi^2 and acres)	[h] Road miles (miles and Road Density)	[j] Total Harvest (acres and percent)	Harvest in Past Decade (acres)
HUC5 totals	207.5	215.7	Mean= 0.21	Mean= 1.1	DATA-GAP	DATA-GAP	90.27 mi^2 57,774 ac.	331.04 mi 3.7 mi/ mi^2	DATA-GAP	684 ac.

[a] HUC7 is BLM #17100311010321, the East Fork Illinois River below Scotch Gulch, above the bridge and includes Allen Gulch

[b] East Fork Illinois River from mouth to Chapman confluence (HUC #17100311010351 and #17100311010357)

[c] Lower East Fork Illinois River (HUC #17100311010333, #17100311010345, and #171003110154) from Chapman confluence to apx. 0.5RM above confluence of Khoeery Creek

[d] Illinois River above Scotch Gulch below Dunn Creek (HUC #17100311010303, #17100311010309, and #17100311010315). This analysis area contains USFS #15L07F and a portion of #15L14F. The analysis area does not include Long Gulch (it was analyzed separately). The portion between Dunn Creek and Bybee Gulch was neglected due to USFS and BLM HUC7 boundary differences.

[e] East Fork Illinois River above Bybee Gulch below Chicago Creek (USFS #15U02F)

[f] Upper East Fork Illinois River (above RM 19.7)

[g] For National Forest lands, riparian harvest is defined as any recorded harvest in riparian reserves. For BLM lands, early seral or seedling/sapling is defined as any stand in early seral, seedling, or sapling stage from either mining, fire, harvest, or any other disturbance.

[h] Road mileage and density for watersheds outside National Forest lands were calculated with BLM GIS maps containing BLM and non-BLM roads.

[i] For analysis areas outside National Forest lands, the percent affected by management is a DATA GAP, though much of the areas have been affected by historic mining.

[j] Total harvest on BLM lands by drainage area is a DATA GAP. See Terrestrial Module for harvest figures by township. Total recorded harvest on BLM lands in the East Fork Illinois watershed before 1986 is 1,834 acres. Since 1986, 444 acres have been harvested on BLM lands in this watershed. The majority is in T39S, R08W and includes Chapman, lower Tycer, and the eastern portion of East Fork Illinois River below Althouse.

[k] Calculated using USFS GIS layers

[l] Effects due to Longwood Fire of 1987. Unable to statistically separate management effects from natural wildfire at time of report.

[m] Combined effects of Longwood Fire and Management.

C. Drainage Analysis Areas of the East Fork Illinois River Watershed

To facilitate this watershed analysis, the East Fork Illinois watershed was divided into drainage analysis areas. These drainage analysis areas are delineated based on similar management and resource issues. They do not, in all cases, coincide with the currently delineated HUC 6 or 7 watersheds.

1. Allen Gulch

All of what is known as "Allen Gulch" is in BLM ownership. However, the 7th field drainage that includes Allen Gulch (the East Fork Illinois River below Scotch Gulch and above the bridge) is divided evenly between BLM and private ownership. The landscape in Allen Gulch is dominated by impacts of historic mining. An intermittent creek flows through the gulch. Based on ODFW Benchmark standards, this creek is characterized by inadequate large woody debris, a lack of channel structure, sedimentation, and inadequate riparian vegetation. Fish presence has not been verified. There are 12 road crossings on intermittent and perennial streams in the entire drainage, which includes the adjacent portion of the East Fork Illinois River. Road density in the entire drainage, which includes private land is high (see Table A-2).

2. Bybee Gulch

A unique geologic feature on the lower slopes of this drainage is an ancient landslide deposit, which covers approximately one square mile and extends across and into Long Gulch. Hummocky terrain, subdued scarps, incised drainages and sag ponds characterize the deposit. The Longwood Fire of 1987 (a stand replacement fire) burned across this drainage, consuming vegetation on the landslide deposit and upland riparian areas. This has resulted in localized sedimentation within draws, intermittent creeks, and along poorly vegetated road cuts.

Recommendation: Roads located on this feature are expected to be difficult to maintain and are good candidates for decommissioning.

Approximately one half of the Bybee Gulch drainage was salvage harvested after the fire. Both the fire and subsequent harvest resulted in effects to Bybee Gulch. The drainage is in the process of recovery.

Recommendation: Implement active riparian silviculture treatments to restore riparian conditions. This would include treatments such as pre-commercial thinning to encourage growth of larger mature trees.

3. Cedar Gulch

Cedar Gulch shows appreciable effects of past fire, timber harvest, and related activities. The 1987 Longwood Fire affected the drainage. In the headwaters, the even-aged stands in harvested units were burned with high intensity. Large areas of unproductive soils (rock outcroppings) acted as natural fire-breaks, which slowed the Longwood Fire and protected more productive sites. As a result, riparian productivity in the headwaters is currently lower than before the stand replacement event. It has high restoration potential. A cooling trend in summer water temperatures is expected over time as vegetation recovers in riparian areas. There are approximately 35 acres of TML (timber marginal land due to landslides) land near the headwaters that were harvested during the 1960s. This area was subsequently burned during the Longwood Fire and recovery has been poor. The lower portion of the drainage is primarily un-roaded and has mature vegetative cover.

4. Chapman Creek

Chapman Creek is in the best condition of the streams in the northern portion of the watershed. This perennial creek flows south to join the East Fork Illinois River approximately 3 miles upstream of the Highway 199 bridge. The presence of mayflies and caddisflies in Chapman Creek may indicate good water quality but more information is needed to make a determination on overall water quality. Large woody material (LWM) levels are at approximately 16 pieces/mile is considered "poor" based on ODFW benchmarks. BLM ownership accounts for approximately 50% of this subdrainage. Private land comprises the remainder. There are 42 road crossings on perennial and intermittent streams. Road density is high in the entire Chapman Creek drainage (see Table A-2).

Recommendation: Improve LWM levels where appropriate.

5. Chicago Creek

The headwaters of Chicago Creek has a very high road density. While road locations are primarily located on the ridge top, there are at least eight stream crossings. In unmanaged areas, riparian vegetation is in primarily mid to late seral stages. There has been a lack of fire during the past 50 years. Currently, 38% of the perennial riparian reserve area has been harvested and is recovering from management related effects. The potential for recovery is good.

The Chicago Creek Slide area contains a number of debris slides that occurred off Chicago Peak most recently after 1964. They are debris slides that converge at Chicago Creek. The upper and larger of the slides is over 0.25 miles long and averages 250 feet across. The failure is within an older landslide headwall, which may have contained poorly consolidated glacial deposits such as the Crazy Peak failure. A road drainage failure from a road near the top of the peak initiated the 1964 failure, and other road crossings on the slope below may have contributed to the magnitude of the failure. The lower slide is located below a road, but has no road crossings. As the slide incorporated more water and debris, it developed into a debris flow causing numerous other stream bank failures as it scoured first Chicago Creek and finally the East Fork Illinois River. There are currently 4.5 miles of road per square mile in the area of the slide, located on land classified as TML (timber marginal land due to landslides). The slide is still active due to undercutting at the toe from Chicago Creek and from road intercepts.

Recommendation: Roads in the vicinity of the Chicago Creek Slide have been decommissioned but should be periodically monitored for recovery and to insure drainage is away from the slide.

6. Dunn Creek

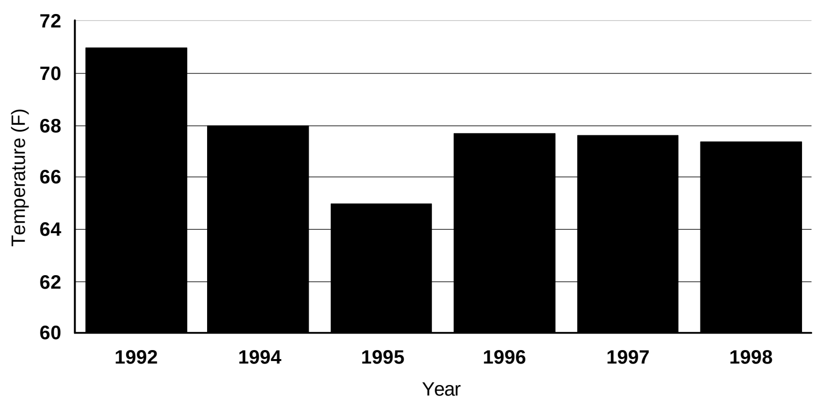
The largest subdrainage within the watershed is Dunn Creek. Dunn Creek has a drainage area of 16,499 acres. It is a fifth order, Class I stream. At the divide between Black Butte and Lookout

Mountain, Dunn Creek originates at an elevation of 5,200 feet and joins the East Fork Illinois River at an elevation of 1,560 feet. Approximately 320 acres are privately owned with the remainder federally owned. Black, Packers, Poker, and NF Dunn Creeks are main tributaries to Dunn Creek.

Dunn Creek is a portion of the East Fork Illinois River Tier 1 Key Watershed. Dunn Creek has been listed on the 1998 Oregon List of Water Quality Limited Water Bodies 303 (d)(1) List) as water quality limited from the mouth to the headwaters for summer stream temperature criteria. Average 7-day high stream temperature is greater than 64EF.

Although stream temperature data exists for Dunn Creek at the mouth and limited data for NF Dunn, there is a lack of data for main tributaries and on its main stem. Restoration activities could be assessed with more credibility if the heating regime of the system were known (Figure H-8).

Figure H-8: Dunn Creek Summer Stream Temperature, 7-day Average High.



Recommendation: Summer stream temperature monitoring on the main stem from the mouth to headwaters to determine the temperature regime of the entire main stem and named tributaries.

Lower Dunn Creek: The first mile of Dunn Creek is a wide alluvial plain, which was geomorphically influenced by an ancient alluvial deposit from East Fork Illinois. A low level of large wood is documented in this reach. This is common for a 5th order stream with its associated stream power. The flood plain averages 250 feet and can exceed 600 feet at times.

Alder, tan oak, and willow dominate the lower two miles of riparian vegetation, with conifers dominating in the remainder of the system. Vegetation in the lower two miles is recovering from the 1964 flood and the 1987 wildfire and could benefit from riparian silviculture treatments such as encouraging the growth of willow and conifer.

Poker Creek: A unique habitat or feature for Poker Creek watershed is an unnamed shallow lake or bog approximately 35 acres in size located at the headwaters. It has been virtually unchanged since the 1940s. Immediately downstream of the lake, Poker Creek is unusually wide for a 2^{nd} order class IV stream and averages 50 to100 feet in width. This condition is historic and no change in trend is predicted. This unique channel morphology is continuous for approximately one mile, after which the channel narrows considerably into what is considered a more common classification for a low order stream. The lake and morphology of the low gradient stream is likely glacial in origin.

Placer mining activity occurs intermittently on Poker Creek and on the main stem of Dunn Creek below the confluence of Poker Creek. These are localized small dredging operations, which on average cumulatively move less than 100 cubic yards per year.

Upper and Middle Dunn Creek: The 1964 flood is responsible for much of the current conditions within the riparian corridor, including localized stream bank instability, sediment loading, and lack of channel complexity. Significant mass wasting and extensive slope failures were triggered by this event. These areas are chronic sources of sediment to the stream. The reach of Dunn Creek between Crazy Peak and the confluence of Dunn and NF Dunn is geologically complex. Several rock types faulted and sheared together. Deposits of large, ancient landslide forms coalesce along lower slopes creating unstable banks of an inner gorge. These poorly consolidated features are prone to debris slides that can be triggered by undercutting of the banks by the stream.

The Crazy Peak slide is the single most significant of these failures in this tributary. The most recent failure in Dunn Creek is attributed to the 1964 flood. The Crazy Peak slide originates in poorly consolidated glacial deposits. Forest System road 4906 is directly over the head of the slide, which undercutting by the road or diverted stream drainage may have contributed to the failure. Including drainage relief into Black Creek, the slide is 0.75 miles in length and up to 1,000 feet in width. Crazy Peak slide is located 2,000 feet above the confluence of Black Creek and Dunn Creek. The effects of the debris torrent as a result of this landslide are evident in Black Creek and Dunn Creek. The slide scoured the channel, resulting in removal of mature riparian vegetation and general channel widening. Vegetation is currently growing on the entire length of the slide. Other smaller inner gorge landslides were historically common in Black Creek and Dunn Creek but none of the magnitude of the Crazy Peak Slide.

Two other landslides on Dunn Creek, one located 1.5 and the other 2.5 miles above the Black Creek confluence, can be similarly dated to the 1964 flood and together are the size and magnitude of the Crazy Peak slide. These landslides added to stream channel degradation on Dunn Creek downstream from these failures. Above the confluence of Black Creek, numerous stream bank failures were mapped off large, older landslide deposits. Smaller debris torrents also occurred off the road system above Dunn Creek. Many of the roads have been decommissioned and drainages restored, but streams and draws scoured by failures triggered by the 1996 flood will continue to contribute sediment until vegetated and stabilized. The current condition of Dunn Creek is an aggraded streambed, with sediment being contributed from both adjacent, over-steepened stream banks and smaller drainages. This condition is expected to continue for many years until sediment decreases to a natural rate and channel forms stabilize.

North Fork Dunn Creek: North Fork Dunn Creek is a 3^{rd} order tributary and contributes 11% to the flow of Dunn Creek. During the summer, peak stream temperatures range from 59E to 63EF with summer flows as low as 0.44 cfs. Riparian vegetation is primarily hardwoods (USFS 1993).

Other tributaries to Dunn Creek: Black Creek is a 3^{rd} order tributary and four miles long. Poker Creek is a 4^{th} order stream contributing 28% of the total stream flow to Dunn Creek and is approximately four miles long.

Slopes on Page Mountain that are within the Dunn Creek watershed are underlain by granitic and metamorphic bedrock. Slopes above NF Dunn Creek are range from 15 to 50%. Several inactive failures, and possible glacial land forms such as wide swales and possible old tarns were noted on the southwest slopes of Page Mountain. Large, ancient slumps or earth flows with deep soils and leaning trees are present on lower slopes. Draws are deeply incised through these land forms, with evidence of multiple debris flows, including scars on riparian vegetation at a height of 20 feet. A recent debris torrent originating in a drainage crossed by road 4808015 has contributed to stream aggradation and stream bank instability in a tributary to NF Dunn Creek. Three miles of road on Page Mountain are on low gradient slopes (less than 50%) in the NF Dunn Creek drainage. These roads are in a “stacked” configuration on the slope.

Recommendation: These stacked roads should be a priority for continued road maintenance to insure their future stability or they should be considered for decommissioning.

Dunn Creek Vegetation: The 1987 fire was responsible for riparian vegetation mortality on Dunn Creek and has influenced future large wood availability. The 1964 flood moved existing large wood deposits out of the system while adding some new deposits, mostly from debris flows and slope failures. Deposits of large wood associated with debris torrents are expected to migrate downstream during large flow events. Natural deposits of large woody material are generally lacking in the lower reaches of Dunn Creek. The inherent nature of Dunn Creek’s drainage area is one of high winter stream velocities, which tend to move large wood out of the system. This large stream may be less dependent on wood and more dependent on other natural features for maintaining channel complexity. Inverted V wood gabions and installed deflector logs are the primary sources of large wood in the lower main stem, which are designed to add channel complexity.

The upper reaches of Dunn Creek, where stream order and stream velocities support large wood accumulation, have approximately 72% of ODFW benchmark standards for adequate large wood.

Approximately 24% or 3,980 acres of the Dunn Creek tributary have had some form of harvesting. The heaviest decade of harvest was 1980 to 1989. A right-of-way 3.5 miles long for power lines is cleared and maintained in a strip 200 feet wide across the headwaters. For analysis purposes, this feature is factored as equal to an 85-acre strip clear-cut.

Historic timber harvest and the associated roads, crossings, and landings on National Forest lands removed varying amounts of riparian vegetation in accordance with Forest Plan guidelines on 18.6 miles of perennial streams in this tributary.

Based on the seral stage distribution map (GIS 1996), variable degrees of vegetative recovery are evident at most sites. Recovery is not complete as the stage of recovery is mostly in early to mid-seral series. These areas are located on the main stem of Dunn Creek downstream from Poker Creek.

Continued timber harvest is expected on localized matrix lands within the Dunn Creek drainage analysis area. Gradual decrease in stream temperature is predicted over time with the recovery of 1964 flood-removed riparian vegetation. Future large storm events and roads are expected to impact the aquatic system, as they have in the past. Sediment from debris torrents stored behind large wood deposits will be released over time during storm events. Future large wood supply is expected to be low for the long term unless management actions for watershed rehabilitation and riparian silviculture are implemented. Existing landslides may be reactivated by large storm events.

Recommendation: Conduct a stream rehabilitation survey and design on the main stem of Dunn Creek from its confluence with Poker Creek to its headwaters. Review the transportation system for candidates for road decommissioning. Increase large wood availability and in-stream placement to 25 to 80 pieces/mile on Dunn Creek. Increase channel complexity by placing wood or vegetation on channel bars in a manner conducive for sediment storage. Evaluate the biological integrity of the unnamed lake in the headwaters of Poker Creek.

7. East Fork Illinois River below Confluence of Chapman Creek

This analysis area extends from the mouth of the East Fork Illinois River to approximately one river mile below the confluence of Althouse Creek (see Table A-2). A stream survey was conducted by ODFW along the East Fork Illinois River in 1994. The survey extends from Highway 199 bridge, approximately 0.9 miles upstream from the confluence with the West Fork Illinois River, up to the Waldo Road bridge (total 10.8 miles). The first two reaches identified in the survey have 66% of actively eroding streambanks which is not properly functioning for stream bank condition according to NMFS standards (1969) and may indicate a degrading channel. Possible causes for eroding streambanks and channel degradation are: excessive water removal, overgrazing, channelization, removal of riparian vegetation, and gravel removal operations. Logging, road construction, the 1964 flood, riparian area clearing, agriculture, and other development have probably increased water temperatures and intermittent turbidity within this drainage analysis area. Moderately high summer water temperatures in the lower reaches are due to a wide shallow channel, open riparian area, and low summer flow.

Road density is high in this area, 5.3 mi/mi^2. While it would be beneficial to stream health to reduce road miles, most of the roads are located on private land and are not subject to federal recommendations or options for road decommissioning.

Data gap: There is little data presently available regarding channel habitat, channel morphology, erosion, shade on this section of the East Fork. Most of this drainage analysis area is privately owned.

8. Lower East Fork Illinois River (From Chapman Creek Confluence to Apx. 0.5 Rm above Khoeery Creek)

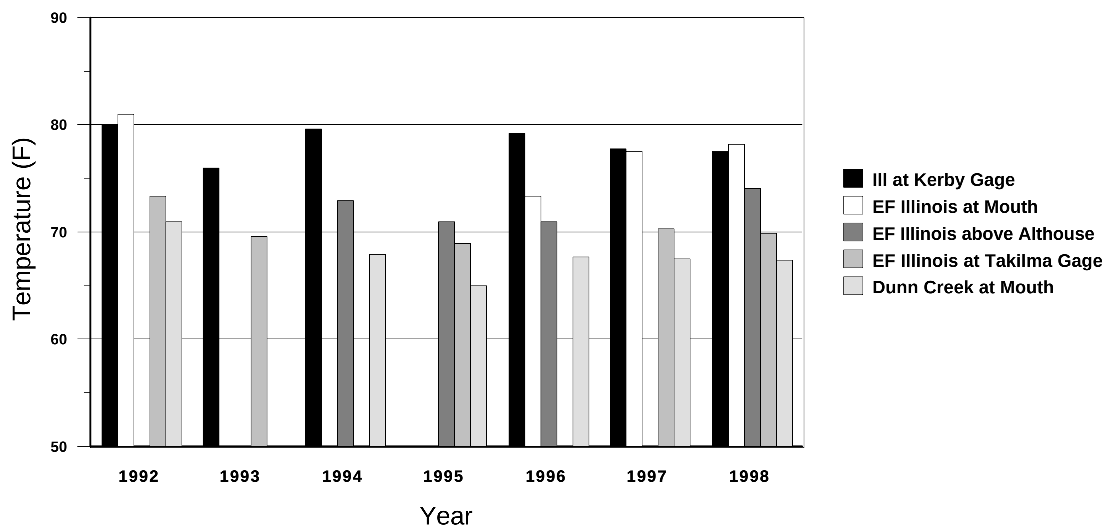
This analysis area includes three HUC7 watersheds (# 17100311010333, 17100311010345, and 17100311010354) and encompasses 5,411 acres. The East Fork Illinois River is a 6th order stream in this reach.

Current shade values throughout the main stem of the East Fork Illinois River are variable. They range from 15 to 80% (IVRD Stream Surveys) on National Forest lands with an average less than 50%, which is rated as poor to fair (USDA 1994). Shade values on the main stem of the East Fork Illinois River below the Forest Service boundary are generally lower averaging less than 15%.

This decrease in shade is due to an increase in stream width and loss of riparian vegetation. Summer peak stream temperatures range from the high 60EF to low 70EF upstream from the East Fork Illinois River gaging station and mid 70EF to low 80EF near the mouth (Fig. H-9).

The East Fork Illinois River is entrenched in a wide valley in this reach. High velocity flows and natural erosion processes are limiting factors for quantity and quality of available vegetative shade. Topographic shade is not dominant due to wide valley bottoms. Large wood is scarce and deposited on occasional flood plains and terraces. Large wood is not the driving factor for channel formation or pool cover in this high order stream. Riparian vegetation has been altered by human disturbance in this stream section. Shade provided by riparian vegetation is less than pre-settlement levels.

Figure H-9: East Fork Illinois Watershed 7-day Average High Summer Stream Temperatures



Much of the main stem of Lower East Fork Illinois River in this reach is open to agricultural use and housing development in private holdings, and timber management on federal lands. Past land clearing for housing development, road construction, placer mining, agriculture, and timber harvest has been responsible for removal of shade producing riparian vegetation and for non-point sources of sedimentation along the main stem of Lower East Fork Illinois River. The infrastructure of developed lands in this portion of the watershed is expected to be maintained and will continue to influence stream side vegetation, shade, and stream temperature.

9. East Fork Illinois River above Scotch Gulch below Dunn Creek

This drainage analysis area is currently delineated to include Long Gulch. For this watershed analysis, Long Gulch is discussed separately due to the extent of disturbance in the drainage (see below).

There are 13.3 stream miles in the drainage and 100% of the riparian reserve is mid-seral (11-21" DBH size class. This area contains a high road density and high number of road crossings per stream mile (See Table A-2).

Data gap: East Fork Illinois River above Dunn Creek below Bybee Gulch was not included in the current analysis due to differences in USFS and BLM HUC7 boundary delineation. This area is less than one square mile in area.

Recommendation: Designate in USFS and BLM GIS the Long Gulch tributary its own unique drainage giving it an individual analysis area.

10. East Fork Illinois River above Bybee Gulch below Chicago Creek

This analysis area, which along with the Upper Illinois River forms the Upper East Fork Illinois 6th field sub-watershed, has a high road density. However, the majority of the roads are not in the riparian reserves and there are only two stream crossings in the drainage. Seven percent (160 acres) of the drainage has been harvested and there is a low amount of riparian harvest. (See Table A-2).

11. East Fork Illinois River – Upper (beginning RM 19.7)

This drainage is currently in or very near historic pre-managed condition. Upper East Fork Illinois contains unique geologic features (moraines and glacial geologic land formations). Approximately 50% of the area is in wilderness. Approximately 5% is roaded and has experienced timber harvest activities. There are currently no future plans for harvest or road construction in this drainage for the next decade. Inner gorge landslides are common and a natural form of mass wasting in the main stem and in steep intermittent side channels.

12. Elder and Little Elder Creeks

Woody material on Elder Creek on Forest Service surveyed lands are above ODFW benchmark standards and range from 130 to 478 pieces per mile. Large wood ranges from 103 to 441 pieces per mile. Pool formation and channel stability in Elder Creek are highly dependent on large wood. Large wood often causes log jams, waterfalls, and plunge pools. Spawning sized gravels are concentrated in and around logjams, in addition to short-term micro-sites of stream side soils and young vegetation. Stream banks are generally well armored by riparian vegetation (see Fisheries section).

The lower main stems of Elder and Little Elder parallel each other through a small valley for about one mile. Though they are only 1,000 feet apart, they are two distinct streams and drain separate canyons. The lower valley of both Elder and Little Elder Creeks mostly consists of private agricultural land. In the foothills, private and federal lands were harvested after the 1940's. Based on 1940, 1964 and 1996 aerial photography interpretation, private timber stand recovery is approximately 50% of reference conditions and the stands are approximately 30 years from consideration for standard commercial harvest. The upper portions of both tributaries are within National Forest lands. Road density in the drainage is moderately high.

Peridotite, serpentine and other ultramafic rock types underlie much of the upper portions of Elder Creek drainage. Soils developed from these rock types are less productive because of soil chemistries reduced in calcium and increased in heavy metals such as chromium, nickel and magnesium. Soils typically have a high rock (clast) content in a matrix of clay and silt. The clays exhibit high porosity, but low permeability. Some areas have weathered to expansive clays. Because of the above, vegetation tends to be sparse and limits the amount of organic material incorporated into the soil profile further inhibiting the development of deeper, productive soils. Shallow serpentine soils are prone to gully erosion and sheet wash. Where groundwater tables are perched, bogs and seeps can be found, along with down slope movement of clumps of soil and vegetation (solifluction). Gully erosion and head-cutting in swales and intermittent streams was most noticeable in areas that had experienced intense fire. Ancient, deep-seated slump/earth flows were mapped from aerial photos. These can be found in association with deeper soils on the west slopes of Elder Mountain and Buckhorn Ridge. Stream bank instability was noted in Elder Creek where deposits from these large, old features terminate at the creek.

Both ancient and recent slump/earth flows were mapped on the middle slopes of Page Mountain in the Elder Creek drainage. Road construction and timber harvest, especially along Roads 4808, 4808015, and 4808065 have reactivated many of these failures, mostly as debris torrents along the lateral margins of the failures.

Timber harvest has occurred on 34% of the National Forest lands in Elder Creek. Additionally, a 200 feet wide, 5.4-mile length of maintained and cleared right-of-way for power lines is located across Elder and Little Elder Creek drainages.

Recommendation: The power line right-of-way should be factored as a permanent infrastructure and for analysis purposes as a strip clear cut equal to the following: 81 acres for WAA 15L03W, 32 acres for WAA 15L02F, and 18 acres in WAA 15L01W. These acres should be used for harvest-by-decades calculation for cumulative effects analysis.

Evaluate Forest Service roads 4808, 4808015, and 4808065 to determine what upgrades are needed to stabilize the roads from future failures where they cross the earth flow area. Consider decommissioning if other options are available to meet future access needs.

13. Kelly Creek

Kelly Creek drainage is mostly in private ownership with only approximately 15% administered by the BLM . Kelly Creek is perennial and flows southwest to its confluence with the East Fork Illinois after being joined by Tycer Creek 0.5 miles upstream of the mouth. There are 34 road crossings on perennial and intermittent streams. Road density is high (3.8 mi./sq. mi.). Kelly Creek is probably below ODFW benchmark standards for large woody debris, riparian condition, channel complexity, and low flow.

14. Khoeery Creek

Khoeery Creek is a tributary to Elder Creek with its confluence located 0.6 miles above the mouth of Elder Creek. This creek flows north through Takilma to its confluence with Elder Creek. Land ownership is primarily private in the valley, and private, BLM (15% of the drainage), and National Forest lands in the uplands. National Forest lands consist of 521 acres of riparian reserve (32% of the National Forest land in the drainage). The upper reach and tributaries are supported by perennial springs, but the main stem goes dry in the summer. Ninety percent of the stream reaches surveyed on BLM land are properly functioning. Road density in the drainage is high (5.3 mi./sq. mi.). There are 32 road crossings on perennial and intermittent streams in the drainage. Most of the roads are located on private land and are not subject to federal road decommissioning to reduce road density.

15. Long Gulch

The lower portion of this watershed contains a large, ancient landslide deposit, which comprises the slopes between Long and Bybee Gulch. The Longwood Fire burned over the drainage, including the upland riparian areas, resulting in areas of localized erosion that has contributed to at least one road failure. Roads located on this feature are expected to be difficult to maintain and are good candidates for decommissioning. Sediment traps built during the 1988 Longwood Fire rehabilitation work were monitored. Several of these sediment traps were notably filled to capacity levels.

Cumulative effects from this fire are difficult to separate from those of management activities. Almost all of this drainage was affected by natural wildfire and salvage activity during the past decade, and by road construction and timber harvest activity over the past several decades. It is expected that there will be no future harvest in Long Gulch in the next decade.

Recommendation: Riparian silvicultural methods, including pre-commercial thinning, may help to accelerate growth of larger trees, and to reduce the risk of high intensity wildfire. Roads within Long Gulch would be good candidates for road decommissioning.

16. Page Creek

Page Creek status on the 1998 Oregon List of Water Quality Limited Water Bodies 303 (d)(1) List is "need data" for temperature, flow, and habitat modification. Temperature data collected from 1997 and 1998 indicates a range of 7-day average peak summer temperatures of 62.5 to 63.8EF, which is below the 64EF threshold set by the DEQ. Currently there is no flow or habitat modification information for this stream.

Recommendation: Collect flow, stream temperature, and habitat information on Page Creek.

The Cowboy mine is a patented private holding surrounded by National Forest lands. It has affected localized riparian conditions where roads are dense and crossings occur on where two main forks of Page Creek have their confluence. The channel has been locally widened. Recovery of riparian vegetation is occurring with poor recovery outside the riparian area where soils are shallower and less productive.

Underlying rock type for Page Creek consists of ultramafic rock, and faulted and often intensely fractured metamorphic sedimentary and volcanic rock types. A deeply weathered granitic intrusion is exposed on the upper slopes of Page Mountain.

Glacial land forms were mapped from aerial photos in the upper Page Creek drainage, along with three large, ancient slump/earth flows into the drainage off the ridge between Page Mountain and

Mount Hope. These may be relic, deep glacial deposits. Within two of the failure forms, debris flows have scoured numerous drainages along road 4808019, and contributed to stream bank instability and aggraded channels in Page Creek.

Recommendation: Reconstruct, storm-proof, or decommission Road 4808019.

17. Sanger Canyon

Deep deposits of un-consolidated sand, gravel, and boulders characterize Sanger Canyon. Post-glacial debris from steep slopes may be covering earlier glacial deposits. The stream has cut a notch up to 50 feet deep through the detritus. Cirque lakes are common in the headwaters with Sanger Lake being one of the larger, which is approximately 5 acres in size.

Timber harvest in this sub-watershed removed approximately 17 acres of riparian vegetation. Recovery is generally in the early-mid seral stages.

18. Scotch Gulch

The south portion of Scotch Gulch was affected by the 1987 Longwood Fire and from large areas harvested by clear-cutting in the 1960s. As a result, riparian productivity in the headwaters has been degraded and is less than historic conditions. The restoration potential is very good. A cooling trend in summer water temperatures is expected over time as vegetation recovers in more productive riparian areas. The lower portion of the drainage is primarily un-roaded and has good vegetative cover. Scotch Gulch has a moderate road density (see Table A-2).

19. Tycer Creek

Tycer Creek flows southwest into Kelly Creek approximately four miles upstream of the Highway 199 bridge. Ownership in this drainage is primarily private with a small amount of BLM administered land. Low flows and loss of riparian vegetation are characteristic of Tycer Creek. Tycer Creek is perennial in the lower reach and intermittent in the upper reach due to irrigation withdrawals and changes in watershed hydroperiod resulting in flashier flows. Substrate is dominated by sand and habitat complexity is inadequate, as are shade and large woody debris according to ODFW benchmark standards. There are 61 road crossings on perennial and intermittent streams. Road density in the entire Tycer Creek drainage, which includes private land, is high (see Table A-2).

Recommendation: Evaluate the road transportation system to identify which roads are candidates to be decommissioned to reduce overall road density. Determine where riparian silviculture treatments could be used to improve future stream shade and large wood recruitment.

D. SUMMARY OF HYDROLOGY RECOMMENDATIONS

1. Recommendation: Improve mature and old-growth component, snags and LWM recruitment, and reduction of fire hazard.

2. Recommendation: Manage roads to reduce their contribution to the erosion processes such as

landslides, surface erosion, stream diversion, and gully formation. Prioritize roads for decommissioning or storm-proofing based on stability and erosion potential. Minimize or avoid new road construction in areas underlain by granitic or serpentine soils, and in areas containing poorly consolidated glacial deposits.

3. Recommendation: Decommission unnecessary roads as identified through the interdisciplinary process. To minimize soil disturbance or gully formation, evaluate the appropriateness of ground disturbing restoration techniques such as scarification. Evaluation should include but is not limited to parameters such as slope gradient, aspect and soil type.

4. Recommendation: Numerous recent failures are associated with older landslide forms. These are currently mapped in the Kingfish, Cougar Ridge and Elder Mountain planning areas. Guide future management decisions with a consideration of the ancient and inactive landslide forms in the remainder of East Fork Illinois River watershed.

5. Recommendation: Increase availability and long-term recruitment of large wood, and wood of varying sizes on 4th order and lower streams. This would improve channel complexity and stability, habitat complexity and productivity for fish, and improve sediment transport and storage dynamics. Large wood could be imported to streams and/or adjacent side slopes, or cultured through silvicultural practices in Dunn Creek, Chapman Creek, Bybee Gulch, and Long Gulch.

6. Recommendation: Implement riparian improvement work such as planting and silvicultural techniques (e.g., thinning primary conifer and secondary hardwood vegetation) to accelerate the growth of larger trees and provide a long-term balanced source of large wood and shade. Known priorities are on Dunn and NF Dunn Creeks, Bybee Gulch, Long Gulch, Elder, Tycer and Little Elder Creeks.

7. Recommendation: Return abandoned transportation system in riparian reserves to vegetative productive conditions. Reduce accelerated and direct runoff from roads and other managed lands by decommissioning unused facilities and returning those lands to a productive vegetative condition, or by upgrading by storm proofing facilities that are still in use. Special attention regarding stabilization and restoration of vegetation should be given to slides, skid roads, landings, and other areas resistant to re-vegetation applications. This will restore the soil permeability and lessen the effect of management in regard to increases in water yield from direct runoff.

8. Recommendation: Where possible, mining ditches should be recontoured at stream draws and stream crossings to return diverted flow to instream flow. This would follow culture resource review.

9. Recommendation: All culverts limiting fish movement should be assessed and replaced or removed.

10. Recommendation: Complete a water quality management plan for the East Fork Illinois River.

11. Recommendation: Reduce fire hazard in riparian areas to “low” using appropriate techniques such as prescribed fire and mechanical methods. Target frequency of under-burning to be within

historic ranges to improve watershed health. Sanger Canyon, Elder, and Little Elder drainages may be appropriate candidates for prescribed burning or thinning. Use fire hazard analysis to direct priority of locations for fuel hazard reduction.

12. Recommendation: Increase the large wood availability and in stream placement to 25-80 pieces/mile on Dunn Creek. Increase channel complexity by developing micro sites on channel bars by placing wood or vegetation in a manner conducive for the channel sediment storage. Identify other stream rehabilitation opportunities.

13. Recommendation: The power line right-of-way in Dunn, Elder, and Little Elder drainages should be considered permanent infrastructure and, for analysis purposes, treated as strip clear cuts. 85 acres in Dunn Creek. For Elder and Little Elder, 81 acres for WAA 15L03W, 32 acres for WAA 15L02F, and 18 acres in WAA 15L01W. These acres should be used for harvest-by-decades calculation for cumulative.

14. Recommendation: Apply riparian silviculture methods, including pre-commercial thinning, in Bybee Gulch and Long Gulch to encourage and accelerate the recovery of riparian vegetation from the 1987 Longwood Fire. Roads in the Long Gulch drainage are good candidates for road decommissioning.

15. Recommendation: Collect more site-specific stream data, especially on Allen Gulch, Chapman Creek, Page Creek and Elder Creek.

16. Recommendation: Complete the Transportation Management Objectives (TMOs) for BLM roads to provide the basis for road management and maintenance in the watershed. On National Forest lands identify “Transportation System Needs” on a site-specific basis.

IV. FISHERIES

A. Introduction

Within the Rogue River Basin, the Illinois River and its tributaries are important spawning and rearing habitats for both anadromous and resident salmonids. The Illinois River constitutes a significant portion of the remnant native wild fish population/habitat within the Rogue River Basin. Thus, the Illinois River watershed is believed to be the stronghold for wild anadromous fish populations in the Rogue Basin. Primary tributaries of upper the Illinois River include: East Fork and West Fork Illinois River, Deer Creek and Sucker Creek. The East Fork Illinois River watershed is classified as a Tier 1 Key Watershed south of the Oregon - California border (NFP 1994). Tier 1 Key watersheds are designated because they contribute directly to conservation of protected, endangered, threatened, and sensitive fish species (see Map 29: Perennial Streams and Fish Distribution).

Anadromous salmonids present within the watershed are: fall chinook (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and winter steelhead (*O. mykiss*) (RVCOG 1997a & 1997b, USDA v.1.0 1995, ODFW 1995). These anadromous species represent important fish populations in the ESUs (Evolutionarily Significant Units) of the region.

Resident salmonids within the watershed include rainbow trout (*Onchorhynchus mykiss irideus*) and cutthroat trout (*O. clarki clarki*). Other native fish species present within the watershed include Pacific lamprey (*Lampetra tridentata*) and sculpin (*Cottidae sp.)*. Non-native fish species found within the watershed include the Redside shiner (*Richardsonius balteatus*) and Eastern brook trout (*Salvelinus fontinalis*) (USDA 1989, 1992, 1993, 1994).

Both resident and anadromous salmonid population trends have been in decline for decades and are considered to be at depressed population levels throughout the Illinois River basin (ODFW 1992). Historically, ODFW harvest data was the only measure of anadromous fish population levels within the Illinois River basin. As a result of declining population levels, ODFW presently prohibits trout fishing within the entire Illinois River basin.

The long-term trend for upper Illinois River salmonid populations remains a question for both State and Federal agencies. Degraded habitat, extended drought conditions, and water withdrawals continue as key factors limiting production of anadromous salmonids within the East Fork Illinois River watershed. Public lands in the watershed play an important role in the survival of salmonids as they provide cool water and large woody material to fish habitat lower in the system and provide refugia during summer months when water temperatures are lethal in the valley segments.

Fish presence surveys conducted by ODFW (1995) have been completed for Cedar Gulch, Elder, Khoeery, Little Elder, and Page Creeks. Forest Service personnel conduct annual fish presence and Level III stream surveys on 0.50 mi reaches of Dunn Creek and the East Fork Illinois River. These surveys verify salmonid distribution. In addition, monitoring efforts indicate that steelhead, coho and some chinook are found primarily in transition between the headwaters and valley where migration is possible.

A smolt-trapping project was conducted on the East Fork Illinois during 1994-1996 by ODFW and Siskiyou National Forest to estimate total salmonid smolt production within the basin. Results of downstream migrating chinook, steelhead, and coho fry are likely underestimated because of peak flows hindering trapping efforts (Vogt 1996). Trap catches peaked from mid-April to early-June (Vogt 1996) with the majority of 1+ yr old fish out-migrating before the 0+ (<1 yr old) fish.

B. Coho Salmon

Coho salmon within East Fork Illinois River watershed are part of the Southern Oregon/Northern California Coho ESU, which was federally listed as threatened on May 6, 1997 (Fed. Reg./Vol. 62, No. 87). The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon and Punta Gorda, California. Most of the coho in this ESU are in the Rogue River, with the largest remaining population in the Illinois River (Stouder et. al. 1997). Current summer water temperatures in the valley limit coho production from reaching historical levels (USDA 1995).

Habitat designated by the National Marine Fisheries Service (NMFS) as critical to the recovery of Southern Oregon/Northern California coho encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and Elk River in Oregon, inclusive. Critical habitat includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassible barriers (*i.e*., natural waterfalls in existence for at least several hundred years). Adjacent riparian zones have been defined by NMFS as part of critical habitat designation and are now based on a functional rather than a quantitative description. Based on NMFS criteria, critical habitat includes riparian areas because they provide the following functions: shade; sediment, nutrient, or chemical regulations; stream bank stability; and input of large woody material or organic matter. It is important to note that habitat quality is intrinsically related to the quality of riparian and upland areas and of inaccessible headwater or intermittent streams that provide key habitat elements crucial for coho in downstream reaches. More detailed critical habitat information (*i.e.*, specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the May 5, 1999 Federal Register notice.

On National Forest lands within the watershed, juvenile coho salmon have been observed as follows: throughout the main stem of East Fork Illinois River up to 1.0 mile past the confluence of Dunn Creek; up 1.0 mile on Page Creek, just past the Forest Service boundary on Elder Creek; up to 1.0 mile past the confluence of NF Dunn Creek; and in the lower reaches of Scotch Gulch and Cedar Gulch. There are no survey data on the distribution of juvenile coho outside National Forest lands within the watershed.

Critical habitat for coho extends throughout the main stem of the East Fork Illinois River including tributaries up to a 15 foot boulder waterfall located approximately one mile below the confluence of Chicago Creek. In Dunn Creek, critical habitat for coho includes all tributaries to the headwaters and is limited on the North Fork of Dunn Creek by a 7 foot waterfall located approximately 1/3 mile up from the mouth.

C. Chinook Salmon

Chinook salmon within the East Fork Illinois River are fall-run and belong to the Southern Oregon and Northern California Coastal chinook ESU, which was proposed for listing on March 9, 1998. In September 1999, the National Marine Fisheries Service (NMFS) identified this ESU as not warranted for listing under the Endangered Species Act. Regional Forester Robert Williams, however, designated chinook salmon and other salmonids within the Pacific Northwest Region as sensitive for Forest Service management purposes (FC 2670-1920; August 20, 1997).

Juvenile chinook are present in the main stem of the East Fork Illinois River usually through at least June (ODFW 1988). Their distribution extends up to the confluence of Dunn Creek. They spawn from October through early January with a peak usually during November.

D. Steelhead Trout

Steelhead within the East Fork Illinois River belong to the Klamath Mountains Province ESU and is a candidate species for listing. Land management activities, including logging and road building, have impacted critical steelhead habitat along the southern Oregon coast where watersheds are particularly unstable. The winter steelhead population in Illinois River has declined based on catch records. Sports harvest declined from 2,500 fish in the 1970s to less than 200 fish in 1992. Irrigation withdrawals have been a major impact to steelhead production in the Illinois River basin, and were particularly severe during the recent drought.

Steelhead are ubiquitous within the East Fork Illinois River basin, extending up to the confluence of Chicago Creek, up Dunn Creek about 0.25 mi above Poker Creek, and up Poker Creek about 0.75 mi.

E. Resident Cutthroat and Rainbow Trout

Cutthroat and rainbow trout are distributed throughout many of the reaches of all tributaries above and below anadromous fish barriers. The resident rainbow population within Illinois River is sympatric with winter steelhead. The Illinois River trout population appears to be much smaller than that observed in the 1950s.

F. Non-Native Fish

Eastern brook trout were documented in the East Fork Illinois River above the anadromous barrier during the 1989 stream survey. The species was thought to have been planted at higher elevation lakes or within the headwaters of the East Fork Illinois River in the past. Native cutthroat can vanish after nonnative trout become established (Behnke 1992).

Redside shiners were first identified in the lower Illinois River at the base of Illinois River falls in May 1960. Redside shiners compete directly with juvenile salmonids and are able to reduce trout production up to 54% in warm water (66.2E to 71.6EF) (Reeves 1987).

G. Fish Habitat

In 1997, the Governor's Salmon Recovery Science Team designated 27 core habitat areas in Southwest Oregon for protection and restoration. Core habitat areas are defined as reaches or watersheds that are judged to be of critical importance to the maintenance of salmon populations that inhabit those basins. Core areas are identified so that they might be managed to best protect and enhance critical habitat and recognize obligations under the Endangered Species Act (RVCOG 1997a). The East Fork Illinois River and Dunn Creek are identified as core areas for coho salmon (RVCOG 1997a) and contribute 10 % (25.2 mi of 247.6 mi) of the total core stream miles of the Rogue Basin and South Coast core areas. Within the Illinois River watershed, the East Fork Illinois River and Dunn Creek contribute 42 % (25.2 miles of 60.7 miles) to the core stream miles identified.

There are approximately 250 miles of perennial streams are in the East Fork Illinois River watershed. Approximately 19% of the 145 miles of perennial streams on National Forest lands have been surveyed (Table A-3).

Table A-3: Stream Miles Surveyed on Forest Service Lands

Stream Surveyed ** (includes tributaries)	Total perennial miles	Miles Surveyed	% Perennial miles surveyed by sub-basin
East Fork Illinois River	16.33	8.77	29.2
Dunn Creek	66.2	9.8	14.8
Elder Creek	18.5	0.57	3.1
Total		19.14	

** USDA Level II Stream Survey Protocol

Forest Service stream surveys conducted in 1989, 1992, 1993, 1994, and 1997 document habitat conditions within the East Fork Illinois, Dunn Creek, and Elder Creek. Results of surveys show the upper reaches of the East Fork Illinois River and Dunn Creek as relatively unaltered, while smaller tributaries to the East Fork Illinois and Dunn Creek have been extensively logged and roaded (USDA 1993). Remaining boulders and large woody material (LWM) from the 1964 flood provide some structure in aggraded reaches (USDA 1995). The lower reaches of the East Fork Illinois and Dunn Creek provide spawning and rearing habitats essential to the survival of salmonids in the Illinois River system when flows are optimum.

Lower East Fork Illinois River: ODFW conducted a stream survey along the East Fork Illinois River in 1994. The survey extended from the Highway 199 bridge (approximately 0.9 miles upstream from the confluence with the West Fork Illinois) up to the Waldo Road bridge (total 10.8 miles). The first two reaches identified in the survey have 66% of actively eroding stream banks, which is “excessive” (NMFS 1997) and may indicate a degrading channel. Possible causes for eroding stream banks and channel degradation are: excessive water withdrawal, overgrazing, channelization, removal of riparian vegetation, and gravel removal operations. The third reach, beginning above Elder Creek confluence, showed 21% actively eroding stream banks. Logging, road construction, the 1964 flood, riparian area clearing, agriculture, and other development have probably increased water temperatures and intermittent turbidity within the East Fork Illinois River. Moderately high summer water temperatures in the lower reaches are due to a wide shallow channel, open riparian area, and low summer flow (see Hydrology section).

Dunn Creek. The most important tributary to the East Fork Illinois River is the seven mile long Dunn Creek which lies entirely in California. Analysis of Forest Service Level II stream survey data indicates that in the entire watershed accessible to anadromous salmonids, populations of steelhead and coho are currently limited by adult escapement (a lack of adult spawning fish). Fish densities are considered below fully seeded levels for the habitat and province. Historically, Dunn Creek contained a strong viable and widely dispersed rearing population of coho. The current abundance of coho is extremely low with rearing populations found only in the premier habitats of North Fork Dunn Creek and Poker Creek, and the main stem adjacent to the confluence of these tributaries. Steelhead density is also below fully seeded levels.

Little Elder Creek: ODFW (1994, 1995) and USFWS (1995) surveys found steelhead and cutthroat trout present to river mile 0.75 and 1.5, respectively. Surveyors also found a private ford through the creek causing silting downstream at approximately 0.3 mile up Little Elder Creek, and eroding stream banks and cattle grazing within the creek system at approximately 1.0 mile upstream. There are 15 road crossings on perennial and intermittent streams in the drainage. Road density in the drainage is moderate (see Table A-2).

Elder Creek: ODFW (1994, 1995) and USFS (1989) fish presence survey data indicate that Elder Creek supports coho and steelhead 3.8 miles upstream to a 10 foot tall natural barrier and rainbow and cutthroat trout 7.1 miles upstream onto National Forest lands. The creek flows northwest from USFS land to its confluence with the East Fork Illinois River. There is no BLM ownership within the riparian reserve of the creek. Road density in the drainage is moderately high (see Table A-2). There are 36 road crossings on perennial and intermittent streams in the drainage.

Pool formation and channel stability in Elder Creek are highly dependent on large wood. Large wood often causes log jams, waterfalls and plunge pools. Spawning sized gravels are concentrated in and around log jams. Most fish are observed spawning near the vicinity of log jams.

Khoeery Creek: This creek flows north through Takilma to its confluence with Elder Creek. The upper reach is supported by perennial springs, but the main stem goes dry during summer. ODFW fish presence survey data (1995) indicate that cutthroat trout are present to river mile 2.0. BLM ownership accounts for approximately 15% of the entire drainage area. Ninety percent of the stream reaches surveyed on BLM land in the Khoeery Creek drainage are properly functioning. Road density in the drainage is high (see Table A-2). There are 32 road crossings on perennial and intermittent streams in the drainage.

Allen Gulch. All of what is known as “Allen Gulch” is in BLM ownership. However, the entire 7th field drainage of which it is a part is divided evenly between BLM and private ownership. The landscape in Allen Gulch is dominated by impacts of historic mining. An intermittent creek flowing through the gulch can be characterized relative to ODFW benchmark standards as follows: it has inadequate large woody debris, lacks channel structure, sedimentation, and it has inadequate riparian vegetation structure. Fish presence is not verified. The riparian acreage is comprised mostly of young and mid-seral stage vegetation. There are 12 road crossings on intermittent and perennial streams in the drainage analysis area, which includes the adjacent portion of the East Fork Illinois. Road density in the drainage is high (see Table A-2).

Tycer Creek: Tycer Creek flows southwest into Kelly Creek approximately four miles upstream of Highway 199 bridge. Land ownership in this drainage is primarily private with a small amount in BLM ownership. Low flows and loss of riparian vegetation are limiting factors for habitat on

Tycer Creek. Tycer Creek is perennial in the lower reach and intermittent in the upper reach due to irrigation withdrawals and changes in watershed hydroperiod. Cutthroat trout and winter steelhead are present (BLM surveys 1999). Compared to ODFW benchmark standards, the substrate is dominated by sand and habitat complexity is inadequate, as are shade and large woody debris. There are 61 road crossings on perennial and intermittent streams. Road density is high in the Tycer Creek drainage (see Table A-2).

Chapman Creek: Chapman Creek is in the best condition of the streams in the northern portion of the watershed. Chapman Creek flows south to join the East Fork Illinois River approximately three miles upstream of the Highway 199 bridge. The creek is perennial and supports cutthroat trout to RM 2.5 and winter steelhead to RM 1.0 (ODFW, undated). Winter steelhead are present but are probably limited by lack of spawning habitat. Spawning gravel in Chapman Creek is naturally limited with 50% embeddedness and 10% sand. The presence of mayflies and caddisflies in Chapman Creek may indicate good water quality, but more information to determine overall water quality. Large woody debris levels are inadequate relative to ODFW benchmark standards (16 pieces/mi.). BLM ownership accounts for approximately 50% of the drainage, with private land comprising the remainder. There are 42 road crossings on perennial and intermittent streams. Road density is high in the Chapman Creek drainage analysis area (see Table A-2).

Kelly Creek: This drainage is mostly in private ownership with approximately 15% in BLM ownership. There is no USFS ownership. Kelly Creek flows southwest to its confluence with East Fork Illinois after being joined by Tycer Creek 0.5 miles upstream of the mouth. Kelly Creek is perennial and probably supports limited numbers of cutthroat trout and winter steelhead. There are 34 road crossings on perennial and intermittent streams. Road density is slightly less than high in the drainage (see Table A-2). Kelly Creek is likely to be limited for large woody debris, riparian condition, channel complexity, and low flow.

See Hydrology section for discussion on stream geomorphology.

KEY QUESTION #A-5: Fish Production

> ***A-5: What are the factors that affect overall fish production within this watershed, and what can be done to improve overall spawning and rearing habitats?***

The primary overall limiting factor identified in the East Fork of the Illinois River Watershed Analysis (EFIRWA) Version 1.0 (1995) was a reduced overall ecosystem function resulting in reduced overall carrying capacity for anadromous salmonids within the watershed. This reduced ecosystem function identified in the EFIRWA 1.0 was directly linked to the following ecosystem function limiting factors: timing and intensity of headwater flow, headwater sediment delivery, transport and storage, large wood, Port-Orford cedar root disease, fire exclusion, the existing condition of managed stands in both Late-Successional Reserves and Riparian Reserves.

Other specific factors associated with the reduced ecosystem function, and which directly affect overall fish production identified in version 1.0, included: depressed anadromous fish populations, annual elevated water temperatures and reduced flows, fish bearing reaches lack adequate large wood and/or mature riparian reserve vegetation, fish bearing reaches lack channel complexity and abundance of side channels. Human uses such as water withdrawal, with its associated seasonal reduced in-stream flow resulting from irrigation ditches, and impoundments were also identified in version 1.0 as specific factors affecting overall fish production.

1. Existing Condition

The existing condition for the entire East Fork Illinois River watershed has changed very little since the first iteration (version 1.0) of the watershed analysis in spring 1995. However, at a site-specific scale, there have been some recent changes due to debris flows and recent landslide activity (see Geology section).

The existing condition was most recently (1997) described in the Southwest Oregon Salmon Restoration Initiative (RVCOG 1997a). The primary limiting factors that affect overall fish production remain those previously identified.

The Forest Service has identified both winter-run steelhead trout and cutthroat trout as USFS Region 6 sensitive species. The direct involvement of the National Marine Fisheries Service, a regulatory agency of the Federal government, in natural resources management activities on both State and Federal lands which may affect listed and/or proposed fish species has resulted in a standardized analysis/display of the existing conditions. The ongoing collaboration between the Forest Service, BLM, and NMFS has resulted in further delineation of the Environmental Baseline (NMFS 1997) in regards to standardized relevant indicators for the Klamath/Siskiyou Mountains.

2. Trend of the Habitat Indicators

Freshwater anadromous fish habitat conditions are often described in key attributes or habitat indicators, which characterize overall carrying capacity (USDA 1991). These attributes can collectively be used to qualitatively rate the habitats available to anadromous salmonids. Present trend of Habitat Indicators for the Rogue basin is documented in the Southwest Oregon Salmon Restoration Initiative (SOSRI) (RVCOG 1997a). In general, the overall trend for limiting indicators (*e.g.*, riparian zone canopy/shade, sediment, temperature) is described as either improving or stable. In the SOSRI the present status of agricultural development was deemed acceptable for the maintenance of salmonid populations, however the trend was documented as deteriorating. Stream return flows status and trend were documented as unknown.

Factors such as water quality, access, habitat elements, channel conditions and dynamics, flow and hydrology, and overall watershed conditions are under ongoing evaluation. In most of the anadromous fish bearing reaches in the watershed, most Environmental Baseline indicators, such as seasonal water temperatures, are either presently classified to be “At Risk”, or “Not Properly Functioning”, relative to the Klamath/Siskiyou Mountains Environmental Baseline. Table A-4 describes the existing environmental baseline for the East Fork Illinois River watershed relative to the Klamath / Siskiyou Mountains Factors and Indicators. This baseline is commonly used in any determination of Endangered Species Act Effects to Listed or Proposed for Listed status regarding Biological Evaluations, Biological Assessments, and Biological Opinions by NMFS.

Table A-4: Klamath/Siskiyou Mountains Environmental Base Line*

Indicator	***Properly Functioning *****	***At Risk** **	***Not Properly Functioning *****
Water Quality *Temperature	Elder Creek Page Creek	Rest of watershed	[2] Lower EF Illinois
Sediment/turbidity		Entire watershed	
Habitat Access *Physical barriers (Human caused)		Rest of watershed	[1]Lower EF Illinois
Habitat Elements *LWM		Rest of watershed	Bybee Gulch, Long Gulch, Page Creek, Elder Creek, Little Elder Creek, [1] Lower EF Illinois
*Substrate	Rest of watershed	[1] Lower EF Illinois	
*Pool frequency		Rest of watershed	Dunn Creek, [1] Lower EF Illinois, [2] Lower EF Illinois
Pool habitat		Rest of watershed	[1] Lower EF Illinois
Off-channel Habitat			Entire watershed
Channel Condition & Dynamic *W/D Ratio by Channel type		Entire watershed	
Stream bank Condition		Rest of watershed	Long Gulch
Floodplain Connectivity		Upper EF Illinois	Rest of sub-basins
Flow & Hydrology Changes in Peak Flow		Rest of watershed	[1] Lower EF Illinois
Watershed Condition *Rd Density & Location	Upper EF Illinois, Sanger Canyon, Bybee Gulch, Cedar Gulch, Scotch Gulch	Dunn Creek, Long Gulch, Page Creek	[1] Lower EF Illinois, [2] Lower EF Illinois, Elder Creek, Little Elder Creek, Chicago Creek
Disturbance History		Rest of watershed	Long Gulch, [1] Lower EF Illinois
Riparian Reserves			Entire watershed
Landslide Rates		Entire watershed	

** These are based on NMFS definitions / criteria (USFS 1998)

*The Environmental Baseline conditions are derived from the interpretation of stream survey data gathered from Forest Service, Oregon Department of Fish and Wildlife, and BLM records. The synthesis of these data and evaluation of the effects of any activities that may affect listed or proposed fish is an ongoing process on public lands.

[1] The portion of the East Fork Illinois outside National Forest lands.

[2] The portion of the East Fork Illinois inside National Forest lands (excluding the Upper East Fork Illinois subwatershed).

Low gradient segments serve as barometers used to evaluate and measure the relative health of fish habitat. For this analysis, the values developed over the past several years for the Pacific Northwest are utilized to assess habitat. These values were developed from extensive inventory data from streams in Oregon, Washington, Idaho, and Alaska.

Temperature: When under stress from water temperatures exceeding 70ºF, salmonid fish populations may have reduced fitness, greater susceptibility to disease, decreased growth and changes in time of migration or reproduction. Growth begins to decline and eventually ceases as water temperature approaches the upper lethal limit of 75º F (Beschta et al. 1987). Temperatures in excess of 75ºF result in fish mortality, while growth ceases within the range of 69º to 75ºF. Temperature is less than optimum for fish within the range of 59º to 69ºF, and optimum within the range of 45º to 59ºF.

Temperature data (see hydrology section) is available for the lower East Fork Illinois River, Elder, Page, and Dunn Creeks. Year-to-year variations in the extent of the range of sub-lethal water temperatures are evident. Lower East Fork Illinois exhibits the highest range of temperature, which can be lethal for salmonids within the watershed. Summer peak stream temperatures for the East Fork Illinois River ranges from 73º to 81ºF. Stream temperature in Elder, Page, and Dunn Creeks are less than optimum for salmonids.

Sediment/Turbidity: Logging roads produce the most sediment generated among forest management practices. The density and length of logging road distribution can be major factors in determining the level of sediment production. The greatest accumulation of fine sediments in streambeds occurs when road areas exceed 2.5% of a basin area (Waters 1995). Road areas within this analysis area do not exceed 2.5% of the watershed area.

Lower East Fork Illinois River, Long Gulch, Chicago, Dunn, and Elder Creeks, are at risk of sedimentation because of landslide and erosional processes (see Hydrology section).

Fish Barriers: Fish barriers can be defined as any physical/chemical/biological factor that prohibits upstream or downstream migration of juvenile or adult fish. Examples are dams, culverts, low water flow, temperature, waterfalls, and predation. Significant waterfalls that act as barriers within the East Fork Illinois River watershed occur along the East Fork Illinois about one mile above Chicago Creek, up Dunn Creek about one-fourth mile above Poker Creek (USDA 1995), and up NF Dunn Creek about 1.2 mile. Anadromous fish probably cannot pass these waterfalls to utilize the habitat in the upper reaches of East Fork Illinois and Dunn Creek.

Fish presence survey reports from ODFW (1995) include observations of fish barriers within areas surveyed. One culvert (Road 4804) in the headwaters of Elder Creek is identified as a fish barrier. An ODFW Rogue Fish Barrier (1999) inventory sheet identifies four gravel push up dams as fish barriers during low flow within the entire East Fork Illinois basin. Three are on the East Fork Illinois River within the analysis area: T40S, R8W, Sec 34, 27, and 2.

High temperatures in the lower valley may also act as a barrier during low flow. Low flows are a barrier when the river is not able to provide refugia during the hot summer months or passage to cooler, deeper pools. However, cool, clear water produced in the upper reaches contribute to the quality of fish habitat in the lower reaches.

Large Wood Material (LWM): Live trees or downed wood that intercept bankfull flow in a substantial fashion and are large enough to influence the formation of habitats for fish should be within the frequency range of 25 to 80 pieces per mile (NMFS 1997). Of the streams surveyed from 1992 to 1994, Elder Creek, Poker Creek, and NF Dunn have a large wood frequency within the expected range for southern Oregon. Dunn Creek and the East Fork Illinois River are at risk of not being within the range of expected large wood. Remaining LWM and large boulders from the 1964 flood and natural debris flows provide some structure for fish.

See "riparian area" section below and Hydrology section for more discussion on future large wood recruitment.

Substrate: The majority of substrate information for this analysis area comes from USFS and ODFW stream surveys. The lower reaches of the East Fork Illinois and Dunn Creek provide spawning and rearing habitats essential to the survival of wild anadromous salmonids in the Illinois River system. Dominant substrate in the lower reaches is cobble/gravel, and cobble/boulder size material in the upper reaches. Areas that have had recent debris flows and landslides are dominated by gravel. Most of the sediment from the 1964 flood has been flushed by winter flows.

During the winter, juvenile steelhead and cutthroat in larger streams (East Fork Illinois and Dunn Creek) generally seek refuge in the interstices of gravel and cobble substrate, while some juveniles migrate to smaller terrace tributaries to the East Fork Illinois and Dunn Creek.

Pool Habitat and Frequency: Pool habitat is of particular significance to juvenile salmon during all life stages of their life cycle. After emergence, coho salmon occupy low velocity stream margins near cover (above green bridge on the East Fork Illinois and in-stream structures on Dunn Creek), and gradually colonize pool habitat as they grow lager. Age 0+ coho salmon have a strong preference for low velocity pools and cover during the summer. The highest density of age 0+ juvenile steelhead tend to be in backwater pool areas, while 1+ juveniles occurring in small streams prefer scour pools, plunge pools, and cascades (Bisson et al. 1988).

The availability of pools or pool frequency will depend on channel width and type. Expected pools/mile for areas surveyed were calculated by dividing 5,280 feet by 7 times the wetted width for 2-4% gradient channels, and by 3 to 9 channel widths for gradients >4%, assuming pools counted will have a length equal to or greater than the wetted width.

North Fork Dunn Creek and the upper reaches of the East Fork Illinois are near or within the expected range of pool frequency for fish habitat. Areas with low gradient and lack of LWM have poor pool availability. In addition, pools within the lower reaches of the East Fork Illinois River may not have the appropriate depths or volume due to water withdrawal and low flows. Pools deeper than 3.0 feet provide adequate depth for juvenile salmonids. Stream segments surveyed showed average residual pool depth across all reaches on the East Fork Illinois as 2.1 feet, while Dunn Creek averaged 2.6 feet. The NF Dunn Creek and Elder Creek were below 2.0 feet.

Off-channel Habitat: Off-channel habitat areas in unconfined and lower gradient streams provide refuge areas for coho salmon when they typically migrate downstream during the fall and winter when the habitat is available. Juveniles will then leave winter habitat and migrate to sea at the end of their first year.

Properly functioning off-channel habitat areas have frequent active side-channels related to large wood and geomorphology. There are very few active side channels in the East Fork Illinois where stream gradient is low. The mid reaches of Dunn Creek, above the confluence of NF Dunn Creek, and above the green bridge on the East Fork Illinois River (FS Boundary) are low gradient areas where there is evidence of previous side channels.

Other Channel Conditions and Dynamics (Width/Depth ratio, stream bank condition, and floodplain connectivity), changes in peak flows, and landslide rates are discussed in the Hydrology section. Disturbance history is discussed in the Social Module.

Road Density and Location: Road density <2 mi/mi^2 (and no valley bottom roads) is an indicator of "properly functioning" in the Siskiyou Mountains matrix table for the East Fork Illinois Watershed (NMFS 1997). Dunn Creek, Page Creek, and Long Gulch are at risk of not properly functioning with some valley bottom roads and road densities of 2 mi/mi^2 and 2.4 mi/mi^2, respectively. The lower East Fork Illinois, Elder Creek, Little Elder Creek, Page Creek, Chicago Creek are not properly functioning. The upper East Fork Illinois, Sanger Canyon, Bybee Gulch, Cedar Gulch, and Scotch Gulch are properly functioning. Watersheds with some valley bottom roads and a road density between 2-3 mi/mi^2 are at risk of not properly functioning. Watersheds with well-roaded valley bottoms and a road density >3 mi/mi^2 are not properly functioning.

Riparian Areas: In major creeks within the East Fork Illinois River watershed, salmonid survival and production are dependent on a properly functioning physical environment that supports the different stages of the fish life cycle. The Aquatic Conservation Strategy (ACS) (ROD 1994) strives to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources, and restore currently degraded habitats as a result of historical mining and management.

Standards for riparian protection under state rules appear to be below what is required to promote recovery of degraded aquatic and riparian habitats on private lands. County zoning laws that regulate disturbance to riparian vegetation on private non-forest lands appear to be weak. Little improvement in riparian protection and road construction standards is expected on private lands over the next decade.

A riparian reserve is the lands along streams, and unstable and potentially unstable areas where special standards and guidelines direct land use. Riparian area is defined as the interface between terrestrial and aquatic ecosystems. Riparian ecosystems usually occur as an ecotone between aquatic and upland ecosystems but have distinct vegetation and soil characteristics. They are uniquely characterized by the combination of high species diversity, high species densities, and high productivity. Continuous interactions occur between riparian, aquatic, and upland terrestrial ecosystems through exchanges of energy, nutrients, and species.

The desired future condition in the East Fork Illinois River watershed is that riparian reserves provide adequate shade, large woody material recruitment, and habitat protection and connectivity for all aquatic biota, especially anadromous salmonids. According to NMFS (1997) a properly functioning riparian reserve system would have at least 80% in late-seral condition (mature and old growth $\geq$ 21 inch dbh) (NMFS 1997). However, some areas such as those underlain by serpentine, granitics, and moraine may not have the natural ability to support this level of late-successional forest (see Geology section).

Valley development has had a significant effect on the diversity and resilience of riparian areas. Fire exclusion has had the most profound effect on the distribution of age classes and vegetation structure in the headwaters. The result for both valley and headwaters for the Illinois River has been a simplification of ecological systems, leading to a loss of ecosystem function and diversity. The East Fork Illinois generally reflects these trends with some local exceptions. The Longwood Fire provides an excellent example of how fire exclusion and management activities can affect the intensity, pattern, and duration of wildfires (see Fire section). Local exceptions include the loss of late-successional forest in some sub-basins that have been heavily logged (see Terrestrial Module).

In healthy watersheds, mature and old-growth trees in intermittent and perennial riparian areas provide for future large wood recruitment. Future large wood recruitment depends heavily on riparian conditions in the headwater/valley segments and on delivery/transport mechanisms. Within The East Fork Illinois watershed, future LWM recruitment varies by sub-basin depending on proportion of mature to old-growth trees within riparian areas and inherent geology (Table A-5 and Table A-6). Potential future large wood recruitment according to PMR (Pacific Meridian Resources) data (1988) is high in Page Creek, Little Elder Creek, and the upper East Fork Illinois River. The lowest potential recruitment is in Cedar Gulch, Bybee Gulch, and Sanger Canyon. However, future large wood recruitment is heavily dictated by the inherent geology and soil productivity of riparian areas. Areas of serpentine geology often have sparse or stunted vegetation in the riparian area, and due to POC root disease mortality, often lack large conifers for either shade or large wood recruitment (see Geology section). Debris flows are a main source of large wood delivery to streams.

Most of the watershed possesses highly diverse vegetative characteristics, with large Douglas-fir being the dominant species. However, Port-Orford cedar is the dominant species in Sanger Canyon, and in the upper reaches of Dunn Creek. Bigleaf maple, Port-Orford cedar, red alder, vine maple, willow, tan-oak, and canyon live-oak are represented throughout the watershed (USDA 1992, 1993, 1994). Red alder and canyon live-oak dominated the floodplain vegetation in the sapling/pole condition (>10 ft tall, <8 inch dbh). Douglas-fir ranging from 8 to 32" dbh was the dominant species in the outer riparian zone.

Although proportions may not differ in overall riparian vegetation seral stage, vegetation composition may be different in intermittent corridors (see Terrestrial Module). On BLM owned land, 17% (873 acres) is mid-seral stage and 6% (327 acres) is early seral stage.

Table A-5a: Forest Service Acres and % of Riparian Vegetation Seral Stages for All Streams in Tributary Watersheds within the East Fork Illinois River Watershed (PMR data 1988).

Riparian Reserve Seral Stage	Little Elder Creek	Elder Creek	Scotch Gulch	Page Creek	Cedar Gulch	Long Gulch	Dunn Creek	Bybee Gulch	Chicago Creek	Sanger Canyon	Upper EF Illinois
Water/Rock/ Grass/Shrub	11 2%	72 6%	24 8%	13 1%	30 12%		474 9%	4 5%	63 14%	53 17%	179 12%
Seed/sap/pole	135 24%	461 36%	91 30%	232 23%	161 64%		2,271 41%	72 83%	183 42%	141 46%	405 27%
Young (9-21" dbh)	115 20%	188 15%	63 21%	149 15%	40 16%		518 9%	0	37 8%	30 10%	140 9%
Mature (21-32" dbh)	159 28%	290 22%	83 27%	280 28%	16 6%		1,435 26%	6 7%	109 25%	51 17%	458 30%
Old Growth (>32" dbh)	146 26%	283 22%	45 15%	327 33%	3 1%		905 16%	5 6%	46 11%	32 10%	342 22%
TOTAL	566 100%	1,294 100%	306 100%	1,001 100%	250 100%		5,603 100%	87 100%	438 100%	307 100%	1,524 100%

*Data gap Long Gulch; Total may not be the same as with Terrestrial Module information.

Table A-5b: BLM Acres and % of Riparian Vegetation Seral Stages for All Streams in Drainage Analysis Areas within the East Fork Illinois River Watershed.

Riparian Reserve Seral Stage	Kelly Creek	Tycer Creek	Chapman Creek	EF below Chapman	Lower EF Illinois	Little Elder Creek	Elder Creek	Khoeery Creek	Allen Gulch	Scotch Gulch	Cedar Gulch	EF below Dunn/ above Scotch
Serpentine	0	29 23%	1 <1%	0	7 10%	14 22%	0	40 48%	0	47 50%	0	0
Non-vegetated	0	0	0	3 11%	45 67%	0	0	0	14 14%	0	0	0
Early Seed/sap/pole (0-11" dbh)	7 10%	22 17%	36 14%	0	0	14 22%	0	0	5 6%	0	0	0
Mid seral (11-21" dbh)	25 37%	43 33%	2 <1%	0	0	0	0	0	39 41%	47 50%	6 100%	3 100%
Mature (>21" dbh)	36 53%	134 27%	216 85%	28 89%	15 22%	34 56%	0	43 52%	37 39%	0	0	0
TOTAL	67	228	255	31	67	62	0	83	95	94	6	3

*Data gap in Lower EF Illinois and Long Gulch; Total may not be the same as with Terrestrial Module information.

Table A-6: Acres and % of Riparian Vegetation Seral Stages for **Intermittent** (Class IV) Stream Tributaries to the East Fork Illinois River Watershed (PMR data 1988).

Riparian Reserve Seral Stage	Little Elder Creek	Elder Creek	Scotch Gulch	Page Creek	Cedar Gulch	Long Gulch	Dunn Creek	Bybee Gulch	Chicago Creek	Sanger Canyon	Upper EF Illinois	TOTAL
Water/Rock/ Grass/Shrub	3 1%	27 5%	14 19%	7 1%	2 5%		224 10%	0	28 13%	37 22%	117 18%	459 10%
Seed/sap/pole	53 22%	207 38%	25 33%	135 26%	32 74%		943 41%	17 81%	89 42%	71 43%	220 33%	1,792 37%
Young (9-21" dbh)	66 27%	95 18%	20 26%	80 16%	6 14%		235 10%	0	19 9%	17 10%	38 6%	576 12%
Mature (21-32" dbh)	73 30%	105 19%	13 17%	130 25%	3 7%		554 24%	3 14%	56 27%	22 13%	166 25%	1,125 24%
Old Growth (>32" dbh)	50 20%	110 20%	4 5%	168 32%	0		342 15%	1 5%	19 9%	19 12%	120 18%	833 17%
TOTAL	245 100%	544 100%	76 100%	520 100%	43 100%		2,298 100%	21 100%	211 100%	166 100%	661 100%	4,785 100%

*Data gap in Lower EF Illinois and Long Gulch.

Willow communities in Dunn Creek provide a significant contribution in bank stability and inner channel complexity. Willow presently growing within the active stream channel is currently the most valuable addition to aquatic habitat complexity and is increasing the diversity of channel morphology. Sediment deposition in these areas stabilizes the vegetative community, which will soon be supplemented by alder regeneration. This process is narrowing the active stream channel which provides diversion of the thalweg and the scouring that will create the complexity and pool depth currently limiting the rearing potential of the stream.

Existing mid to late-successional seral stage riparian vegetation coupled with steep topography results in a high shade factor for parts of the watershed (see Hydrology section). Average canopy cover for areas surveyed can be seen in Appendix 2.

In the early 1990s the Longwood fire burned over 10,000 acres, mostly within the East Fork Illinois River watershed. The riparian areas did not burn as intensely as the upslope areas, but many trees and shrubs were killed along streams (RVCOG 1997a). The 1964 flood triggered landslides, denuded riparian vegetation, and scoured stream banks throughout the watershed. Effects of the storm are still evident. During the 1994-95 season heavy winter rains brought substantial flooding and damage in the Dunn Creek drainage.

The habitat elements listed in Table A-7 are requirements for all life stages of coho. All opportunities for maintaining and improving freshwater productivity of anadromous salmonids should be identified so that individual and grouped land management actions (and other human activities) may be modified accordingly in order to prevent potential mechanisms that affect survival.

Table A-7: Summary of Environmental Factors and Potential Mechanisms of Mortality Affecting Freshwater Habitat Capacity and Related Density-independent Survival (By Life Stage) of Coho Salmon

Life Stage	Factors affecting population productivity	Potential mechanisms affecting survival
Egg to emergent fry	Substrate stability, amount of fine sediment in spawning gravels, spawning gravel permeability, water temperature, peak flows	High flow events cause loss of eggs due to streambed scour and shifting; reduced flow and DO levels to eggs due to high sedimentation cause increased mortality; high fine sediment levels cause entombment of fry; increased temperatures advance emergence timing, thereby affecting survival in next life stage; anchor ice reduces water exchange in redd causing low DO levels and/or eggs to freeze.
Emergent fry to September parr	Flow dynamics during emergence period, stream gradient, number of sites suitable for fry colonization, predators, temperature[1], nutrient loading[1]	Loss of emergent fry occurs due to being displaced downstream by high flows; advanced emergence timing causes fry to encounter higher flows; high gradient and lack of suitable colonization sites for emergent fry cause fry to move downstream increasing risk of predation; stranding and excessive temperature promote disease and cause mortality; temperature and nutrient changes affect growth thereby affecting other causes of density-independent loss.
September parr to smolt	Fall and winter flows, number of accessible winter refuge sites, temperature, predators	Displacement during high flows; stranding and death due to dewatering; loss of predators; loss due to poor health associated with winter conditions.1

1 Effects likely have both density-independent and dependent components. (adapted from NMFS 1997)

H. In-Stream Restoration and Enhancement Opportunities

In-stream enhancement activities on both the East Fork Illinois River and Dunn Creek occurred in the late 1980's. Wood structures were placed in the vicinity of the confluence of Dunn Creek to the East Fork Illinois River. The majority of structures placed on the East Fork Illinois did not hold in place and were washed down river. Most structures on Dunn Creek placed well up-stream from the confluence with the East Fork Illinois held in place, although those adjacent to the confluence were flushed out or placed up on the banks.

Structures further up-stream on Dunn Creek past the NF Dunn Creek confluence have held in place and been maintained and/or modified up to the present date. As recently as 1998, these structures under went maintenance by the Forest Service, California Department of Fish and Game, California Conservation Corps, and Americorps. Out planting of conifer seedlings within the Riparian Reserve immediately adjacent to this in-stream improvement site occurred in the winter of 1999 by the same partnership. During the spawning season, coho redds and carcasses are always found within this improved area. There is a concern that juvenile coho may have difficulty migrating over the “v-notch” structures during low flows.

The stream crossing on NF Dunn Creek was identified as a barrier to juvenile salmonids in 1993 (Bio-Surveys 1993). The replacement of this crossing with a bottomless arch occurred in 1995. Other in-stream opportunities identified by Bio-Surveys for Dunn Creek included the introduction of a mixed stand of conifers along the riparian corridor. Planting occurred within this corridor in both 1995 and again in 1998. Bio-Surveys also recommended the development of off-channel rearing habitat in the lower reach of Dunn Creek and some modification of existing structures to increase rearing habitat.

A.G. Crook (1994) surveyed the East Fork Illinois River and recommended installing new structures and/or maintenance of old ones for temporary watershed improvements. Reaches one and two were considered the best opportunity for improvements. A.G. Crook also identified that "all reaches of the stream would benefit from restoration of Douglas-fir to the riparian zone." The 1992 (USFS) survey of Elder Creek did not produce any recommendations for in-stream enhancement projects.

Since the first iteration of the East Fork Illinois watershed analysis in 1995, several other categories of watershed restoration activities have been initiated within the watershed. These other categories include, but are not limited to, various road treatments and management of both terrestrial and riparian vegetation.

I. Fisheries Recommendations

Watershed restoration efforts help restore/improve ecosystem function and meet ACS objectives and benefit fish and other aquatic biota both directly and indirectly. For example, by improving water temperature in the lower valleys, fish are expending less energy and are able to rear in available habitat. Fish benefit directly from in-stream enhancement measures such as placement of large woody debris. Most of the large wood currently providing cover and habitat in Dunn Creek is in constructed in-stream structures.

The following are recommendations based on the data available for this watershed.

- For habitat management strategies, continue to implement watershed strategies set forth in the 1995 East Fork Illinois Watershed Analysis Version 1.0 including the following:

    1. Road decommissioning (especially valley bottom roads in Allen Gulch, Long Gulch, Elder Creek, and Dunn Creek), including the removal of stream culverts, to facilitate delivery of large wood downstream.
    2. Develop an up-to-date inventory of existing roads on BLM, Forest Service, and private lands (i.e., mining roads, potential road barriers) for the entire watershed, then develop TMO recommendations for BLM and Forest Service roads.
    3. Storm-proof or remove culverts where fish passage is a problem and/or water course is compromised (e.g., Allen Gulch, Elder Creek).
    4. Where appropriate, in stream placement of large wood (must be ≥24" dbh and 50 ft long or twice the bankfull width) to raise towards benchmark levels, including on-site placement of whole Port-Orford Cedar trees that are removed for *Phytophthora lateralis* control.
    5. Protect tributaries to the East Fork Illinois River and Dunn Creek dominated by Port-Orford cedar from root disease (source of LWM mainly from Port-Orford cedar)
    6. Stream-side channel creation (only in low gradient areas where there have been previous side channels)
    7. Water Conservation and irrigation system improvement (help private landowners to implement conservation measures by assisting in project proposals, grant writing, etc to replace/improve water withdrawal methods *(i.e.,* 3 gravel push-up dams on The East Fork Illinois located in T40S, R8W, Sec 34, 27, and 2).
    8. Riparian Silviculture in areas where site-specific analysis verifies there is the need. Silvicultural activities could be used to increase LWM in aquatic system.
    9. Determine the distribution of the eastern brook trout and other non-native fish species in the watershed. These fish can be important competitors against resident and anadromous juvenile salmonids. Any fish stocking in headwater lakes should be evaluated with regard to the potential hazard to native species.

- Establish long-term monitoring strategies which include the following:

    1. Conduct Level II stream surveys above existing survey areas
    2. Conduct ODFW physical habitat stream surveys in tributaries to the lower East Fork Illinois.
    3. Work with ODFW and CDFW for fish presence above confluence of Chicago Creek and in Dunn Creek watershed (Brook trout presence and extent).
    4. Identify and map extent of exotic species within the entire basin.
    5. Monitor tributaries to the East Fork Illinois River and Dunn Creek for habitat condition.
    6. Establish permanent photo points for riparian plantings, possible silviculture activities, and prescribed fire.
    7. Evaluate habitat capacity of lentic water bodies within the East Fork Illinois watershed (springs, ponds).

8. Interpret future macro-invertebrate data to relate with watershed analysis findings.
9. Gather quantitative information on riparian canopy cover and shade values by using established field methods, such as the solar path-finder and moose-horn (stream surveys and GIS are subjective).
10. Inventory all permanent natural anadromous barriers to assess the extent of critical habitat for coho and other anadromous fish (see Fisheries section for definition of natural anadromous barrier).

- Develop appropriate in-stream enhancement projects such as the following:

  1. Use salmon carcasses for providing nutrients to stream ecosystems where appropriate.
  2. Maintain and enhance existing fisheries habitat enhancement structures on Dunn Creek (notch "v" structures so that juvenile migration is not compromised during low flows). Consider juvenile fish passage during low flows in designing future in-stream projects.
  3. Develop new fisheries habitat enhancement structures on lower Dunn Creek (near confluence).
  4. Improve existing side-channels on Dunn Creek.
  5. Work with private landowners and ODFW to improve side channels and existing habitat.
  6. Add to Fisheries enhancement structures previously placed on the East Fork Illinois.

- Limit adverse effects of prescribed fire and/or wildfire on fisheries resources.

- Continue to implement the Oregon Coastal Salmon Recovery Initiative (1997a, & 1997b) as it proposes to help recover habitat for salmon within the state of Oregon. The plans are identified as:

  Phase 1: *A Plan to stabilize the native Coho population from further Decline*
  Phase 1: *A Plan to stabilize the native Steelhead Population in Southwest Oregon*

- Continue ongoing Endangered Species Act Effects Consultation Process with NMFS to: Implement Aquatic Conservation Strategy, Further mitigate any actions deemed "Likely to Adversely Affect" Listed Species, Develop "Not Likely to Adversely Affect" Action Alternatives

J. Data Gaps

The following have been identified as data gaps:

- Condition and function of lentic water bodies within the entire watershed.
- Comprehensive identification of fish distribution.
- Total perennial and intermittent stream miles and acres outside of National Forest lands.
- Comprehensive road densities for the watershed at the HUC 7 level.
- LWM frequency for streams other than what has been surveyed.

- Pool quality and frequency for streams other than what has been surveyed.
- Quantitative information on canopy cover for streams other than what has been surveyed and compiled from PMR data.
- Harvest acres in riparian areas outside of National Forest lands.
- Percent of open land in transient snow zone of each drainage.
- Temperature and turbidity data outside of National Forest lands.
- Comprehensive analysis of roads and harvest within the transient snow zone.
- Shade value data outside of National Forest lands.

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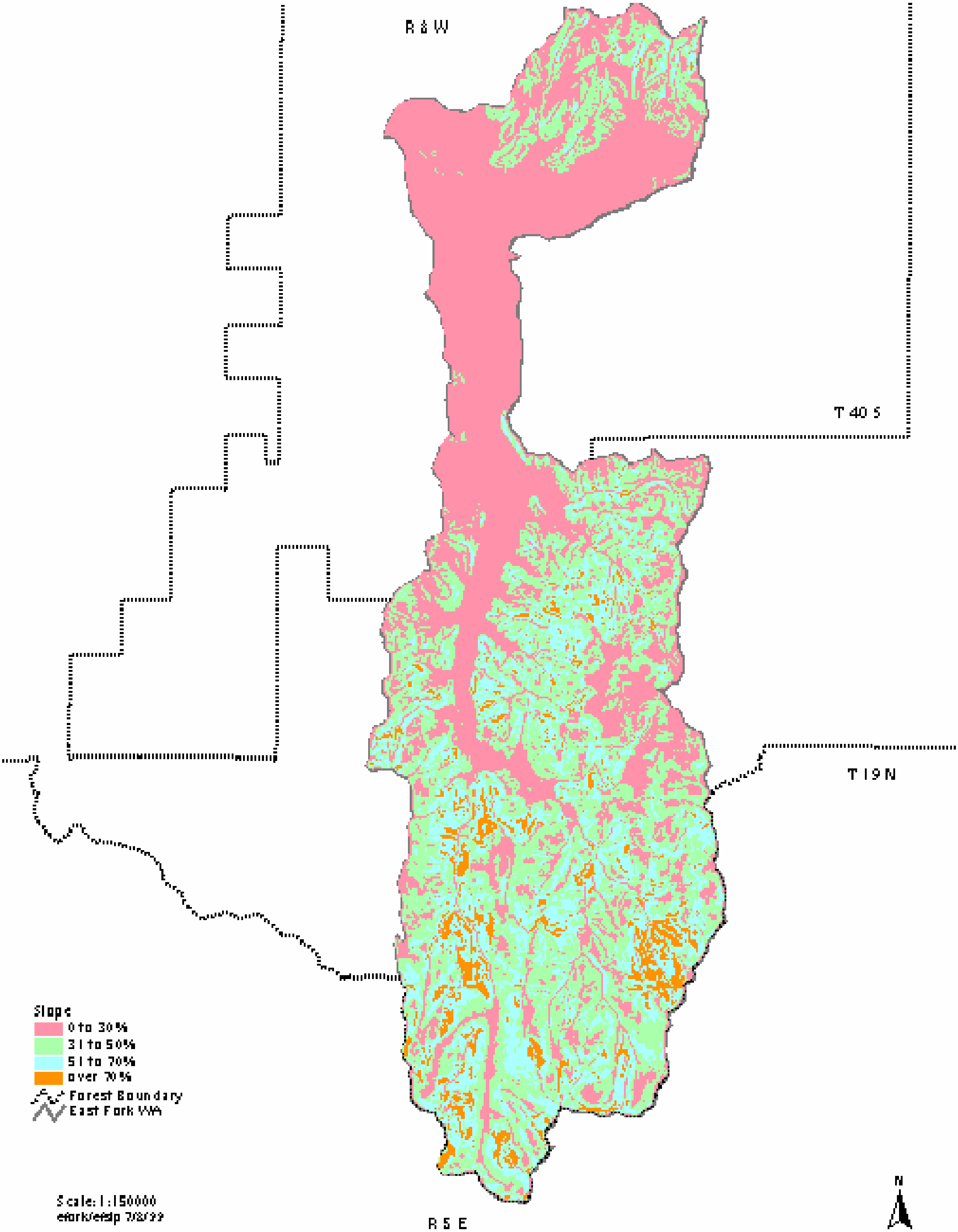
APPENDIX A: In-stream Habitat Comparison for Dunn Creek, Elder Creek, and the East Fork Illinois River.

Habitat Elements	Stream Name and Reach No.												
	Dunn Creek (USDA 1993)						East Fork Illinois (USDA 1994)					Elder Creek (USDA 1992)	
	1	2	3	4	NF Dunn	Poker Creek	1	2	3	4	5	1	2
Reach Gradient (%)	3	3	12	8	8	8	2	2	2	4	4	12	20
Reach length (mi)	1.84	1.78	2.31	1.04	0.54	1.05	1.3	1.43	0.9	1.1	0.7	0.44	0.13
Bankfull Width (ft)	23.8	23.1	18.2	13.7	13	13.9	38.7	31.4	35.2	34.7	32.7	7.5	63
Expected Pools/mile ** (based on 3 - 9 channel widths)	24 to 73	25 to 76	32 to 97	42 to 126	45 to 135	42 to 126	15 to 45	18 to 56	16 to 50	17 to 50	18 to 53	78 to 234	93 to 279
Observed Pools/mile	11.4	17.4	23.7	25	41.7	19.2	13	10	36.7	36.4	36	130	0
*Width/Depth	19.6	19.4	15.4	10.4	13.0	16.8	34.0	13.1	14.3	14.5	18.9	17.3	18.0
Large Wood Pieces / mile (>24" dbh, 50 ft length or 2X bankfull width) (>25/mi = Good <10/mi = Poor)	9	20	13	21	44	39	0.8	5.4	16	12	14	103	441
Canopy Cover (%)	20-30	30-60	20-30	20-30	90	90	20-30	20-30	20-30	20-30	20-30	20-30	20-30

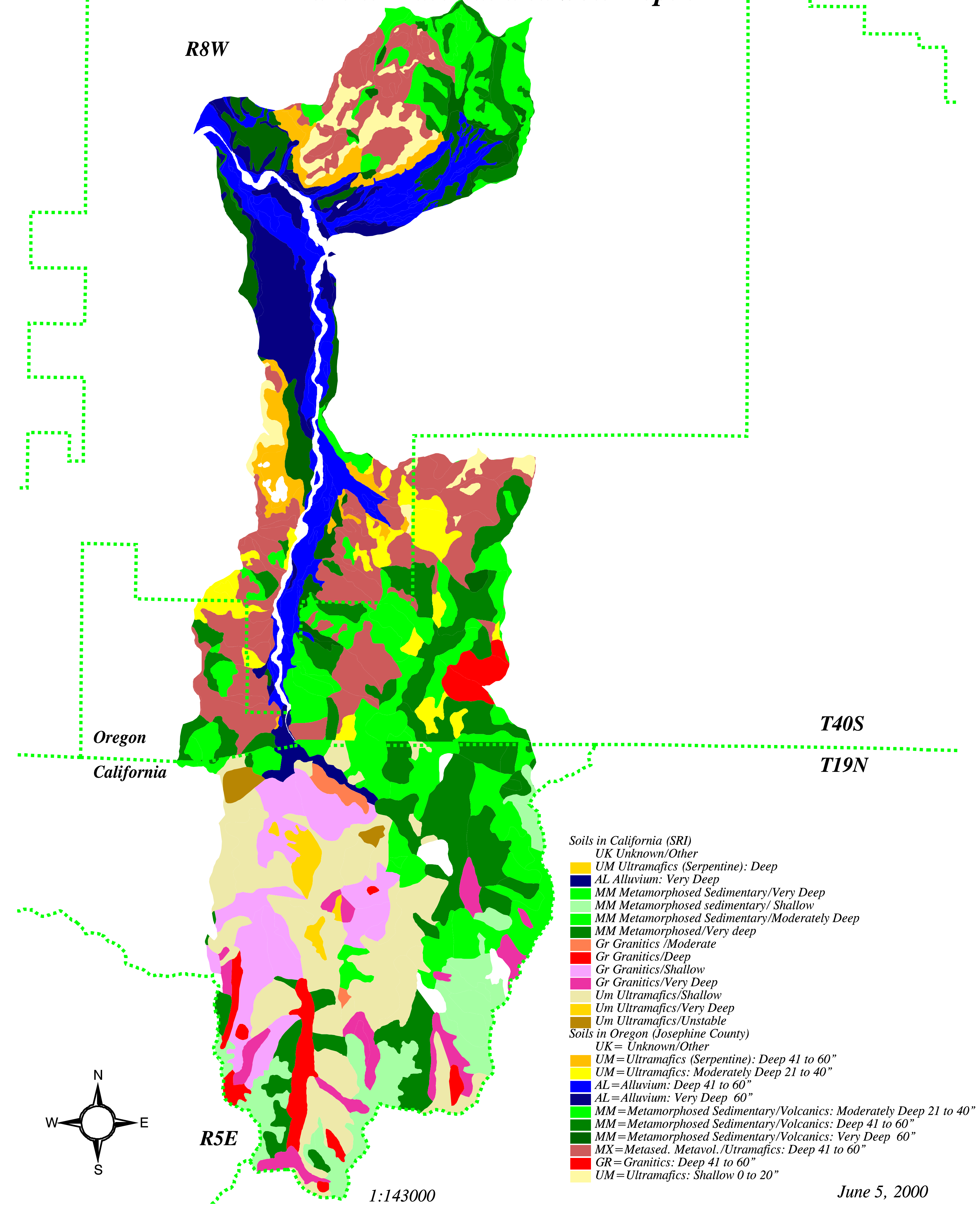
* In general, W/D ratios in excess of 12 for Rosgen A, E, and G channel types, and in excess of 30 for B, C, and F channel types are red flags that require further investigation.

** Range based on stream type, channel morphology, gradient.

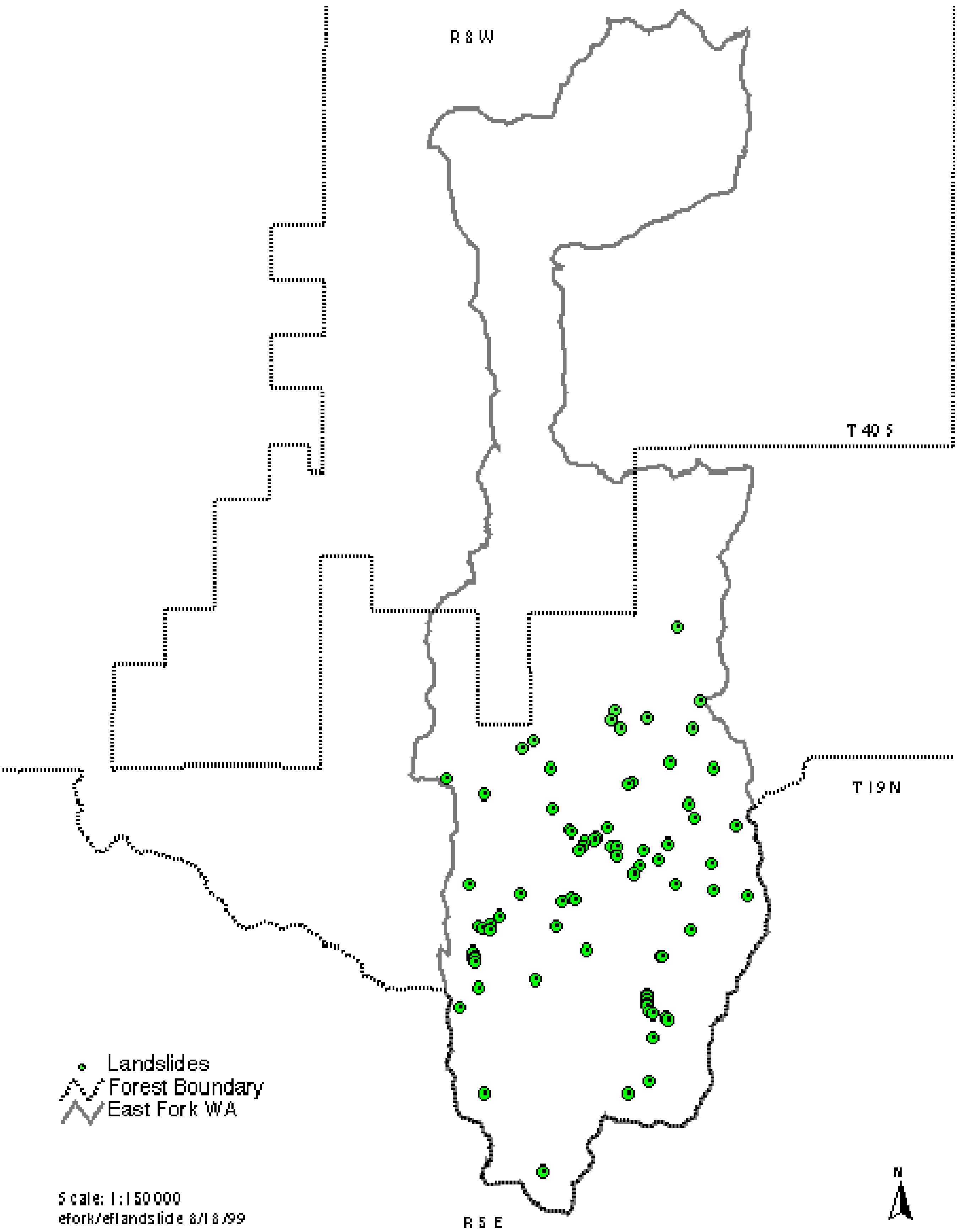
East Fork Watershed Analysis
Percent Slope

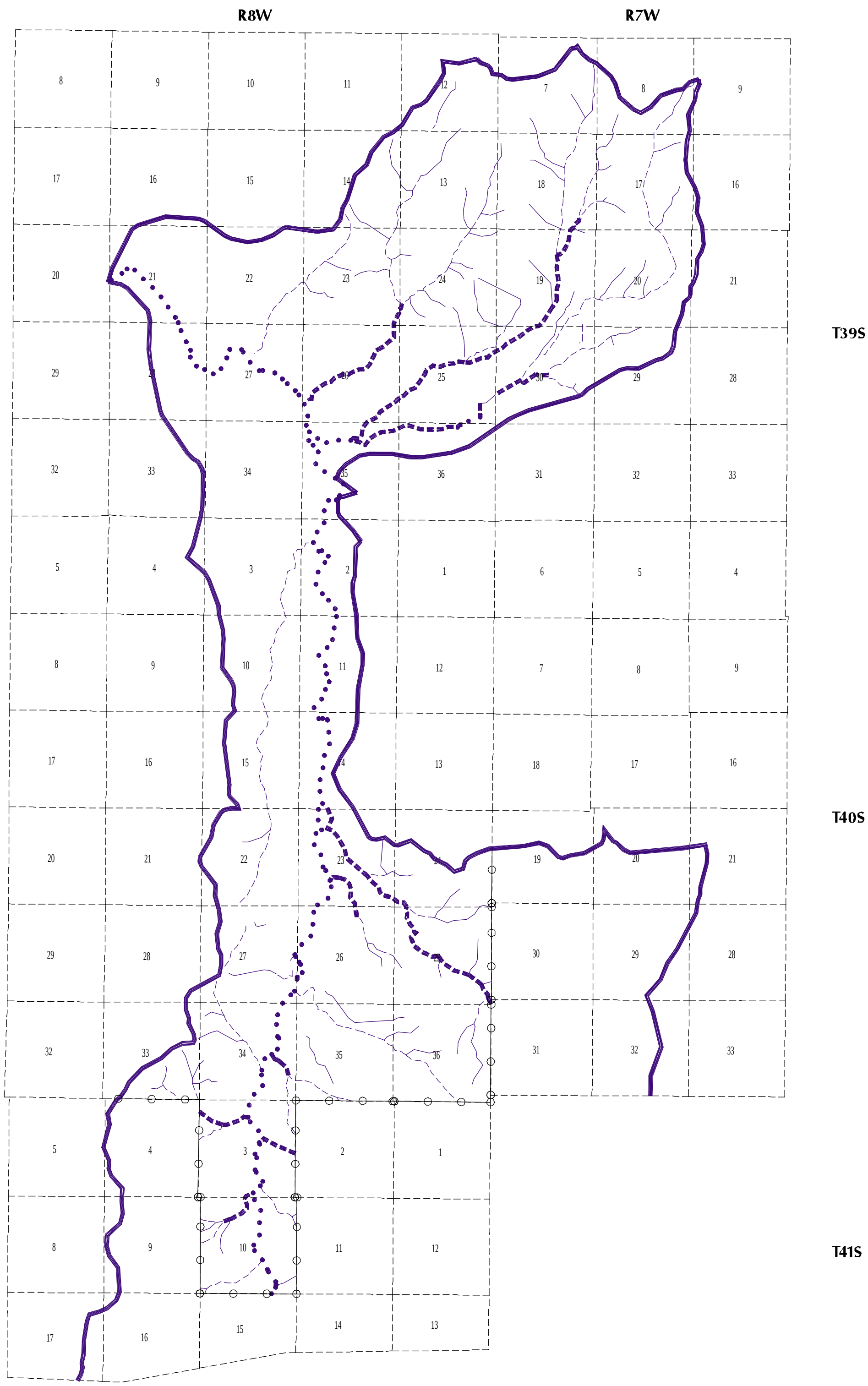


East Fork Illinois Watershed
Parent Material and Soil Depth



East Fork Watershed Analysis
Landslides





SCALE 1:110000

STREAM ORDERS (> 1)
OUTSIDE THE USFS BOUNDARY
IN THE EAST ILLINOIS WATERSHED

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

LEGEND

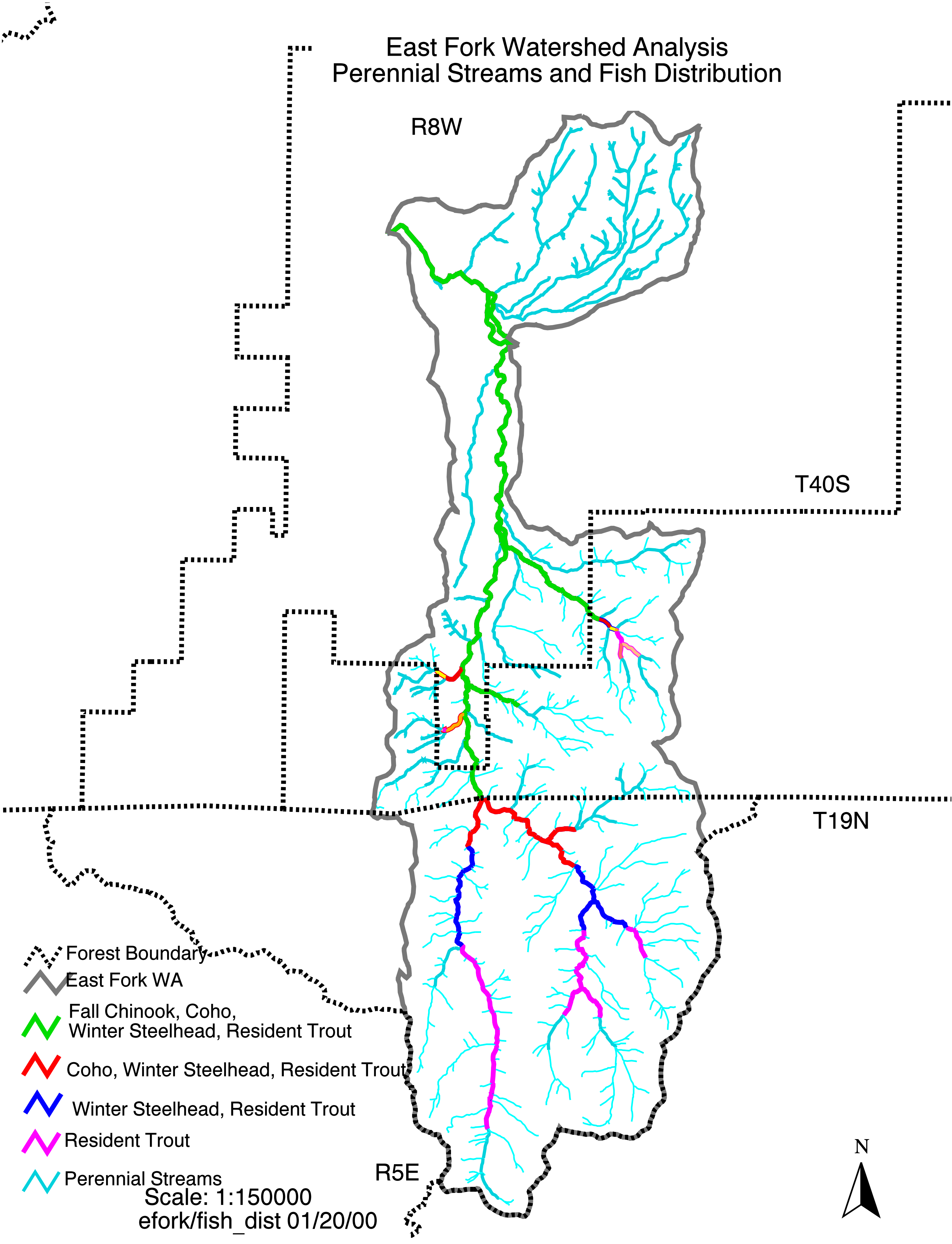
- ORDER 2
- ORDER 3
- ORDER 4
- ORDER 5 to 7
- WATERSHED BOUNDARY
- USFS BOUNDARY

N

August 1999

John McGlothlin

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.


East Fork Watershed Analysis
Perennial Streams and Fish Distribution
R8W
T40S
T19N
R5E
Forest Boundary
East Fork WA
Fall Chinook, Coho,
Winter Steelhead, Resident Trout
Coho, Winter Steelhead, Resident Trout
Winter Steelhead, Resident Trout
Resident Trout
Perennial Streams
Scale: 1:150000
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EAST FORK OF THE ILLINOIS RIVER

WATERSHED ANALYSIS

SOCIAL MODULE

US FOREST SERVICE
Illinois Valley Ranger District

BUREAU OF LAND MANAGEMENT
Grants Pass Resource Area

JULY 2000

Social Module

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Social Module

I. Social Sciences Key Question Summary

S-1: How have past and present human activities influenced the watershed?

S-2: What future activities, other than timber harvest, could affect watershed function?

II. **Key Question** #S-1: Historical and Current Uses

S-1. How have past and present human activities influenced the watershed?

A. Prehistory and Ethnography

Broadly speaking, the native people of the region were hunter-gatherer-fishers who made their living from a wide variety of natural resources found in the narrow canyons and small interior valleys they occupied. People wintered in semipermanent villages located along major rivers and dispersed during the spring-summer-fall season to exploit upland resources. The archaeological record reflects this subsistence-settlement system.

Ethnographically, Penutian and Athapaskan speakers occupied the region. Tribes included the lowland Takelma of the upper Illinois River; Athapaskans occupied the Applegate Valley (Kendall 1990). Gray (1987: 20-24) however, concludes that the whole Illinois River drainage was Athapaskan. At the time of Euro-American contact native cultures could be characterized as simple, stratified, village-based societies, with ceremonial systems much like that found among the Hupa, Karuk, and Wiyot of northwestern California (Aikens 1993; Kendal 1990: 591). Gray (1987) provides an excellent synthesis of the Takelma and their Athapaskan neighbors.

Aikens (1993: 221-266) recently summarized the prehistory of southwest Oregon. The oldest recorded site in our immediate area is located at Marial on the Rogue River. This site has been dated to around 8,000 years before present (Schriendorfer 1985). However, little is known of the archaeology of the upper Illinois River watershed. Recorded archaeological sites located downstream of the analysis area include the MaCalaeb's Ranch site (35JO32) possibly correlated with the ethnographic site "Talsalsan", and the Gallaher site (35JO28), a late Archaic site that was possibly occupied to the mid-1800's. In addition, pit house village sites have been recorded on the wild section of the Illinois River (Steep 1994). Four prehistoric sites are recorded for the watershed (three USFS and one BLM).

Traditional Native American cultures were effectively destroyed in the Illinois Valley area by the intrusion of miners in the early 1850's and the subsequent Rogue Indian Wars**.** After the 1853 treaty, most of the Takelma were on the Table Rock Reservation. In 1856, after the cessation of hostilities, they were moved to the Grand Ronde Reservation, and also to the Siletz Reservation.

At present there does not appear to be any formal use of the area by Native Americans.

B. Indian Burning

Fire is an important aspect of ecosystem function in southwest Oregon. Major plant communities are dependent on fire and other types of disturbance to successfully maintain ecosystem health (Atzet and Martin 1991). In this respect, Native Americans played an active role in maintaining fire dependent communities over time, and in establishing themselves as the dominant "edge dependent species" (Bean and Lawton 1993; Lewis 1989, 1993).

There are numerous parallels between modern vegetation management and Indian burning. Each seeks to maintain an array of early to mid-seral plant communities across the landscape. These various plant communities provided small and big game habitat, natural fuel breaks, and for native populations various edible plant foods, materials for basketry, and other technological uses. Other uses for fire included hunting, crop management, insect collection, pest management, warfare, preparing foods, and clearing areas for travel (Williams 1993). Fire also recycles nutrients, provides vistas, and often destroys forest pathogens. See Williams (1993) for a recent bibliography of the use of fire by Native Americans.

Until recently specific ethnographic information for the use of fire in southwest Oregon was limited (Lewis 1989). However, research specific to the Applegate and Illinois Valleys has been published (McKinley and Frank 1995; Pullen 1995). In addition to these recent publications, detailed information is available for the Willamette Valley (Boyd 1986), and it is possible to extrapolate techniques to native populations in the analysis area based on similarities of plant communities. Similar plant communities also occur in northern California, such as chaparral, and ethnographic data is available for burning by those tribes. Natives' burning practices in southwest Oregon must have functioned similarly to those described for such tribes as the Miwok, Hupa, Tolowa, and Wintun found in California (Lewis 1989, 1993). Also see Blackburn and Anderson (1993).

The following review is based on Lewis (1989) and Pullen (1995). In addition, Pullen (1995) provides an extensive review of historic journals and other writings illustrating Applegate and Illinois Valley plant communities at the time of historic contact.

Riparian zones: Conifers were an important part of riparian zones along the Illinois River and their tributaries; ponderosa pine along the upper Illinois River (Illinois Valley) and Douglas-fir on its lower reaches.

Valley floor-oak-grasslands: These plant communities were burned beginning as early as late July and continuing through September. Burning often occurred after spring rains. Burning initiated early growth of grasses and provided habitat for game. Burning also controlled acorn-destroying insects (McCarthy 1993). Native American seasonal habitation sites are usually found along the boundaries of this zone. Recent research indicates that more oak-pine habitat existed in the past and that these communities were specifically maintained by native burning (Pullen 1995). Open ponderosa pine stands interspersed with open groves of Oregon white oak were maintained.

Valley slopes: North-facing slopes in the Illinois Valley were covered with open stands of ponderosa and sugar pine and an occasional Douglas-fir. South-facing slopes were covered with grass, except along ravines where oaks, chaparral, and scattered ponderosa pine occurred.

Chaparral: Fires were usually initiated in the fall. The primary goal was to maintain a mosaic of early to mid-seral plant communities that functioned as small and big game habitats. Edible plant species were also produced. This mosaic created natural fuel breaks. Spring burning helped to maintain more permanent openings. Fire was also used to create seedbeds for planting of tobacco; tobacco was the only "cultivated" plant species.

Mid-elevation forests: Fire was possibly used to maintain open understories in stands dominated by Douglas-fir and ponderosa pine. Fires eliminated the build up of ladder fuels that could contribute to stand replacement fires. Meadows were maintained but overall the native use of fire in this zone was limited.

Upper elevation forests: Upper elevation forests in the Illinois River drainage were composed of mature forest of fir, pine, and cedar. Meadows were likely maintained by native burning but overall use of anthropogenic fire in this zone was limited.

One of the management objectives of native burning was the maintenance of wildlife habitats; therefore, a brief discussion of wildlife populations at the time of contact is in order. Based on a review of historic sources, Pullen (1995: VI-19-20) provides the following general observations:

Deer, elk, bear and wolf: Deer, elk, bear and wolf populations were much higher before or at the time of Euro-American contact. This can be attributed to the positive effects of native burning.

Beaver: Large numbers of beaver existed along the Applegate River but it is difficult to determine beaver populations for the Illinois River drainage.

Rabbits and squirrels: Rabbits and squirrel populations may have been considerable in the Illinois Valley. Jackrabbit populations may have been high due to the maintenance of quality habitat in the valley. Silver gray squirrel populations would have benefitted from fire maintained oak-pine woodland habitats.

C. Fire in the Landscape: The Potential for Cultural Landscape Restoration

One consequence of the removal of Native Americans through either direct violence or forceful removal to reservations was the interruption of periodic burning of specific plant communities, especially those communities found at the interface of oak-pine valley woodlands and forested slopes. An informal fire study done in mixed conifer stands, somewhat adjacent to the valley floor, noted that the last time fire had moved through the area was in the 1860's (Dick Boothe, personal communication). This would roughly correspond to the period of time after the Rogue Indian Wars and the removal of Native Americans.

Miners, by contrast, tended to burn indiscriminately to improve access to mining areas. Burning by miners, and other Euro-Americans, amounted to an "ecological transition" which changed the distribution of habitats and array of seral communities across the landscape, and may have contrasted sharply with communities that existed over time as a result of Indian burning. The legacy of mining and the subsequent mix of plant communities across the landscape may bias our vision of what we consider to be pre settlement conditions.

Forest Service fire suppression policy also influenced the composition and structure of plant communities. After 1910 fire suppression became better-organized and following WWII new techniques such as smoke jumping, and easy access to previously unroaded areas allowed for more efficient fire suppression. In addition, large fires primarily caused by lightening, such as the Longwood Fire of 1987, still periodically dominate the landscape.

Burning by miners, fire suppression, and the natural fire frequency of the area can lead to questioning the degree and intensity of Native American burning to manage habitats. Is it possible to separate out the effects of Native American habitat management from naturally occurring fire? If we allow for a large time frame in which native people used fire, possibly thousands of years in specific habitats, we can posit that a number of plant communities (e.g., pine-oak savannahs, meadows) were primarily anthropogenic in nature and owed their continued existence to the periodic and systematic use of fire by Native Americans. In this context, prescribed fire will play a critical role in maintaining the vitality of the watershed over time and restoring specific pre settlement plant communities.

D. Native American Management of the Anadromous Fish Resource

The importance of anadromous fish resources to aboriginal societies is well documented in the ethnographic literature for northwestern California and southwestern Oregon (Hewes 1942, 1947; Kroeber 1925; Kroeber and Barrett 1960; Rostland 1952; Suttles 1990). Estimated total yearly consumption of salmon in native California, which includes northwestern California watersheds, is estimated at more than 15 million pounds (Hewes 1947). Chinook salmon (*Oncorhynchus tschawytscha*) and silver or Coho salmon (*O. kisutch*) dominated aboriginal fish harvest. The abundant seasonal runs and ease of procurement of anadromous fish strongly influenced the distribution of aboriginal settlements and the spiritual life of native peoples.

Harvesting and storage of anadromous fish in the Pacific Northwest has been part of a yearly subsistence routine dating back to prehistoric times (Aikens 1993). Charred salmon bone was recovered at the Marial site located on the Rogue River. This site dates back to at least 8,000 before present (Schriendorfer 1985). Exploitation of riverine resources occurred at the Umpqua-Eden site located on the Umpqua River estuary. Artifacts associated with fish procurement and salmon-coho bones were recovered; this site dates to 1010 BC (Ross 1990). The excavation of the Gallaher site on the lower Illinois River yielded artifacts associated with fishing technology.

Fishing techniques used throughout the region include hook-line, netting from canoes, dip nets from falls, harpoons, night fishing with torches, clubs, salmon fences (weirs), and basketry traps (Gray 1986; Kroeber 1925). Salmon was cooked and then pulverized for storage for winter use. Fish drying was a common method of preservation and extremely important as a winter food source. Salmon eggs were smoked. In hard times toward the beginning of spring, the tails and heads of salmon might be eaten with some acorn mush. Spring runs of salmon were especially important at a time when stored winter reserves were dwindling or exhausted.

The distribution of villages and camps along the Rogue and Illinois Rivers and their tributaries attest to the importance of obtaining and processing fish. Major villages were often located near falls or rapids to facilitate harvesting. Examples are the village sites at Gold Hill and Marial on the Rogue River, the village site of Tlegetlinten located at the confluence of the Rogue and Illinois Rivers, and McCaleb's Ranch located within walking distance of a waterfall on the Illinois River.

Native peoples were familiar with all major fish species: trout, salmon trout, steelhead, silverside, and Chinook (Gray 1987). In addition, fresh water fish, mussels, and crawfish were taken. Riparian products include willows and other wetlands materials used in basketry.

Harvesting of anadromous fish was incorporated in a larger web of ceremonial interactions. Ritual procedures were used to organize harvest of a variety of food resources and to insure a sustainable resource. Part of the yearly ritual cycle was devoted to salmon (Sewezy and Heizer 1977). Tribes in northwest California and southwest Oregon had "first salmon" rites. Rites were often held with the onset of the spring king salmon run, a fish migration of major importance. These rites were used to recount orally the myth of the origins and travels of the first Salmon, who became a culture-hero and was invited to ascend the rivers and streams again. Priests or formulist controlled the timing of rituals in northwestern California (Kroeber 1925). Tribal members were strictly forbidden to eat salmon until rituals were completed, and often up to ten days afterwards. These restrictions had the ecological effect of avoiding premature harvest of salmon and also insured that a portion of the run could travel upriver. Intertribal conflicts concerning downstream over harvest were thus avoided. A first salmon ceremony was performed at Ti'lo-mi-kh falls in Takelma territory. This was a central place that drew people from the entire watershed (Gray 1987). The first five or ten Chinook salmon, among Athapaskans, were eaten ritually by the entire group (Miller and Seaburg 1990). Failure to incorporate salmon into the ritual cycle was believed to result in poor fish runs or failures of entire watersheds to produce fish.

Ritual specialists also organized the building of fish damns and weirs at critical locations. Weirs were left open at night both to ensure that facilities weren't damaged as well as to allow the continued passage of fish upriver. Dams were removed after a set fishing period (Waterman and Kroeber 1938).

E. Gold Mining

The discovery of gold at the mouth of Josephine Creek in the summer of 1850 brought about tremendous change in the East Fork of the Illinois River area. The first known trails into the Illinois Valley from the west were opened in early 1851, bringing people from Trindad, California, and over the Siskiyous from above present day Happy Camp. Mining activities at first centered on Josephine and Canyon Creeks, but after 1852 explorations for gold discovered extensive deposits on the alluvial flats of the upper Illinois River and along the streams and gulches that feed the East Fork of the Illinois River. Reviews of regional environmental and mining history are found in McKinley and Frank (1996), Ramp and Peterson (1979), and Francis (1988).

Althouse Creek, just to the east of the analysis area, saw a tremendous amount of gold mining activity, supporting more than a thousand miners along ten miles of its length for perhaps ten years (McKinley and Frank 1996: 25). By 1853, Browntown was a thriving mining center on Althouse Creek, serving miners in the area. In 1852 a trail was opened up from Crescent City, California, which lead to an increase in miners coming into the valley.

Within the watershed area, placer gold was first discovered in Sailor, Allen, Fry and Scotch Gulches. These areas were intensively mined and lasted only a few years (Ramp and Peterson 1979: 30). Beginning around 1860, a system of ditches was developed to bring water to the hydraulic mine operations developing in the area; the Osgood Ditch, located above the East Fork of the Illinois River, dates from this era. It is estimated that thirty miles of ditches and flumes at four levels were constructed (McKinley and Frank 1996: 89). Operations included the High Gravel No. 416, the Deep Gravel No. 393 and Esterly mines (Llano de Oro), No. 396. These areas contained several thousand acres of gold and platinum gravels and were hydraulically mined from about 1870 to 1940. Their combined estimated production was about 55,000 oz. (Ramp and Peterson 1979: 30). Bedrock at the Deep Gravel and Esterly Mine was well below the elevation of the Illinois River and huge hydraulic elevators were used to hoist the gravel to the sluices. The Esterly Mine closed in 1942. The Esterly Lakes are remnants of those early hydraulic mining operations.

As miners came into the area whole towns sprang up over night. Towns appeared in Allens Gulch and at Waldo located just outside the watershed. By 1856, 500 people were living in Waldo and by 1858 the town had four hotels (one for Chinese only), a stable, blacksmith shops, saloons, and a bowling alley. Francis (1988: 59) estimated that more than 3,000 people used the services and materials the town had to offer. When Josephine County was formed on January 22, 1856, Waldo, the largest town in the area, was chosen as its territorial seat. Waldo declined until the late 1920's. In the mid-1930s the hydraulic giants of the Esterly Mine mined what was left of Waldo. Between 1852 and 1979 Josephine County produced 567,989 oz. of gold valued at $12,797,434 (Ramp and Peterson 1979: 20-21). For a detailed discussion of individual mines see the Oregon Metal Mines Handbook (1942).

In addition to gold, copper was produced, primarily before 1920, from the Queen of Bronze Mine No. 421, and the Cowboy Mine No. 446, both in the Waldo-Takilma area. Ore was processed at a local smelter but some ore was shipped by horse drawn freight wagons to the railroad terminal at Waters Creek. More than 25,000 tons of ore were produced (Ramp and Peterson 1979: 33). Copper has been the second most important metal in terms of production in Josephine County.

Mines and later copper processing facilities produced a demand for forest products, and almost certainly impacted forests heavily at the local level. Flumes, chutes and towns needed building materials. Two whipsaws in the Waldo area in the 1850's were producing up to 20,000 board feet per week for mining operations, and Chinese miners ran a mill for the Sailor Diggings. Large pines were the preferred species. By 1886 J.W. Bennet opened a water run lumber mill in Butcher Gulch near Waldo. Other mills opened in the 1890's but lumbering really didn't take off in the analysis area till the 1950's (McKinley and Frank: 1995: 152).

Numerous claims exist on the lower reaches of the East Fork of the Illinois River and Dunn Creek. Currently there are three suction dredging operations on Dunn Creek and two to three operations on the East Fork of the Illinois River. In the near future suction, dredging operations are planned for Poker Creek and upper Dunn Creek. Under current Forest Service mining regulations suction dredging requires a Notice of Intent as opposed to a more formal Plan of Operations.

1. Environmental Effects of Mining

Early placer and hydraulic mining profoundly altered riparian and other habitats that are still in various degrees of recovery. Sediment loads from large-scale hydraulic mining operations in the watershed had an impact on anadromous fish, and water withdrawal, specifically from the East Fork Illinois River, may have had an impact on water temperature, which in turn affected fisheries. Areas within the reaches of the upper East Fork Illinois River were heavily impacted by mining activities. In some areas, the streambeds were virtually turned upon themselves (McKinley and Frank, 1995: 31-33). The French Flat area, just north of Waldo, was heavily modified by early day mining activities.

The timing of the mining season played a major role in terms of severity. Lalande (1995) has pointed out the seasonal effect of severity: the effect upon anadromous species was more pronounced in the fall, when lower water levels and stream turbidity created an environment detrimental to the fall runs of Chinook and Coho salmon. Winter resident species were also impacted. The effect from stream channelization extended beyond seasonal impact. As streams were channelized, their ability to hold water was decreased, with an overall loss of moisture in riparian and marsh communities and a resultant loss of moisture reliant plant species.

F. Livestock Grazing

After the decline of mining, livestock farming grew in the Illinois Valley, and certainly lands within the watershed were used for grazing. The number of cattle doubled in Josephine County between 1875 and 1883 (McKinley and Frank: 1995, 85). Sheep were also raised and large numbers grazed high mountain meadows around the turn of the century. Atzet and Wheeler (1982: 5) state "Sheep grazing has been a significant influence on the vegetation of the Klamath Province, particularly in the high elevations... In 1903, a typical year, 103,000 sheep and 7,500 cattle grazed the backbone of the Siskiyou Mountains between where Interstate 5 and U.S. Highway 199 are now located. By 1917 most meadows along the Siskiyou crest were 'badly depleted' ". Cattle and sheep tend to change understory composition, reduce fine fuel loadings, and create conditions for the establishment of exotics. In addition, unregulated grazing causes the deterioration of soil conditions. By 1910 the Siskiyou National Forest supported grazing of at least 4,000 cattle and horses and about 3,200 head of sheep and goats (*Siskiyou National Forest Grazing Report January 8, 1910*; cited in McKinley and Frank: 1995: 132).

The Upper Illinois River watershed supported at least nine grazing permits in 1912 (McKinley and Frank 1995: 132). The last remaining livestock permit was terminated in 1985. The permit was district wide, for 144 head of cattle, and held by Jack Sauers of Cave Junction (Don McLennan, personal communication).

G. Federal Land Ownership

Land ownership in the watershed is diverse. The Bureau of Land Management (BLM) manages 5,043 acres (2,681 acres in Oregon and California (O&C) status and 2,362 Public Domain (PD) acres) within the watershed. The Forest Services administers 36,688 acres. In addition, there are 15,861 acres of private land located in the watershed. (See the following maps; Land Ownership, Government Ownership, Land Use Allocations, and Management Areas)

The Siskiyou National Forest was created on October 5, 1906. A ranger station was established at

Page Creek in the spring of 1909; Mr. M. M. Lewis was the Ranger (Cooper 1939). Early forest service activities included the surveying of boundaries, making field examinations of timber tracts, checking on the validity of Homestead entries, carrying on minor timber sales for mining companies, constructing trails, fighting fires, and laying phone line. By 1936 the station had been moved to its present location in what is now Cave Junction and the facility at Page Creek became a guard station.

The construction of roads began with the Civilian Conservation Corps (CCC) in the 1930's. CCC camps were located at the Oregon Caves and in Kerby. A smaller CCC camp was located in the Waldo area. The Sanger peak road was constructed at this time. Road construction in earnest began in the watershed in and around 1948 when the first stands of timber were harvested around Takilma. Other roads were constructed in the Page Mountain area in the 1950's. Timber stands during this time were harvested using crawler-tractors. Roads reached the upper reaches of the watershed in the decade of the 1960's when timber stands were harvested in the vicinity of Black Butte. The current road system reflects the introduction of skyline logging technology in the 1970's.

A portion of the land within the watershed administered by the BLM is land formerly owned by the Oregon and California Railroad with title subsequently being revested back to the General Land Office in 1916. The General Land Office was combined with the Grazing Service in 1946 to form the BLM.

The private lands in the watershed were originally public lands. Most of those public lands were transferred to the private parties as authorized by either the General Mining Laws or Homesteading Laws.

H. Cultural Resources Sites

1. Forest Service

Fifteen recorded sites exist in the watershed: four cabin sites, three trails, two historic dumps, two mining sites, two ditches, a bridge, and a road segment. Several of these sites date to the early 1850's. The two mine ditches are among the earliest ditches constructed by miners in the area, and are associated with the Sailors Diggings and the Esterly Mine. None of the recorded cabins are standing, but at least one dates to the 1880's and could have archaeological value. Other sites represent early forest service administrative activities.

2. BLM

Approximately 3,700 acres were surveyed in 1999 as a part of the Esterly Cultural Survey. This survey included lands in the East and West Fork Illinois River watersheds. Forty-two new sites were recorded in the East Fork Illinois watershed. Forty-one of those sites are historic (including two contemporary use areas of special significance to the local community) and one site is prehistoric. Nine isolates were recorded: three are prehistoric and six are historic. Historic sites represent a full range of local mining history. The mining site chronology extends from the discovery of gold in Sailor's Gulch in the early 1850's to more recent prospecting in the 1930's and 1940's and includes sites representing all the important technological developments associated with hydraulic mining. (Budy 1999.)

I. Roads

There are approximately 331 road miles within the East Fork Illinois River watershed, consisting of 25 miles of BLM inventoried roads (7%), 144 miles of Forest Service roads (44%) and the remaining 162 miles are on private lands (49%).

1. Forest Service

The Forest Service transportation system in East Fork Illinois started with 3.77 miles in 1925. During the 1930's the Forest Service constructed 19.59 miles; 1940's, 17.9 miles; 1950's, 7.95 miles; 1960's, 53.55 miles; 1970's, 37.71 miles; and in the 1980's, 16.81 miles. In the decade of the 90's there was no new construction.

Currently there are 144 miles of road on Forest Service land within the watershed which is 4.8% of the total Forest road system, and 22.5% of the Illinois Ranger District road system. (*Note*: The total mileage of roads included in this report have been collected by odometer road logs and is maintained in a database. This number differs from miles of road provided by GIS mapping and reports generated by Primary Base Series maps. These maps are flat and two-dimensional and do not account for extra mileage due to road grades.) The transportation system can be accessed by the U.S. Highway 199, County Roads 5560 and/or 5828 and National Forest (NF) arterial road 48.

Table S-1 summarizes the mileage of Forest Service roads by operational maintenance level.

Table S-1: Forest Service Roads by Maintenance Level

Maintenance Level [1]	Miles of Road	Surface Type
5	12.00	Surface Treatment
4	None	N/A
3	None	N/A
2	132.44	Native and Aggregate
1	12.84	Native and Aggregate

[1] *Level 1* - Physically closed for long periods, high clearance vehicles, minor Average Daily Traffic (ADT), open only for selected activities, probably not surfaced, other than native, and passenger cars not a consideration.
Level 2 - High Clearance vehicles, minor ADT, usually open, but can be seasonally closed, probably not surfaced, other than native, passenger cars not a consideration.
Level 3 - Opened and maintained for prudent driver of passenger car, meets Highway Safety Act (HSA), user comfort/convenience not considered a priority, typically low speed, single lane w/turnouts and spot surfacing, might be aggregate or native surfaced.
Level 4 - Provide moderate degree of user comfort/convenience at moderate travel speeds, meets HSA, mostly double lane and aggregate surfacing, some may be single lane, some may be paved or dust abated.
Level 5 - Provide high degree of user comfort/convenience, meets HSA, normally double lane and paved, some may be aggregate surfaced and dust abated.

In 1994, a Transportation Network Analysis was completed Forest wide to determine the future needs of the transportation system. Historically, timber management has been the primary reason for the existing road system development. In the future the Forest envisions a less extensive road system and possibly an expansion of the trails network. This transportation system will allow reasonable access to major points of interest across the Forest. The East Fork Illinois watershed contains 36.55 miles of roads identified as candidates for decommissioning, obliteration or conversion to another use. A list of these roads is included in Appendix A. Roads to be decommissioned within the next 2 years are 4803083 (0.20 miles, constructed in 1940), 4803130 (1.20 miles, constructed in 1950) and approximately the last mile of road on 4906, also known as the Crazy Peak Road. Roads 4803, 4803090 and 4803096 are in contract for storm proofing within the next year.

Current road densities are considered adequate from a recreation and fire perspective. Future roading needs to facilitate timber harvest and other forest management activities will be determined on a site-specific project basis.

Road closures and road decommissioning are controversial on public lands. Many roads have a long history of public use and are used for hunting and other recreational access. Attempts at road closures often fail due to the public's perception that such resource protection activities infringe of the right to drive where there has been traditional access. Public outreach and education is necessary to develop a successful road management policy.

Table S-2 displays road and stream crossing densities in the watershed on National Forest Land.

Table S-2: Forest Service Road and Stream Crossing Density

Miles of Road	Stream Crossings	Area (mi^2)	Crossing Density (per mi^2)	Crossing Density (per mile)	Road Density (miles per mi^2)
144	195	90.3	2.16	1.35	1.60

Source: Stream crossings and area gathered from GIS maps and reports**.**

2. BLM

Table S-3 summarizes the mileage of BLM roads by operational maintenance level. Table A-2 (Appendix) lists the maintenance level by road for BLM roads.

Table S-3: BLM Roads by Maintenance Level

Road Maintenance Level [1]	Miles of Road
5	-
4	-
3	15.91
2	7.72
1	0.93
Total	24.56

[1] *Level 1:* This level is the minimal custodial care as required to protect the road investment, adjacent lands, and resource values. Normally, these roads are blocked and not open for traffic or are open only to restricted traffic. Traffic would be limited to use by high clearance vehicles, passenger car traffic is not a consideration. Culverts, water dips and other drainage facilities are to be inspected on a three-year cycle and maintained as needed. Grading, brushing, or slide removal is not performed unless they affect roadbed drainage. Closure and traffic restrictive devices are maintained.

Level 2: This level is used on roads where management requires the road to be opened seasonally or for limited passage of traffic. Traffic is generally administrative with some moderate seasonal use. Typically these roads are passable by high clearance vehicles. Passenger cars are not recommended as user comfort and convenience are not considered priorities. Culverts, waterdips, and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted as necessary only to correct drainage problems. Brushing is conducted as needed (generally on a three-year cycle) only to facilitate passage of maintenance equipment. Slides may be left in place provided that they do not affect drainage and there is at least 10 feet of usable roadway.

Level 3: This level is used on intermediate or constant service roads where traffic volume is significantly heavier approaching an Average Daily Traffic of 15 vehicles. Typically these roads are native or aggregate surfaced, but may include low use bituminous surfaced road. This level would be the typical level for log hauling. Passenger cars are capable of using most of these roads, by traveling slow and avoiding obstacles that have fallen within the travelway. Culverts, waterdips, and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted annually to provide a reasonable level of riding comfort. Brushing is conducted annually or as needed to provide concern for driver safety. Slides affecting drainage would receive high priority for removal, otherwise they will be removed on a scheduled basis.

Level 4: This level is used on roads where management requires the road to be opened all year and have a moderate concern for driver safety and convenience. Traffic volume is approximately an Average Daily Traffic of 15 vehicles and will accommodate passenger vehicles at moderate travel speeds. Typically these roads are single lane bituminous surface, but may also include heavily-used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis, although a preventative maintenance program may be established. Problems are repaired as soon as discovered.

Level 5: This level is used on roads where management requires the road to be opened all year and have a high concern for driver safety and convenience. Traffic volume is exceeds an Average Daily Traffic of 15. Typically these roads are double or single lane bituminous, but may also include heavily-used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis and a preventative maintenance program is also established. Brushing may be conducted twice a year as necessary. Problems are repaired as soon as discovered.

The BLM's Transportation Management Objectives (TMOs) have not been completed for this watershed. They will be completed as required under the BLM Western Oregon Transportation Management Plan of 1996. This will result in the identification of road improvements, decommissioning, and other road management needs in the watershed.

Current road densities are considered adequate from a recreation and fire perspective. Future transportation system needs to facilitate timber harvest and other forest management activities will be decided on a site-specific project basis. The breeching of road closures is a problem on BLM lands, notably in the French Flat area.

J. Economics and Demographics

The following discussion is from Cosby (1997).

Agriculture, wood products and tourism are the Province's three basic industries. Recent data indicates that the main area of the employment expansion will be in the trades and services industries. Although there has been growth in construction and non-timber related manufacturing, there is still strong reliance upon the wood products industry for the region's economic well-being. The decline in wood products activity through the 1980's was locally amplified by the nation-wide recession. Projections by the State of Oregon Employment Division indicate that the timber industry is expected to lose an additional 1,100 jobs statewide over the next 10 years.

Josephine County has consistently rated among the least wealthy of Oregon counties. Unemployment ranges to 8%, and the per capita income in 1995 was $15,581. This ranges from

80.2% to 85% of the state's per capita income. Typically, citizens in this region are older, retired individuals who rely heavily on income from Social Security, retirement, and public assistance programs. The State of Oregon Employment Department reports that in 1995, 26% of all income in Coos and Curry counties was provided by transfer payments, including Social Security, Medicare, other retirement income, veteran's benefits, unemployment and food stamp programs.

Approximately 71,100 people live in Josephine County. Approximately 30% of these people live within a one-hour drive of the watershed. Grants Pass is the county seat (pop. 18,120) and the largest city in Josephine County. Cave Junction (pop. 1,200) is the second largest community and is located at the terminus of the watershed. Currently 15,000 people live in the Illinois Valley, scattered in the backwoods and small hamlets such as Takilma, Selma, O'Brien, and Holland.

The population of Josephine County is focused in unincorporated areas. Much of this unincorporated area is identified as the "interface." Throughout the "interface" of forest and rural development there are a number of usually unnamed communities. These communities are defined by little more than a small store or tavern, but they play a role in the dissemination of information and the formation of geographic-based community identity.

Over the past decade, a number of demographic shifts have been taking place. Young people who were raised in southwest Oregon have been inclined to leave in search of employment while the region has been experiencing a steady increase in overall population. The increase is primarily due to an immigration of both young, professional ex-urbanites and senior citizens. The median age of Josephine county residents is 39.9 years (risen from 33.7 years in 1980).

The southern portion of the watershed, in particular, has long been an area of alternative lifestyle cultures. This segment of the population has a very strong interest in the management of public lands around their homes and around Takilma.

In Josephine County the proportion of citizens aged 65 years and older is on the increase. Between 1980 and 1990, the proportion of persons over 65 in Josephine County increased 42%. Seniors are frequently not tied economically to southern Oregon; most receive an annuity of some type. They are commonly here for other reasons including a favorable social climate, proximity to family, and/or enjoyment of southwest Oregon's many amenity values. The new, young immigrants generally possess a higher income, higher education level, and they generally have strong environmental values but little experience in land management. Few of these folks have ties to the traditional industries of southwest Oregon.

At a coarse level, demographics of the watershed area seem to match those of the Province. As a point of departure, the Applegate Adaptive Management Area's Ecosystem Health Assessment lists a number of social and economic trends that, at a general level, could be applied to the East Fork Illinois River area. These include:

- Strong population influx and residential development;
- Dispersed settlement patterns, which have created widespread residential/forest interface;

- In-migration of younger, more educated ex-urbanites with strong environmental values and community interest;
- Dramatic shrinking of the local, traditional economic base (specifically, ranching, farming, and timber employment);
- Strong representation and economic contribution of "lone eagles"; “global entrepreneurs" with few ties to the local economy;
- Declining ties to the land for economic contributions and reliance on commuting to urban employment sites;
- Newcomers are less integrated into the community and less knowledgeable about the local ecosystem than in previous decades;
- An increase in a wide-range of recreation activities on public lands, creating endemic conflict between users and challenging management to incorporate these different interests.

Economic opportunities are limited only by human imagination and initiative, although the scope will be constrained by current and future market values and location. Several potential areas of economic development and employment that could be explored include:

- Certified timber production
- Watershed Restoration
- Special forest products, Forest Nurseries
- Small log utilization
- Community forestry
- Stewardship contracts
- Ecotourism

1. Josephine County Rural Enterprise Community

The Josephine County Enterprise Community was designated a Rural Enterprise Community in 1994. Three census tracts make up the community: Cave Junction, Selma, and Wolf Creek. To facilitate community outreach Cave Junction and Selma have been organized into the Illinois Valley Community Response Team (CRT). The program, enacted into law in August 1993, is designated to give low-income communities opportunities and guidance for growth and revitalization. The program is based on four key principles:

a. Economic Opportunity: Creation of jobs provides the foundation for economic self-sufficiency and community revitalization.

b. Sustainable Community Development: Creation of jobs is the first critical step toward the creation of a livable and vibrant

c. Community-based Partnerships: Economic opportunities and community development starts with broad participation by all segments of the community

d. Strategic Vision for Change: The Josephine County EC, through the Community

Response team, has already developed a community action plan with a double focus: Community quality of life and Business development

2. Forest Service Community Based Partnerships

Partnerships and cooperation are key principles for Rural Enterprise Communities, and were emphasized by Chief Mike Dombeck as a focus for the Forest Service. Traditionally, public involvement and participation have been limited in the NEPA process to issue identification, responses to draft documents, appeals, and lawsuits. In 1994 the Northwest Forest Plan gave clear direction to more closely involve communities in management processes.

The Illinois Valley CRT has formed working partnerships with a number of community-based organizations. These organizations include USDA Rural Conservation and Development, the Illinois Valley Soil and Water Conservation District, the Forest Action Committee, and the Siskiyou Regional Education Project.

3. Economic Contribution of Timber Harvest

The East Fork Illinois River watershed has been providing timber products for many years. Timber harvest began on lowlands in the analysis area in the mid-1850's. Harvesting was associated primarily with mining and housing construction. Timber harvest began in earnest on public lands in the 1950's. Approximately 217 million board feet (MMBF) of public timber (National Forest) was harvested. This accounts for 3,906 jobs (direct, indirect, and include jobs, based upon the formula provided by the Siskiyou National Forest of 18 jobs/MMBF harvest). This averages 4.4 MMBF annually with an mean of 79 jobs.

On BLM Oregon and California (O&C) lands, 50% of the total revenue generated by timber sales is distributed to western Oregon communities. Average payments to Josephine County from 1984-1988 was $7.6 million. Additionally, approximately five percent of the revenues generated from public domain lands are dispersed through the state to the counties based on total land area of the county. (USDI, BLM, 1994)

Although timber production will continue to provide employment in southern Oregon, the continued survival of communities, especially rural communities, will depend on the region's ability to diversity their economic base. For many rural areas, the path to sustainable economic development will include innovative approaches to natural conservation, management, and utilization (USDA FS 1993).

4. Economic Contribution of Mining

Today, mining of precious metals does not offer the same level of economic contribution to the county as it did in the past. Some panning and dredging for gold still occurs along streams, but the primary mining activities in the Province are the quarrying of sand and gravel for construction (Oregon 1993). In 1992, total reported employment from mining was 57 jobs, and these were reported for non-metallic mining (Oregon 1992). Some employment exists from gold mining, but information is difficult or impossible to collect and verify.

5. Special Forest Products

Non-timber forest resources ("special forest products") are a commodity resource that is developing in support of economic diversification. Special forest products include: aromatics, berries, chips, shavings, excelsior, sawdust, bark, smokewood, fuelwood, decorative wood, forest botanicals, greenery and floral products, honey, Christmas trees, Port-Orford cedar boughs, fir boughs, and wildlife. Except for the collection of fuelwood, which is tied to timber harvest activities, managers in the Province state that the sale of these products has been on the increase. Exact use data for the watershed is unknown, but is undoubtedly used for mushroom harvest, bear-grass gathering, and other products.

K. Watershed Recreation Use

Tourism is the third largest industry in Oregon (SCORP 1988). In 1988 visitors to Jackson and Josephine counties spent $126,235,000 creating 2,826 jobs (Runyan 1991). Approximately 73% of all visitors to southern Oregon are from out-of-state. Regionally, "driving for pleasure" and "sight-seeing" are ranked the #1 and #2, respectively, demanded outdoor recreation activities in 1987 and they are projected to remain 1 and 2 through the year 2040 (USDA FS 1993).

Recreation use on National Forest lands is diverse. Activities include swimming, hiking, backpacking, horseback riding, fishing, and driving for pleasure. Two major concentrated use areas are Hogue Pasture and the Page Creek meadow area; both located in the area of Takilma. Other popular recreation areas are Whiskey Lake and Camp Chicago located near Sanger Peak. Concentrated use areas are often found adjacent to riparian areas. The Page Mountain Sno-Park is the only developed Forest Service recreation site in the watershed area.

In addition, *The State of Jefferson Scenic Byway* traverses through part of the watershed.

BLM lands in the watershed are used for dispersed recreation activities, such as horseback riding, hiking, OHV riding, and mountain bike riding. This use is concentrated in the French Flat Area of Critical Environmental Concern (ACEC), Allen Gulch, Rockydale Road area and the area around Limestone Rock in the northern part of the watershed. There are many non-maintained trails on BLM lands in the watershed that are used by OHVs, hikers and horseback riders. Off highway vehicle use is also occurring in the French Flat ACEC.

Off Highway vehicle designations are identified as open, closed or limited on all BLM lands. Open lands are open to motorized use, closed lands are closed to all motorized use and limited lands limit motorized use to designated roads and trails. In the Medford District, 391,400 acres are open, 441,700 acres are limited and 25,200 acres are closed to motorized use.

There is a Recreation and Public Purposes Lease on BLM land in the northwestern part of the watershed. The State of Oregon’s State Parks, leases an eighty acre piece of land at the location of the Illinois River Forks State Park. This area is currently being used as a picnic area, however, the State has proposed an undeveloped area as a campground for the park.

1. Trails and Concentrated Use Areas

The following chart displays National Forest trails and concentrated use areas (CUA) in the watershed:

Table S-4: Forest Service Trails and concentrated use areas

Trail Name	Trail Number	Miles	Use
Sanger Peak LO	1270	0.6	Old LO site
Sanger Creek	1271	1.8	Wilderness
Black Butte	1272	2.2	Wilderness
Black Butte Tie	1273	1.5	Wilderness
EF Illinois River	1274	10.0	Partial Wilderness
Crazy Peak	1275	0.8	-
Osgood Ditch	1278	1.8	Old mine ditch
Sanger Peak	1277	2.0	Longwood Fire
Page Meadow	-	-	CUA
Hogue Meadow	-	-	CUA
Sno-Park	-	(24 miles of road)	Winter use
Elder Interpretive Trail	-	0.7	Under construction

There are approximately 21 miles of trail in the watershed.

2. Page Mountain Sno-Park Winter Recreation Area

The Page Mountain Sno-Park winter recreation area is located on the eastern edge of the watershed and is accessed by Forest Road 48. The area is open for recreation use from November 15 to April 1, depending on snow conditions. A Sno-Park permit is required. Facilities and infrastructure include:

- Composting toilet (currently functioning as a regular vault toilet)
- Two log warming huts and sledding hill
- 30 vehicle parking lot
- 10 miles of cross-country ski trails (not open to snowmobiles)
- 14 miles of snowmobile trails

The park serves as a starting point for access to the high Siskiyou backcountry, primarily the Red Buttes area. A volunteer host lives at the site during the heavy use season. Illinois Valley residents primarily use the Sno-Park with some people coming from the Grants Pass area, and as far away as Crescent City, California.

The Page Mountain Sno-Park is not accessed by a State highway. Normally permit fees are used to pay for snow plowing but since access is provided by a county road State funds for snow removal are not available. Instead, Josephine County pays to plow the road; State funds are only used to plow the parking lot. The availability of county funds to plow the main road may be an issue in the future. In addition, the existing toilet needs to be replaced due to vandalism.

Opportunities exist for stand density treatments in managed stands adjacent to the Sno-Park. Treatments would provide forested areas favorable for snowboarding while meeting objectives for managed stands located in Late-Successional Reserves.

3. Siskiyou Wilderness

The northern portion of the Siskiyou Wilderness is located in the watershed. The district manages 5,405 acres of the 150,000-acre wilderness. The lead forest for the wilderness is the Klamath National Forest in Region 5.

The district portion of the Siskiyou Wilderness is accessed primarily from the Black Butte trailhead, vis-à-vis road 4906-053. Black Butte is the most popular wilderness access point. Other trails include the East Fork Illinois River trail, #1274 and the Sanger Canyon trail, #1271. The Sanger Canyon trail receives little use. Other access through the analysis area includes road 4803, crossing through the Six Rivers National Forest, to the Youngs Valley trailhead. Youngs Valley was accessible to motorized vehicles until 1984 when the road was closed with the enactment of the California Wilderness Act. Local residents still lament the closing of the valley to motorized traffic. The Youngs Valley road was built to access mining claims.

No use data for the wilderness exists at the district level. The Klamath National Forest characterizes wilderness use as "light" (Recreation staff, Happy Camp Ranger District). Heavy recreation use is commonly associated with extended holiday weekends. Under the Wilderness Recreation Spectrum, as outlined in the Siskiyou LRMP, the area is managed for a semi-primitive (trailed) recreation experience. Other information on the wilderness is found in the Siskiyou LRMP, pages IV: 68-75.

The visual quality management objective for the Siskiyou Wilderness is Preservation.

4. Other Recreation Management Allocations

Other recreation allocations in the watershed include non-motorized backcountry recreation. Approximately 630 acres are allocated to MA-6, Chicago, and north and adjacent to the Siskiyou Wilderness. (Siskiyou LRMP: IV: 97-99) (See section below on Assessing Recreation Settings).

5. Amenity Values

Amenity values relate to visitor satisfaction. These are subjective and personal values, which vary from individual to individual. Generally, satisfaction can be predicted by examining such items as the scenic quality, wilderness values (or how well the watershed provided for an individuals need for solitude), and what settings are available within the watershed for recreational activities to take place.

Many Illinois Valley residents value unmanaged landscapes for their beauty and as a medium to appreciate aesthetic and spiritual values. People feel that forest management, specifically timber harvest, detracts from the beauty of an area and interferes with natural processes. Residents of the Takilma area are especially attached to the "Takilma Forest", located on BLM lands. This forest is used for spiritual renewal, social gatherings, and as a natural area that engenders community identity.

a. Assessing Visual Quality

1) Forest Service

The East Fork Illinois River watershed encompasses four National Forest viewsheds: Bolan Lake, Crazy Peak, Highway 199, and Siskiyou Wilderness. Visual quality management allocations are displayed below:

Table S-5: Forest Service Visual Quality allocations

Viewshed	Total Viewshed Acres	Viewshed Acres in Watershed	Partial Retention Visual Management Allocation (MA-13)
Bolan Lake	16,459	6,886	1,768
Crazy Peak	25,947	23,913	622
Highway 199	12,983	481	15
Siskiyou Wilderness [1]	5,405	5,405	-

[1] Preservation is the visual quality management objective for the Siskiyou Wilderness

Visitors participating in recreational activities are generally more sensitive to highly modified landscapes. For that reason, the Forest Service manages for scenic quality in highly used recreational areas. The Siskiyou National Forest outlines management of Forest Visual Resources in their Land Management Plan (LRMP) by assigning Visual Quality Objectives (VQO's) to the landscape. Criteria used to define VQO's are: scenery quality ratings, public sensitivity ratings, and distance from viewer. The LRMP describes management objectives by VQO as follows:

MA 12: Retention Visual. This land is managed with the primary goal being " to provide a level of attractive scenery by maintaining a natural or near natural condition." "Management activities will be conducted in such a way that they are completely subordinated to the character of the landscape and not evident to the casual Forest visitor." There are no retention visual quality allocations present in the East Fork Illinois watershed.

MA 13: Partial Retention Visual: This land is managed with the primary goal being "to provide a level of attractive scenery by maintaining the area in a near natural condition." "Management activities will be conducted in such a way that they are subordinated to the character of the landscape." There are 2,405 acres of Partial Retention Visual VQO in the watershed.

Standards and Guidelines for MA-13 state that no more that 16% of the viewshed may be in visually perceived created openings at any one time. Visually perceived openings are harvest units with trees less than 20 feet tall. Analysis of the current status of MA-13 lands in the watershed will occur on a site-specific basis during timber sale design. An important MA-13 visual allocation is *The State of Jefferson Scenic Byway*.

There is a difference between Siskiyou National Forest Plan MA-13 allocations and the Northwest Forest Plan. The majority of acres in the watershed previously allocated to MA-13 are now subsumed under Late-Successional Reserve (LSR) management allocations. Regeneration harvest schemes are not allowed for LSR lands.

MA 14: General Forest. Land managed with the primary goal being "to obtain a full yield of timber within the capabilities of the land..." The VQO for this management area is modification. The Northwest Forest Plan details additional green tree retention requirements that mitigate the visual impacts of timber harvest in areas allocated to MA 14 (Matrix).

Assessing visual quality is a two-step process. Standardized, objective size and area criteria have been established as a general "rule of thumb." Site-specific analysis is more objective.

The East Fork Illinois River watershed generally meets the stated visual quality objectives. Large scale events, such as the Longwood Fire of 1987, has impacted visual quality in the Takilma area.

2) BLM

Visual Resource Management Classes on BLM lands are all classified as VRM III. Objectives for VRM class III lands are to “partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.” (BLM Manual, 1986)

b. Assessing Recreation Settings: Forest Service

In addition to Visual Quality Objectives the Forest Service uses the "Recreation Opportunity Spectrum" (ROS) as a method to classify land as to its suitability as a setting for recreation activities.

Settings within the watershed are classified as "Roaded Natural" (RN) and Semi-primitive non-Motorized" (SPNM). SPNM includes the Siskiyou Wilderness and the Chicago Backcountry Recreation management allocation.

Portions of East Fork Illinois River watershed has been modified over time, and generally meet the intent of land classified as MA-14 (see above). During the early part of this century this land was undeveloped, and substantially unroaded. Users including miners, packers, and explorers who were physically fit and very self-reliant. At this time the wildness of the land was looked at as an inconvenience. As trails were constructed, they provided the only access into the watershed during the early part of this century. During the 1940's, 50's and 60's roads replaced many of the trails. During the 1970's and 80's, as roadless area acres were reduced, the public demand for such areas was increasing. Public opinion regarding undeveloped forestland had begun to change.

Today the East Fork Illinois River watershed provides scenic quality, clean water, and recreation settings for most visitors to have a satisfying experience in a roaded and unroaded setting. The settings are present for a wide-variety of uses; however, user conflicts can exist. Encounters between recreationists and more industrial-type users of the forest can be a potential source of problems.

With careful management, recreationists can find satisfying roaded experiences through a large portion of the watershed. Visual quality will play an important role in the future of tourism in the area. Timber harvest or other management activities should be programmed to protect the scenic quality of sensitive watersheds, particularly from Forest Road 48, the State of Jefferson Scenic Byway, which is managed as MA-13, Partial Retention Visual.

L. Illegal dumping

Illegal dumping occurs at several locations within the watershed, primarily along roads off main travel arteries. BLM is actively cleaning up these illegal dumpsites as time and public funds allow. On National Forest lands illegal dumping occurs at Hogue Pasture and Page Creek Meadow.

III. Key Question #S-2: Effects of future activities

S-2*: What future activities, other than timber harvest, could affect watershed function?*

A. Recreation

Given current trends, recreation use of the watershed, especially in the area of the Siskiyou Wilderness, is expected to gradually increase over time. Impacts to watershed function should be minimal if recreationists practice a ***leave no trace*** outdoor ethic. Contact with the public will enforce the need for an outdoor ethic. Limits of Acceptable Change (LAC) analysis will be conducted, if necessary, to determine the impact to watershed recreational carrying capacity.

Impacts at concentrated use areas will most likely remain at current levels for the foreseeable future. Hogue Pasture will continue to be a minor problem during the summer months but signing this area as *day use only* may help to mitigate impacts.

The French Flat area, managed by the BLM, will continue to have conflicts with off-road vehicle (OHV) use and there is a recurring need to protect the plant species and habitat, and the cultural resources of the site.

B. Cultural Resources

The Allen Gulch/Esterly Lakes area, managed by the BLM, has a rich history of mining documented by historic mining sites. Management of this area should protect these historic resources and retain the integrity of the sites consistent with their values and legal requirements.

C. Mining

The Llano-de-Oro gravel of the Takilma-Waldo area, including the Leonard and Sucker Creek placer, contains extensive gold deposits. Current estimates are 117,140,000 cubic yards averaging 43 cents in gold per cubic yard at 1973 dollars (Close and Ramp 1973: 37). Currently, suction dredging is confined to the Dunn Creek area, and is expected to remain at existing levels for the foreseeable future. The potential, however, exists for gold exploration at a larger scale when market conditions improve.

The watershed also contains large copper reserves. Unlike gold, which has had a history of controlled prices, copper values have varied with the economy. Only when the price has been high has it been economically feasible to exploit copper ore from Josephine County deposits (Ramp and Peterson 1979: 33). Currently world wide copper prices are extremely low and no mining is anticipated.

On the lands administered by the BLM there are three levels of operations that may occur. The lowest level of operations is considered casual use. Casual use operations include those operations that usually result in only negligible disturbance. These types of operations usually involve no use of mechanized earthmoving equipment or explosives, and do not include residential occupancy. There is no administrative review of these types of operations. In fact, individuals mining at the casual use level are not required to notify the BLM of their activities. The number of casual users in this category are not known.

The most common level of operations involve activities above casual use and below a disturbance level of five acres. This level of operations requires the claimant/operator to file a mining notice pursuant to the BLM Surface Management Regulations. The mining notice informs the authorized officer of the level of operations that will occur, the type of existing disturbance at the location of the operations, the type of equipment to be used in the mining operations, and the reclamation plans following the completion of the mining activities.

Mining notices involve an administrative review of access routes used in the mining operations and a review to determine if unnecessary or undue degradation may occur as a result of the mining operations. This level of activities is not considered a Federal action and no administrative review or approval of mining notices occurs.

There are three mining notices that have been submitted for operations at the location of the BLM-administered lands within the watershed. The notices have been filed for placer operations.

A plan of operations is required for mining operations that meet any of the following criteria:

a. Proposed operations that may exceed the disturbance level of five acres;

b. Activities above casual use in specially-designated areas such as areas of critical environmental concern (ACEC), lands within an area designated as a Wild or Scenic River, and areas closed to off-highway vehicle use; and

c. Activities that are proposed by an operator who, regardless of the level of operations, has been placed in noncompliance for causing unnecessary or undue degradation.

The review of plans of operations involves a NEPA environmental review to be completed no later than 90 days from the date of the submission of the plan. No plans of operations exist within the watershed at this time.

In addition to federal laws mining claimants must comply with state laws where applicable:

- The State Department of Environmental Quality monitors and permits dredging activities and activities where settling ponds are used.

E. The Department of Geology and Mineral Industries (DOGAMI) permits all activities over one acre in size and ensures reclamation is completed in a timely manner. DOGAMI requires reclamation bonds where applicable.

F. The Department of State Lands permits in stream activities where the removal, or displacement, of 50 cubic yards of material is anticipated and where the movement of a stream channel is planned.

G. The Department of Fish and Wildlife (ODFW) monitors turbidity discharges from mined sites. ODFW also recommends preferred dredging periods for operations within anadromous fish bearing streams. ODFW also approves variances for operations outside the preferred work periods where applicable.

No plan of operations have been filed within the watershed**.**

If mining claim occupancy is proposed by the operator/claimant the use is reviewed by the Authorized Officer. The occupancy must be determined to be reasonably incident to mining and reviewed in a manner similar to a plan of operations since this determination is a Federal action covered by NPEA. No occupancy may occur until the proposed occupancy is reviewed and written permission is issued by the authorized officer. There are no mining claim occupancies within the watershed at this time.

D. Surface Uses of a Mining Claim

In some instances the mining claimant has surface rights on the BLM administered lands. These are usually claims that were filed before August 1955 and determined to have a valid discovery. The claimants in these cases have the same rights as mining claimants without surface rights, however, they have the right to eliminate public access across that area where they have surface rights. There are no claims within the watershed where the claimants have surface rights.

IV. Data Gaps

Research has identified a number of data gaps. These are:

A. Cultural Resources

1. Archaeological surveys are lacking for the Illinois Valley proper; however, BLM lands have been surveyed.

2. Subsistence-settlement data is lacking that is watershed specific.

B. Livestock grazing

1. Grazing impacts that are watershed specific are lacking.

C. Mining

1. The stream carrying capacity for the number of suction dredging operations is unknown. Currently suction dredging activities operate under a Notice of Intent. A "trigger" needs to be established to determine when a Notice of Intent becomes a Plan of Operations.

On BLM lands suction dredging is both allowed as casual use in some instances, and in larger operations involving residential occupancy a mining notice is required. Activities under a mining notice are not considered a Federal action, thus no NEPA review is undertaken.

D. Recreation

1. Backcountry use data for the Siskiyou Wilderness is lacking.

2. Standardized or realistic models are lacking to quantify watershed aesthetic and spiritual values.

3. Non-designated trails have not been inventoried, amount of use on BLM lands not quantified.

4. The Recreation Opportunity Spectrum (ROS) has not been inventoried for BLM lands.

E. Roads

1. Transportation Management Objectives (TMOs)have not been completed for this watershed. They will be completed as required under the BLM Western Oregon Transportation Management Plan of 1996.

2. BLM Non-Capitalized Roads and Skid Trails have not been inventoried.

V. Findings

1. Using fire Native Americans intensively managed valley floor and valley-foothill habitats for specific resource outputs

2. Wildlife populations at the time of historic contact were, to a large degree, a function of habitat manipulation by Native Americans

3. Seral forested conditions at the time of the establishment of the Siskiyou National Forest were partly a function of native American burning *and* indiscriminate burning by miners

4. Hydraulic mining heavily impacted riparian habitats, notably in the Allen and Scotch Gulch areas, and areas in the watershed are still in various degrees of recovery

5. Suction dredge mining is currently occurring on Dunn Creek. Future exploitation of gold in the watershed is dependent on global gold prices

6. Areas within the watershed were heavily grazed at the beginning of the century but the legacy of impact is difficult to quantify

7. The next decade will continue to see immigration of younger more educated exurbanites with strong environmental values and community interests. There will continue to be declining ties to the land for economic contributions and greater reliance on commuting to urban employment sites

8. The continued survival of communities, especially rural communities, will depend on the region's ability to diversity their economic base. For many rural areas, the path to sustainable economic development will include innovative approaches to natural conservation, management, and utilization

9. Timber production has made important economic contributions in the past. However, future harvest levels will probably be at a much-reduced level

10. Recreation will continue to increase at a slight rate with the majority of use occurring in the Siskiyou Wilderness

VI. Management Recommendations

A. Recreation

1. Future recreation development in the watershed is tied to public input, community partnerships primarily focused around the Community Response Team (CRT), funding, and cooperation between federal agencies. Projects might include diverse trail opportunities including horses, mountain bikes and motorcycles, campgrounds, improvement and expansion of existing infrastructure, and development of activities associated with Ecotourism. Open public meetings, possibly under the auspices of the Community Action Team, local Watershed Council, or the Southwest Oregon Provincial Advisory Committee, could meet with the Forest Service, BLM, and appropriate state and county agencies, to work together on management options in the EF Illinois River watershed.

2. Identify signing needs associated with trail heads, etc.

3. Nominate Hogue Pasture as "day use only"; maintain for trailhead parking only.

4. Maintain registration cards at the Black Butte trailhead, Siskiyou Wilderness. Compile use data trends. Develop a Memorandum of Understanding (MOU) with the Klamath National Forest to manage the Illinois Valley Ranger District portion of the Siskiyou Wilderness.

5. Work closely with the public to understand the diversity of views associated with road closures and decommissioning

6. Treat managed stands adjacent to the Sno-Park to provide snowboarding opportunities and meet long-term Late Successional Reserve objectives.

7. Replace the toilet at the Page Mountain Sno-Park with a conventional vault toilet. Investigate expansion of the sledding hill to accommodate increased use.

8. Develop a management plan for French Flat ACEC (BLM) by 2005.

9. Clean up and close dump sites on all public ownerships. Consider road access restrictions as a part of the Transportation Management Objectives process (BLM).

B. Cultural Resources

1. Interpretative opportunities of historic mining activities exist in the watershed. Data gaps relating to the prehistoric subsistence-settlement system will be filled as site-specific surveys take place. Continue the policy of contacting Tribes regarding project undertakings.

2. Further evaluate the historic values in Allen Gulch and French Flat area. Evaluate their potential for special designation as, for example, a National Historic Mining District. Provide

protection for individual sites appropriate to the value and significance of the site.

3. Further evaluate the unique vegetation types / areas for possible designation as an ACEC or Research Natural Area. Identify vegetation management prescriptions and techniques that would be needed to reestablish and maintain the presence and vitality of these types / areas.

C. Mining

1. Continue to monitor suction dredging activities in the watershed. Monitor the impacts of camping and sanitation. Establish a system to determine when Notice of Intent needs to upgrade to a Plan of Operations. For activities in California maintain better communications with California Fish and Game.

D. Roads

1. BLM: road inventories, Transportation Management Objectives (TMOs) are determined through the interdisciplinary team process as field data is collected and presented for evaluation. Recommendations for roads will come from the TMO process and will be attached to the watershed analysis.

APPENDIX A: Roads and Transportation System

I. National Forest lands

A. Definitions

Decommission: Eliminates most of the risk and impacts of major storm events, except for the first year when erosion and sedimentation may occur. However, the road is no longer available for use.

Storm proofing and closing to Level 1: Reduces the risk of damage and allows the road to better handle large storm events. Eliminates casual vehicle use, allowing the road surface to stabilize and eliminate most surface rill. Reduces the risk of damage and allows the road to remain in the system and will be less costly to open if needed in the future. May or may not include culvert removal.

Storm proofing Level 2 roads: These roads need to be open for various uses. Storm proofing will reduce the risk of damage from major storm events and reduce the need for recurrent maintenance.

B. Transportation System Recommendations

The following are the recommendations for storm proofing (level 2), decommissioning and road closures (level 1) on National Forest lands. High priority locations are followed by an "*".

Table A-1: Forest Service Transportation System Recommendations

Road #	Recommendation
4800023	Decommission
4800049	Level 2
4800057	Need to field check [Matrix land (active instability)]. If level 2, need redesign
4800065	Decommission the last half of a mile; rest, level 2
4800070	Level 2
4800450	Level 1
4800455	Level 1
4800460	Level 1
4800520	Level 1
4800570	Level 1*
4800571	Decommission
4803	Level 2*
4803097	Decommission
4803101	Decommission
4803124	Active instability, but need to access managed stands and fire access. Needs field check.
4803130	Maintain remaining road as level 2 (already decommissioned past Whiskey Lake)

Road #	Recommendation
4804013	Power line right-of-way, fire, timber access, and hydrology concerns. No consensus for recommended treatment.
4804420	Level 1
4804023	Level 1
4804424	Level 1
4804442	Level 1
4804445	Level 1
4804447	Level 1
4808012	Level 1
4808013	Level 1&2
4808015	Level 2 with redesign*
4808019	Level 2 with redesign*
4808027	Needs field check before recommendation consensus.
4808030	Level 2
4808064	Level 1
4808520	Level 1
4808530	Level 2 (POC rock pit)
4808532	Level 1
4808534	Level 1
4808581	Level 1
4808585	Level 1
4810	Level 2*
4810011	Level 2
4810012	Decommission the last one half mile; rest, level 2
4810020	Level 2
4810027	Level 1
4810630	Level 2
4810036	Level 2
4810590	Decommission
4810591	Decommission
4810601	Decommission
4810610	Level 1
4810650	Decommission from #652; rest of road -level 1
4810652	Level 1
4810653	Level 1
4810690	Decommission
4904011	Decommission last half mile; rest of road-level 1*
4904035	Decommission
4904036	Level 2
4904060	Decommission from crossing; rest, no consensus on decommission vs. level 1
4904581	Decommission
4904585	No consensus (fire needs road)*
4904555	No consensus (fire needs road)

Road #	Recommendation
4904588	Decommission
4904589	Decommission
4904625	Decommission
4904635	Level 1
4906017	Needs field review; may access Sunstar private property
4906039	Level 1
4906053	Level 2
4906615	Decommission
4906620	Decommission
4906621	Decommission
4906642	Decommission
4906643	Decommission
4906674	Decommission

II. BLM ROADS

BLM road conditions/status in the East Fork Illinois River watershed are summarized in Table A2. Total road miles indicated have been collected by road logs, odometer readings and GIS information. Recommendations for management of these roads will be reviewed and updated as a part of the BLM's TMO process which is currently underway.

Table A-2: BLM Roads

Road Number / Segment	Total Miles (within watershed)	Surface Type	Subgrade Width	Maintenance Level [1]
38-7-31 D	0.18	NAT	16	2
39-7-7	0.09	NAT	14	1
39-7-8 A	0.07	NAT	14	1
39-7-8 B	0.07	NAT	17	1
39-7-8 C	0.19	NAT	14	2
39-7-8 D	0.73	NAT	14	2
39-7-8 E	0.35	NAT	14	2
39-7-8.2 B	0.09	NAT	17	1
39-7-9.4	0.40	ASC	14	3
39-7-9.6	0.07	ASC	16	3
39-7-17 A	0.19	ASC	14	3
39-7-17 B	0.83	NAT	14	2
39-7-17.1	0.09	NAT	14	2
39-7-17.2	0.74	ASC	14	3
39-7-17.3	0.38	ASC	14	3
39-7-18 A	0.92	NAT	14	2
39-7-18 B	0.39	NAT	14	2
39-7-18.2	0.24	ASC	16	3
39-7-18.3	1.41	ASC	14	3
39-7-18.4	0.48	ASC	17	3
39-7-19 A	2.82	ASC	14	3
39-7-19 B	1.77	ASC	14	3

Road Number / Segment	Total Miles (within watershed)	Surface Type	Subgrade Width	Maintenance Level [1]
39-7-19.1	0.06	ASC	17	3
39-7-19.2	0.37	ASC	16	3
39-7-21.1	2.74	ASC	14	3
39-7-29	0.20	NAT	14	1
39-8-12 B	0.08	NAT	12	2
39-8-13.1	0.33	ASC	17	3
39-8-13.2	0.22	ASC	17	3
39-8-13.3	0.46	ASC	17	3
39-8-13.4	0.20	ASC	17	3
39-8-13.5	0.32	ASC	17	3
39-8-22 B	0.22	NAT	14	1
40-8-3	0.13	PRR	16	2
40-8-15	1.23	NAT	14	2
40-8-15.1	1.25	NAT	14	2
40-8-23 A	0.95	ABC	14	3
40-8-23 B	1.07	ABC	17	3
40-8-23.1	0.34	ABC	14	3
40-8-23.2	0.21	NAT	14	2
40-8-24 A	0.33	ABC	14	3
40-8-24 B	0.02	NAT	14	3
40-8-35 A	0.68	NAT	12	2
40-8-35 B	0.36	NAT	12	2
40-8-35 C	0.10	NAT	12	2
40-8-35 D	0.19	NAT	12	1
TOTALS	**24.56**			

[1] ***BLM Road Maintenance Levels:*** The extent and intensity of road maintenance scheduled for a road is as follows.

Level 1: This level is the minimal custodial care as required to protect the road investment, adjacent lands, and resource values. Normally, these roads are blocked and not open for traffic or are open only to restricted traffic. Traffic would be limited to use by high clearance vehicles, passenger car traffic is not a consideration. Culverts, water dips and other drainage facilities are to be inspected on a three-year cycle and maintained as needed. Grading, brushing, or slide removal is not performed unless they affect roadbed drainage. Closure and traffic restrictive devices are maintained.

Level 2: This level is used on roads where management requires the road to be opened seasonally or for limited passage of traffic. Traffic is generally administrative with some moderate seasonal use. Typically these roads are passable by high clearance vehicles. Passenger cars are not recommended as user comfort and convenience are not considered priorities. Culverts, waterdips, and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted as necessary only to correct drainage problems. Brushing is conducted as needed (generally on a three-year cycle) only to facilitate passage of maintenance equipment. Slides may be left in place provided that they do not affect drainage and there is at least 10 feet of usable roadway.

Level 3: This level is used on intermediate or constant service roads where traffic volume is significantly heavier approaching an Average Daily Traffic of 15 vehicles. Typically these roads are native or aggregate surfaced, but may include low use bituminous surfaced road. This level would be the typical level for log hauling. Passenger cars are capable of using most of these roads, by traveling slow and avoiding obstacles that have fallen within the travelway. Culverts, waterdips, and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted annually to provide a reasonable level of riding comfort. Brushing is conducted annually or as needed to provide concern for driver safety. Slides affecting drainage would receive high priority for removal, otherwise they will be removed on a scheduled basis.

Level 4: This level is used on roads where management requires the road to be opened all year and have a moderate concern for driver safety and convenience. Traffic volume is approximately an Average Daily Traffic of 15 vehicles and will accommodate passenger vehicles at moderate travel speeds. Typically these roads are single lane bituminous surface, but may also include heavily-used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis, although a preventative maintenance program may be established. Problems are repaired as soon as discovered.

Level 5: This level is used on roads where management requires the road to be opened all year and have a high concern for driver safety and convenience. Traffic volume is exceeds an Average Daily Traffic of 15. Typically these roads are double or single lane bituminous, but may also include heavily-used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis and a preventative maintenance program is also established. Brushing may be conducted twice a year as necessary. Problems are repaired as soon as discovered.

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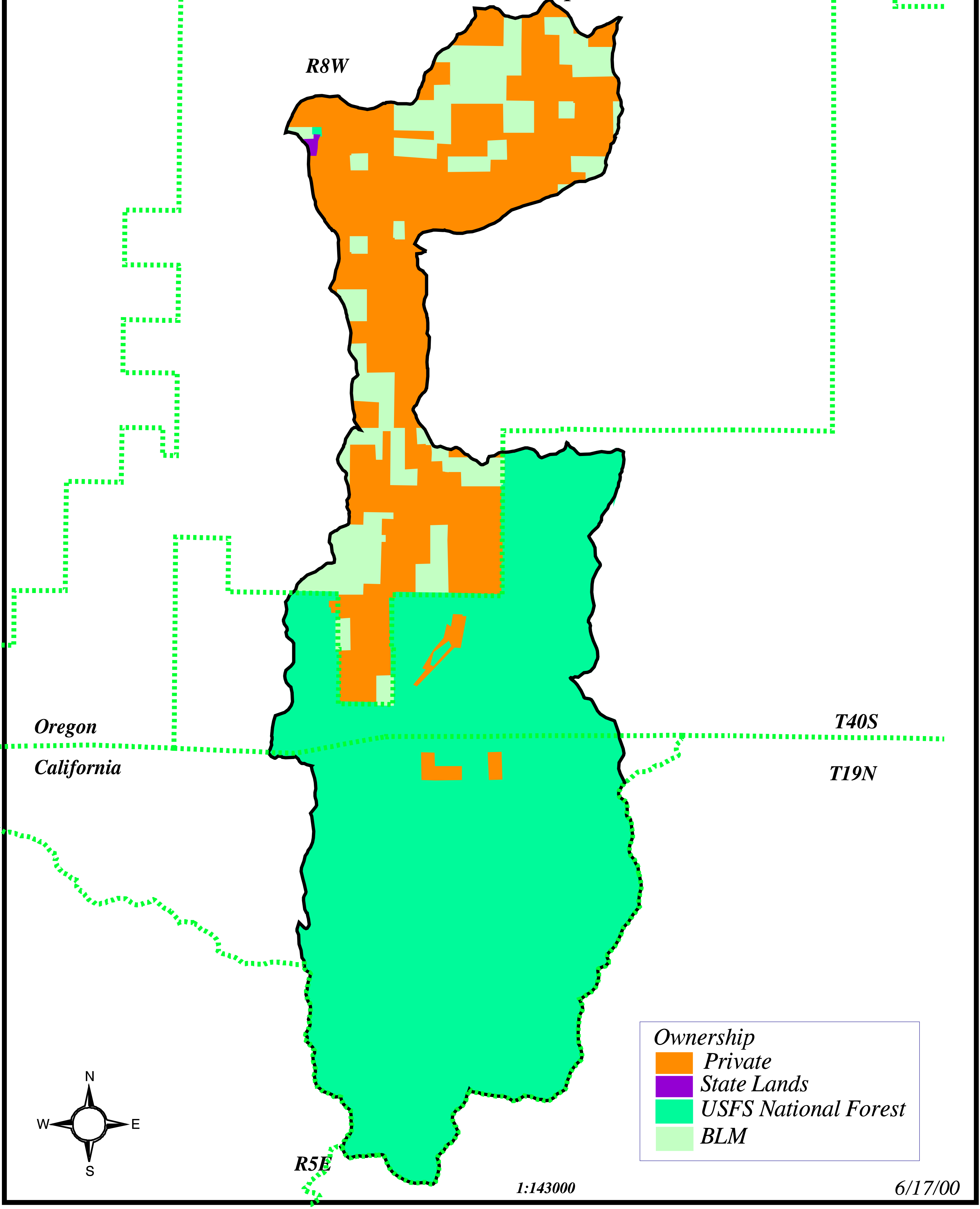
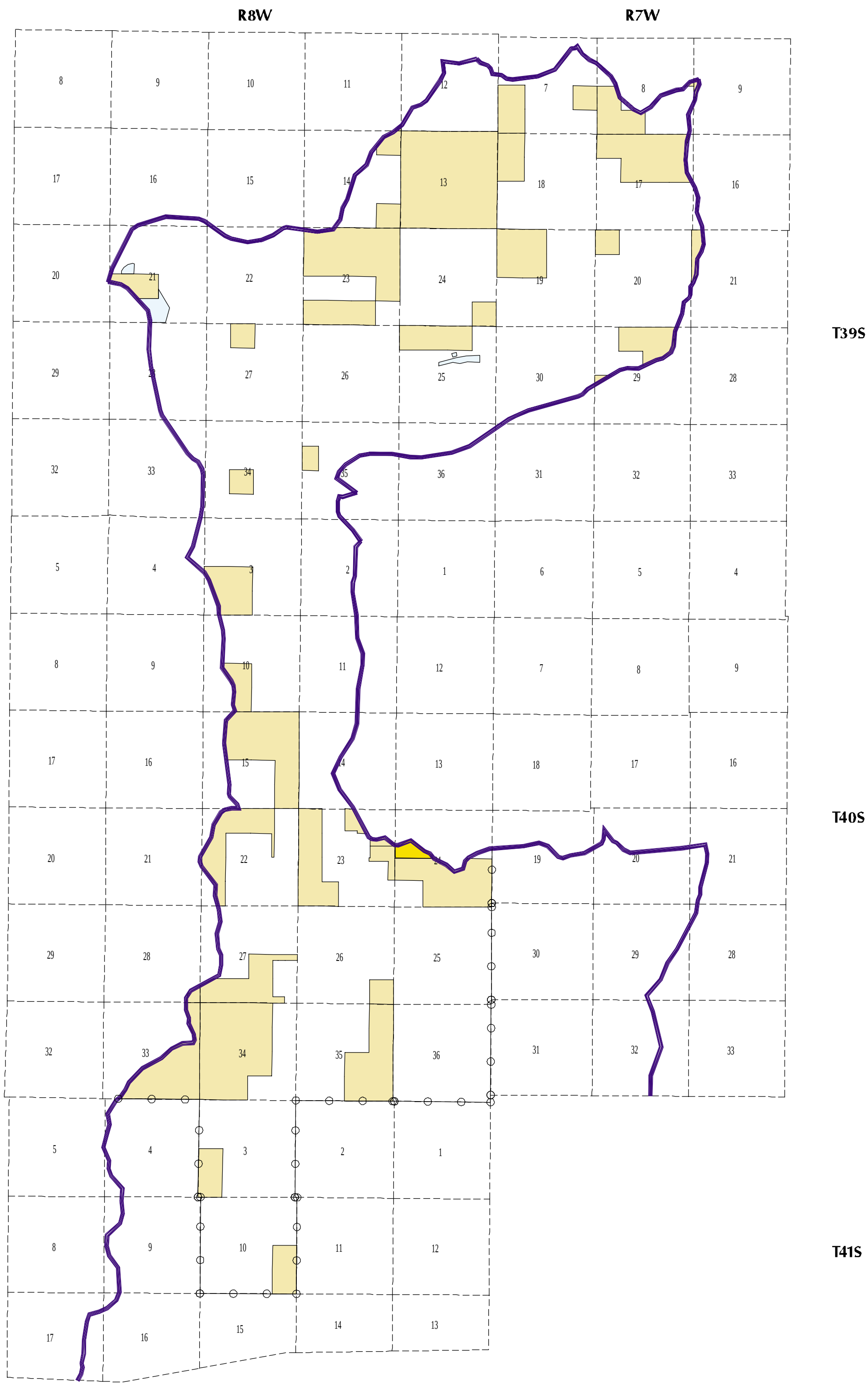
East Fork Illinois Watershed Land Ownership





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GOVERNMENT OWNERSHIP OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- BLM
- STATE OF OREGON
- JOSEPHINE COUNTY
- WATERSHED BOUNDARY
- USFS BOUNDARY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

August 1999

John McGlothlin

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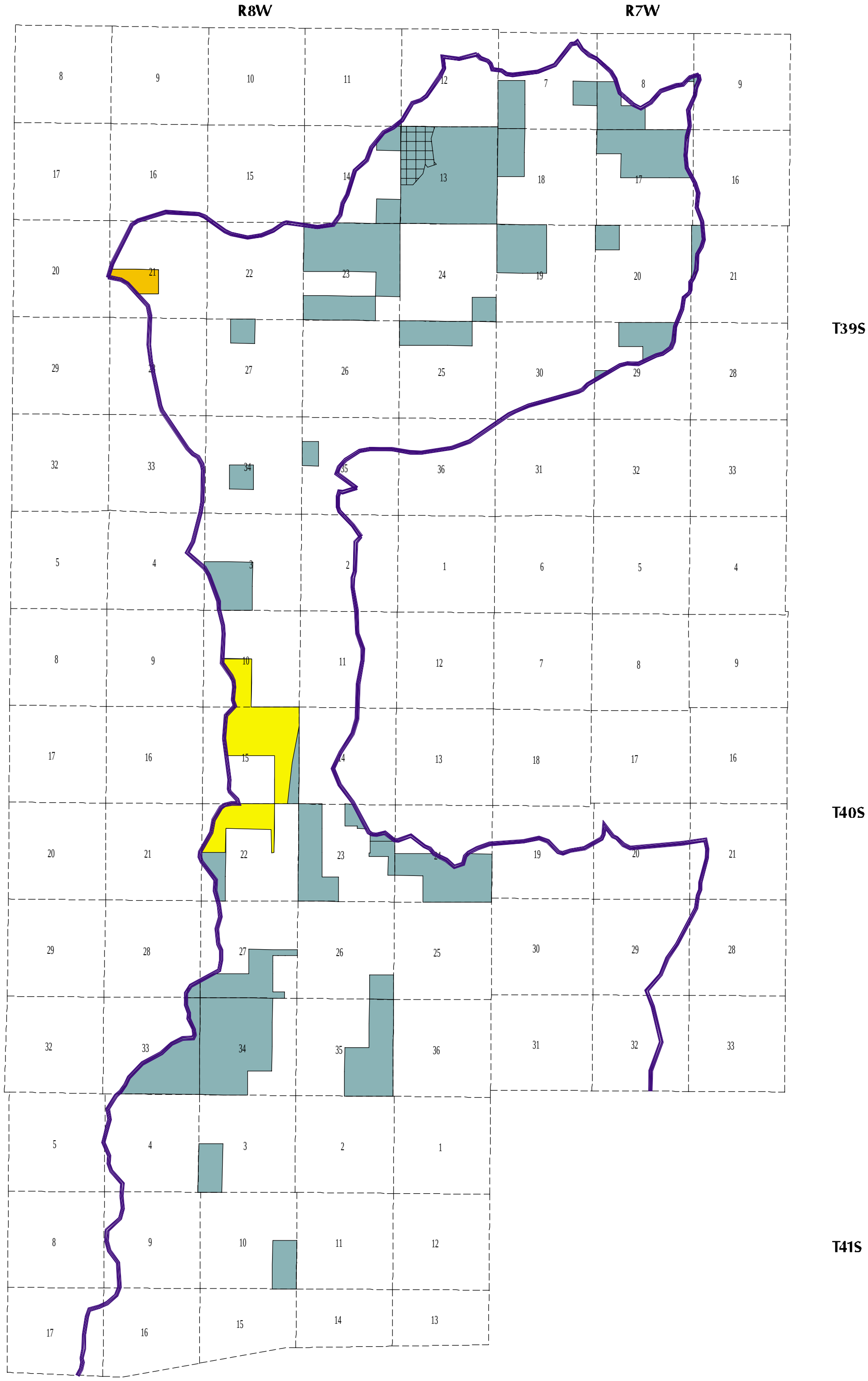

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LAND USE ALLOCATIONS ON MEDFORD BLM DISTRICT LANDS IN THE EAST ILLINOIS WATERSHED

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

August 1999

John McGlothlin

LEGEND

- MATRIX
- 100-ACRE OWL CORE
- WATERSHED BOUNDARY
- ACEC
- R & PP PARK LEASE

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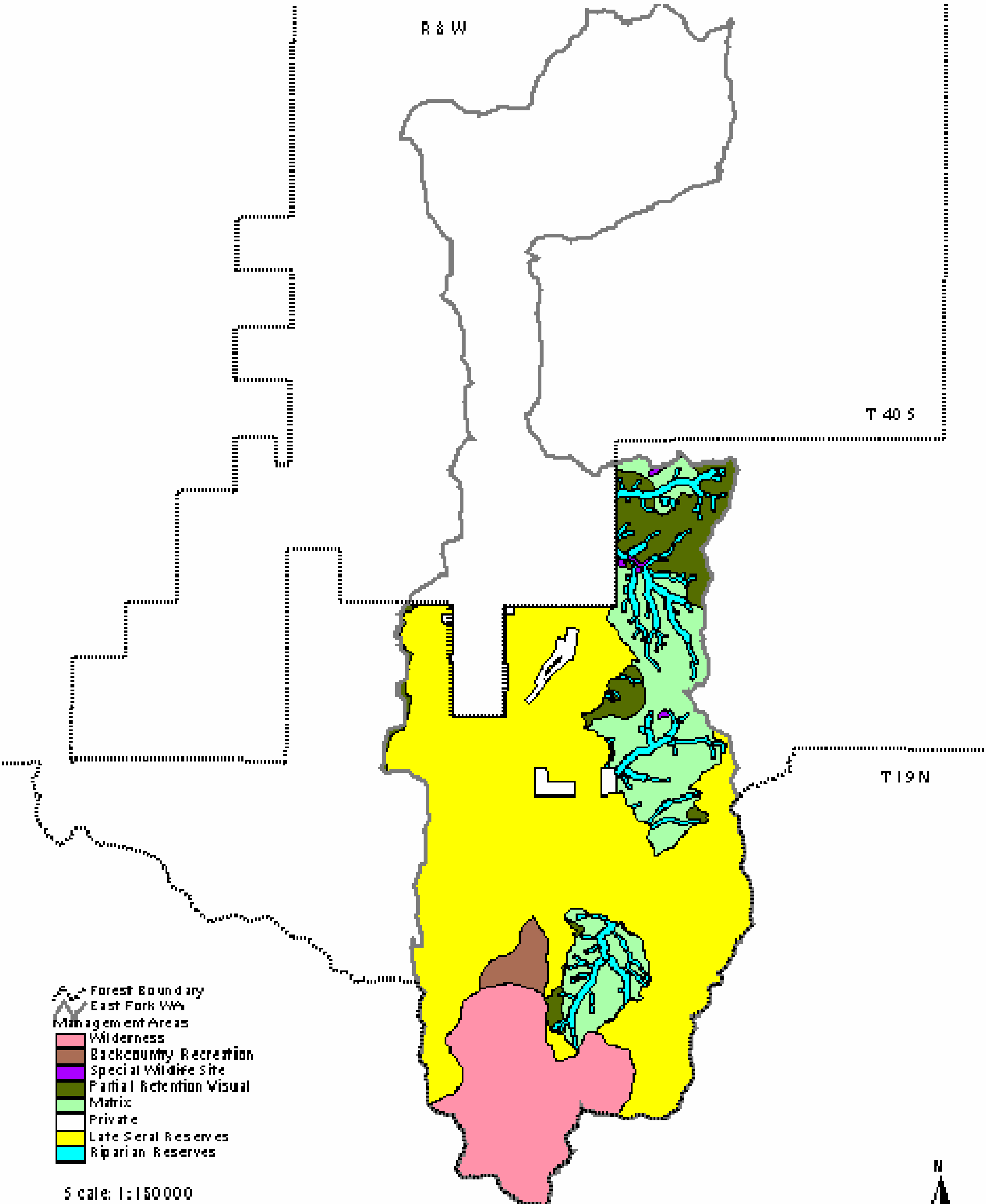
East Fork Watershed Analysis
Management Areas



EAST FORK OF THE ILLINOIS RIVER

WATERSHED ANALYSIS

SYNTHESIS MODULE

US FOREST SERVICE
Illinois Valley Ranger District

BUREAU OF LAND MANAGEMENT
Grants Pass Resource Area

JULY 2000

SYNTHESIS MODULE

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I. PURPOSE

This module of the East Fork Illinois River Watershed Analysis provides a synthesis of the aquatic, terrestrial, and social modules. Its purpose is to identify priorities for maintenance and restoration of multiple integrated resource values.

II. METHODS

An interdisciplinary team consolidated all the resource issues discussed in the three preceding modules of the watershed analysis into the following resource values (arranged alphabetically):

- Critical Fish Habitat
- Cultural Resources
- Fire Hazard
- Forest Products
- Large Wood Delivery Potential
- Old Growth Forest Habitat
- Rare Plants
- Recreation
- Savannas and Grass / Forb Habitats
- Water Quality

For each resource value, the related hazards and risks were considered to assess relative priorities for management actions and treatments.

III. VALUE RATINGS

Each resource value was considered within the context of 20 drainage analysis areas in the East Fork Illinois watershed. Individual analysis areas were rated based on the importance of each value within that drainage. Factors considered in determining the ratings include, but are not limited to, fish bearing streams, fire hazard, stand density, slope stability, interior mature and old growth habitat connectivity, land allocation and management emphasis, perennial stream flow, road/stream crossings, road density, road location, potential for recovery, noxious weeds, rural interface, fish barriers, dead wood, species composition shifts, and tree pathogens. The drainage analysis areas were also rated for their overall priority for restoration and maintenance treatments based on an aggregation of the priorities. Hazard and risk for each value were determined within each drainage analysis areas. The ratings for each drainage analysis area are summarized on the following maps;

- Critical Fish Habitat Maintenance Value
- Critical Fish Habitat Restoration Value
- Cultural Resources Sites Present / High Probability Area
- Cultural Resources Interpretation Value
- Large Wood Delivery Potential Maintenance Value
- Private Property and Public Safety Maintenance Value
- Private Property and Public Safety Restoration Value
- Old Growth Maintenance Value
- Old Growth Restoration Value
- Rare Plants - Maintenance and Restoration Value
- Recreation Use Value
- Recreation Increased Management Value
- Savannas and Grass / Forb Habitats Maintenance Value
- Savannas and Grass / Forb Habitats Restoration Value
- Resource Value Ratings - Aggregate

A. Hazard

Each resource value is susceptible to a unique set of potential hazards; hazards are defined as existing or potential disturbance factors such as wildfire, timber harvest, insect or pathogen infestations, erosion and soil mass movement, etc.

B. Risk

Risk is defined as the relative probability of a hazard actually occurring. For example, a given stream has a hazard of significant sediment delivery through erosion and landslides. However, the risk, or potential for delivery, may be low if soils and geology in the delivery area are relatively stable. Risk assessment can identify data and monitoring needs and provides the decision maker with critical information to determine which areas are the best candidates for treatment based on value, hazard, risk and economics.

C. Value Descriptions and Priority Areas

Resource value ratings for each of the drainage analysis areas are summarized in Appendix A Table S-A-1. The ratings are discussed further in this section.

1. Critical Fish Habitat

Critical fish habitat is essential for the survival and completion all life stages of anadromous and resident fish, especially the Southern Oregon/Northern California coast coho salmon, which is listed as a threatened species under the Endangered Species Act. The East Fork is a primary contributor to the Illinois River basin salmonid population. At least 50% of the Rogue River basin coho production comes from the Illinois River. Designated critical habitat for Southern Oregon/Northern California coast coho salmon (Fed. Reg./Vol.64/No.86/May 5, 1999) includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassible barriers (i.e., natural waterfalls in existence for at least several hundred years).

Potential hazards to critical habitat within the East Fork Illinois River watershed are floods, landslides, water quality, inefficient water withdrawals (i.e., gravel push-up dams), migration barriers, and direct habitat disturbance (i.e., suction dredge mining and gravel removal). Floods and landslides can dramatically change stream geomorphology. With lower stream flow, there is an increase in the surface area to volume ratio, resulting in increased temperature from solar radiation and a decrease in pool habitat for fish. Fire, timber harvest, rural development, agriculture, and landslides can all affect stream shading, a component of water quality, which, in turn, affects critical fish habitat.

Natural hazards (floods, landslides, debris flows, fire) can be periodic and exacerbated by human intervention. Critical habitat is especially vulnerable to these hazards when they occur outside their natural range of variability. Further hazards include road crossings and water withdrawals that limit fish passage, and ground disturbing activities that contribute sediment to streams. Salmonid productivity is affected by shade reduction, high sediment smothering redds, no rearing habitat, and inaccessible spawning grounds.

Conclusion: The need to maintain and restore critical habitat is high throughout the entire watershed. Because streams are dynamic, upland in-stream activities impact downstream conditions. The highest priority is to restore fish passage in areas where passage is limited, and restore large wood in streams and riparian areas. The most important known spawning and critical habitat areas are above the green bridge at the Forest Service boundary, Dunn Creek drainage, and the lower reaches of tributaries to the main stem of the East Fork.

2. Cultural Resources

The East Fork of the Illinois River watershed has a rich cultural history. Features include prehistoric lithic scatters, large hydraulic mine complexes, and sites relating to early day Forest Service activities. In addition, the watershed has numerous high probability areas for cultural resources that are not yet inventoried. Cultural resources are nonrenewable resources. Each site or complex is unique and serves as a window to the past. Once a site is destroyed or its integrity violated, valuable information to reconstruct culture history is lost. Sites must be inventoried through a formal process to determine their eligibility to the National Register of Historic Places (NRHP).

Hazards to cultural resources are primarily associated with ground disturbing activities, and to a lesser extent wildfire. Examples of ground disturbing activities include timber sales, road and trail construction, and off-road vehicle use. Looting (pot hunting) can also destroy sites.

Mitigation of hazards to cultural resources on public lands is managed through the cultural resource management process. Sites are inventoried, described, and evaluated for their potential to the NRHP. If a proposed undertaking will have an effect on a significant cultural resource, appropriate means of treatment are designed and implemented. Treatment primarily takes two forms: (1) modification of the undertaking and (2) data recovery.

The risk to cultural resources from management related activities is generally low. Literature reviews, professional judgements and field surveys are used to minimize risk. An attempt is made to survey all high and a percentage of medium and low probability areas. It is possible, however, to miss sites due to terrain, forest duff, and areas of impassible brush.

In high probability areas that have received a surface survey but revealed no sites, subsurface testing can determine if buried deposits are present. This can also take place when, for example, a toilet is installed or a road is constructed and is another avenue to lessen the chance of impacting unrecorded sites.

Fire can impact cultural resources. A review of existing sites is conducted in the advent of a wildfire to provide protection to structures and sites. But suppression activities are often insufficient to protect resources. An example is the 1987 Longwood Fire, which consumed many wooden features associated with mine ditches in the East Fork Illinois River watershed.

Looting of sites and artifacts is always a hazard.

Conclusion: The areas of highest value are located on BLM lands in Allen Gulch, Scotch Gulch, and French Flat. This complex of sites contains numerous mines / headwalls, ditches, town sites, and other features associated with the earliest episodes of mining in the area and subsequent development as a major factor in the region's economic development. The areas have high site integrity and contain many opportunities for interpretation. It may have potential for designation as a National Historic Mining District. Such a designation would not preclude vegetation management, however, sites must be protected from ground disturbing activities. Control of off-road vehicles is important in protecting the integrity of the area.

3. Fire Hazard

The value of public safety and private property is high. A hazard to public safety is wildfire. The risk is greatest within the rural interface where federal and private lands adjoin. All BLM lands in this watershed are considered to be within the rural interface. The risk of a wildfire occurring in the rural interface is high.

Conclusion: Priority locations for hazard reduction treatments are Allen Gulch, Scotch Gulch, Lower East Fork Illinois, and Khoeery Creek. Fuels should be reduced first in areas adjacent to private lands and residences. Fuels treatments are recommended throughout the watershed.

4. Forest Products

The East Fork Watershed is an important source of forest products. Forest products include (but are not limited to) individual collection of mushrooms, decorative plants or plant parts, firewood, post and poles, and timber sales. Timber values were specifically evaluated for this synthesis document, however, the value of forest products within Late-Successional Reserves and Riparian Reserves was not assessed, because programmed timber harvest does not occur in these areas. (Forest products may be removed from Late-Successional and Riparian Reserves where the purpose of their removal meets or is to meet the objectives of the land allocation.)

The forest product rating in Table S-A-1 is based on potential timber production conditions on Matrix land allocation lands in each drainage analysis area. Drainages with significant acreage within Matrix include: Allen Gulch, Cedar Gulch, Chapman Creek, Dunn Creek, Lower East Fork Illinois, East Fork - Scotch to Dunn, Elder Creek, Kelly Creek, Khoeery Creek, Little Elder Creek, Page Creek, Scotch Gulch, and Tycer Creek. Table S-A-1 indicates the relative amount of timber available within Matrix lands (first rating letter), and the need for silvicultural treatment within that drainage (second rating letter).

Conclusion: Hazards to timber production include forest pathogens (insects and diseases), intense wildfire, and stand density based competition for light and moisture (from other trees or vegetation). The risk of these hazards occurring is generally high. Active stand management using silvicultural techniques such as thinning, planting, site preparation, and regeneration harvesting can reduce the risk and hazard levels.

5. Large Wood Delivery Potential to Streams

Large wood provides cover, nutrients, shade, and habitat for aquatic and terrestrial organisms. The delivery of large wood depends on natural processes. In intermediate sized streams, large instream wood strongly influences the morphology of the stream channel as well as the routing and storage of sediment and water; it may be the principle factor in determining the characteristics of aquatic habitats (Franklin et al. 1981).

Hazards to large wood delivery potential can be both natural and anthropogenic. A lack of large trees (hence, a lack of a wood source) near streams would be a hazard. Because wood is often delivered through landslides, areas with stable soils and/or low slopes outside the transient snow zone are less likely to deliver wood. Other hazards include road culverts that block wood from flowing downstream. The risk to large wood delivery potential is dependent on elevation, slope, soil type, road crossings, road locations, and upland disturbance.

Conclusion: Priority treatment areas for maintaining large wood delivery potential include Upper East Fork, Sanger Creek and Scotch Gulch. Restoration areas include Cedar Gulch, Chicago Creek, Elder Creek, and Long Gulch. The potential for large wood delivery is not as high on BLM lands because there are no unstable granitic soils, most slopes are low, and very little land is in the transient snow zone. Khoeery, Tycer, Kelly, and Chapman Creek drainages have moderate priority for both maintenance and restoration. These areas lie partially within the transient snow zone in areas with greater than 55% slope and have a high percent of the riparian reserve in mature/old growth (in the case of Tycer, greater than 11" dbh).

6. Old Growth Forest Habitat

The term "Old growth" relates to a subset of late-successional forest. For National Forest lands this is defined as having at least eight trees per acre that are larger than 32" dbh and canopy closure greater than 40%. The more inclusive term, late-successional, is defined as a stand having more than half the trees greater than 21" dbh. On National Forest lands the acreage of late-successional forest is comparable to the reference condition but the acreage of old growth is less. BLM data addresses late-successional forest without subdividing it.

The value of old growth is high wherever it occurs. Value is greatest where old growth occurs in large patches, Riparian Reserves, or when it is part of large patches of late-successional forest habitat.

The main hazards to maintenance or restoration of old growth are wildfire, high stand densities, and timber harvest, especially regeneration harvest. Wildfire hazard (due mostly to high stand densities of trees less than 21" dbh) to maintenance or restoration of old growth is moderate for about 70% of the habitat (including current and potential old growth), whereas the desired hazard level is low for about 90% of the area.

Priority locations to reduce fire hazard are within the areas identified on Map 27 The Best Mature and Old Growth Habitat Patches and Their Connections and Map24 Potential High Priority Areas for Hazard Reduction. Areas at lower elevations are particularly important. Priority areas for the BLM are Allen Gulch, Chapman Creek, Khoeery Creek, Little Elder Creek, Lower East Fork drainage, and Tycer Creek.

Excessive stand densities are a hazard to old growth maintenance and restoration because they increase large tree mortality, retard growth, and cause species composition changes; most significantly, the decline of shade intolerant conifers, hardwood, shrub, and herbaceous species. The timber harvest hazard to old growth is high in the Matrix land allocation and very low in other allocations under current federal land management plans.

The risk of wildfire, excessive stand density, and timber harvests varies. Wildfire risk depends on the chance of a fire starting at a time and in a location that makes it difficult to stop. The risk of ignition is high where human use is frequent, such as adjacent to human populations and well traveled roads, and where lightning frequently strikes. The risk of ignition resulting in a large fire during hot, dry conditions is high, given current watershed fuel loadings.

The risk of excessive stand density occurring is very high; stand densities are high in all areas except those that have been recently thinned, either pre-commercially or commercially. The risk of the regeneration timber harvest hazard is high within Matrix lands.

Conclusion: On National Forest lands, priority areas for fuel hazard and stand densities reduction work to protect old growth habitat is indicated on Map 27 The Best Mature and Old Growth Habitat Patches and Their Connections. Areas in Page, Lower Elder, and Little Elder Creeks and the connection along Buckhorn Ridge are of highest priority. The patch in Dunn Creek between the North Fork Dunn and Poker Creeks, and the connections from this patch are of lesser priority. The patch in the upper reaches of Poker Creek and its associated connections are of lower priority. Priority areas on BLM lands are in Allen Gulch, Khoeery Creek, Little Elder Creek, Chapman Creek, Tycer Creek and Kelly Creek. Riparian Reserves outside these drainages are also priority treatment areas.

7. Rare Plants

The value of rare plant species is high wherever they occur. Their abundance tends to be higher in serpentine soils, wet areas, and old growth forest habitat. About 40 percent of the BLM lands in the East Fork watershed are in a botanical emphasis area.

The hazards to rare plants are severe intensity wildfire (moderate to high hazard), timber harvest (see above for hazard description), and off-road vehicle use. The risk of severe intensity fire, timber harvest, and off-road vehicle use varies. For a description of the wildfire risk and timber management risk in old growth habitat, see above discussion. The risk to rare plants from timber management in Matrix lands is low because plant surveys and required management for known sites avoid or minimize impacts to populations. The risk to rare plants from off-road vehicle use is high near roads where gentler slopes are conducive to off-road driving.

Conclusion: Priority areas for rare plant treatment coincide with old growth and savannah areas (see these discussions). Priority BLM areas are Scotch Gulch, Allen Gulch, Khoeery Creek, and Little Elder Creek. A Research Natural Area (RNA) designation has been proposed by the BLM for portions of Allen Gulch and Scotch Gulch. Resource values for the proposed RNA include unique serpentine plant communities (Scotch Gulch) and late-successional tanoak forest (Allen Gulch). The majority of the area in this proposed RNA is BLM, with a small inclusion (about 25 acres) of Forest Service lands.

8. Recreation

Recreation use on National Forest lands is diverse. Activities include swimming, hiking, backpacking, horseback riding, fishing, and driving for pleasure. Two major concentrated use areas are Hogue Pasture and the Page Creek meadow area, both of which are located near Takilma. Other popular recreation areas are Whiskey Lake and Camp Chicago, located near Sanger Peak. Concentrated use areas are often adjacent to riparian areas. The Page Mountain Sno-Park is the only developed Forest Service recreation site in the watershed area. In addition, The State of Jefferson Scenic Byway traverses through part of the watershed.

BLM lands in the watershed are used for dispersed recreation activities such as horseback riding, hiking, OHV and mountain bike riding. This use is concentrated in the French Flat Area of Critical Environmental Concern (ACEC), Allen Gulch, Rockydale Road area and the area around Limestone Rock in the northern part of the watershed. There are many non-maintained trails on BLM lands in the watershed that are used by OHVs, hikers and horseback riders. Deleterious off highway vehicle use is also occurring in the French Flat ACEC.

Areas with high recreation value include Allen Gulch, Chicago Creek, Dunn Creek, Upper East Fork, Page Creek, Sanger Creek and Scotch Gulch. High value areas also have a high need for increased management. Areas of moderate recreational use and, therefore, moderate value, include Lower East Fork, East Fork (Scotch to Dunn), East Fork (Bybee to Chicago), Elder Creek, Khoeery Creek, and Poker Creek.

Hazards to recreation resources are primarily associated with ground disturbing activities, and to a lesser extent wildfire. Examples of ground disturbing activities include timber sales, mining and road construction. Natural disturbances such as erosion can be a hazard to trail systems. Inappropriate uses can also be hazardous to recreation sites, e.g., motorized use in an area not suitable for motorized use.

Conclusion: Priority areas for treatment include existing and potential recreation sites and trails in high value areas, such as Allen Gulch, Chicago Creek, Dunn Creek, Upper East Fork, Page Creek, Sanger Creek and Scotch Gulch. Priority areas on Forest Service lands include Page Mountain Sno-Park, the Hogue Pasture and Page Creek Meadow area, Whisky Lake and Camp Chicago area. On BLM land, higher priority areas include Allen Gulch, Scotch Gulch, and French Flat. Control of off highway vehicles in French Flat and the surrounding areas is important to protect cultural and botanical resources.

9. Savannas (pine and deciduous oak) and grass/forb (meadows and forest under-story).

Jeffery pine savanna occurs within serpentine lands. The deciduous oak savanna is generally outside of serpentine, and contains ponderosa pine and black or white oak. Another savannah type is characterized by ponderosa pine.

The value of savanna and grass/forb habitats is high. Values are greatest at lower elevations or on south aspects because of their importance to wintering wildlife.

The hazards savanna and grass/forb habitats come primarily from excessive stand densities and high severity fire. Timber management practices can either conflict with or contribute to maintenance and restoration of savannah and grass/forb habitats. Practices that retain early seral species and allow of adequate mineral soil exposure to regenerate these species contribute to maintenance and restoration goals.

The hazard to savanna and grass/forb habitats from excessive stand densities is high. Over-dense stands result in the elimination of pine, deciduous oak, and grass/forb species, thus changing savanna and grass/forb habitats to forest habitat. The hazard of a severe wildfire is moderate to high for the larger pine and oak species and low for grass/forb species (wildfire should increase the amount of grasses/forbs). Prescribed burning that retains high amounts of duff and litter retention may not be adequate to maintain these habitats.

The risk of the above hazards occurring varies. The risk of elevated stand densities is high because the condition already exists. For a discussion of the risks of fire hazard and timber management occurring, see the discussion for Old Growth.

Conclusion: To restore savanna and grass/forb habitats, reduce stand densities. To maintain these habitats, use prescribed fire where deciduous oaks are located and in portions of the Jeffery pine plant series. (See:Map 9A Plant Series, Map 9B East Fork Plant Series and Map 5 Plant Material and Soil Depth) Areas of remnant deciduous oak savannas are at lower elevations in the mainstem of the East Fork drainage and in Dunn, Page, Little Elder, Elder, and Chapman Creeks, Lower East Fork Illinois (French Flat) and possibly Allen Gulch. Native vegetation conditions within Allen Gulch are difficult to discern due to intense mining history and its effects on habitat.

10. Water Quality

Adequate stream flow, cool temperatures and clean water are valuable for ecological and societal needs. Aquatic ecosystems as well as people living and working (mining, farming, etc.) in the valley are highly dependent on cool, clean water. Aquatic biota, especially cold-water organisms, rely on good water quality to complete their life cycles. Stream density for drainages in this watershed ranges from 2.1 to 7.5 miles per square mile.

Potential hazards to water quality include droughts, inefficient water withdrawals (i.e., gravel push-up dams), excessive water rights, and high solar radiation heating of the stream (Brown 1980). With lower stream flow there is an increase in the surface area to volume ratio, resulting in increased temperature from solar radiation and a decrease in pool habitat for fish. Removal of riparian vegetation (extremely low canopy cover) and/or topographic features as a result of fire, harvest, rural development, agriculture, and landslides affect the quality of water in the watershed.
Further hazards include road crossings, locations and densities as well as rural development and agriculture. Roads near streams can decrease shade, increase the stream network through drainage ditches, increase sediment input, and prohibit or exacerbate natural stream dynamics (i.e., debris flow, fish passage). Rural development, road building, and agriculture can also cause channelization (through diversions) and contamination (from sewage, fertilization). Degraded water quality and landslides, due in part to human activities, greatly affect channel morphology and the overall function of streams as they relate to living organisms, including humans.

Natural hazards (landslides, debris flows, floods, fire) can be periodic and exacerbated by current conditions (upland disturbance, road crossings/locations, high fuel load, stream channelization). Water quality is vulnerable to excessive upland disturbance as a result of fire and landslides, inefficient water withdrawals coupled with a high number of water rights, and loss of riparian vegetation and channelization from further rural development. The Longwood Fire, bare soils adjacent to streams (due to campgrounds and mining) and channelization due to roads may contribute to current water quality. Upland disturbance such as the right-of-way for power lines in Dunn, Elder, and Litter Elder Creek drainages is a long-term loss of vegetation.

East Fork Illinois River was listed on the 1998 Oregon DEQ 303(d) list of Water Quality Limited Bodies as water quality limited for flow modification and stream temperature (seven-day average high temperatures exceeding 64°F). Consequently, hazard and risk are high for the East Fork from the mouth to the California border and all of the Dunn Creek drainage. East Fork from the mouth to the California border has a documented impaired aquatic community, flow requirements that are frequently not met, and a human contribution to reduction of in-stream flows below an acceptable level. There is some question, however, as to whether the system was historically able to meet the current water temperature goals. This will be addressed further in a Water Quality Management Plan currently planned for completion in 2003.

Conclusion: The need to maintain good water quality is high in Bybee Gulch, Chicago Creek, East Fork from Bybee to Chicago, Upper East Fork, and Sanger Creek. The need to restore water quality is high in Allen Gulch, Chapman Creek, Dunn Creek, East Fork from the mouth to the California border, Kelly Creek, Khoeery Creek, Long Gulch, Page Creek, Scotch Gulch, and Tycer Creek. Specific road recommendations are part of the watershed analysis documentation.

The highest priority for restoration is removing the gravel push-up dams on the East Fork and replacing them with more efficient water withdrawal systems. Secondly, a Water Quality Management Plan needs to be written for the East Fork Illinois Watershed to determine the cause of degraded water quality and to develop a restoration plan.

Further high priority areas include those with high road densities, high stream crossings per stream mile, and high number of road miles per stream mile in riparian areas (see Appendix B). Six drainage analysis areas have at least 1.5 stream crossings per stream mile (Appendix B). Half of the drainage analysis areas have road densities greater than 3 miles / mi^2 and seven drainage analysis areas have at least 0.25 miles of road per stream mile in the riparian reserve (Appendix B). Based on the combination of road densities greater than 3 mi/mi^2 and many valley bottom roads, some of these drainage areas are considered "not properly functioning for road density and location" according to NMFS (1996) criteria. The drainage analysis areas that are characterized this way are primarily those in the lower portions of the watershed where the land ownership is primarily private. When analyzing the effects of specific roads on a stream system, other factors which must also be considered include: road condition, road grade, surfacing, soil type, stream crossing type and number, and condition and placement of drainage structures.

D. Maintenance and Restoration Priority Value Ratings

Each drainage was rated based on its aggregate overall priority for maintenance and restoration treatments of some type within the next five years. These are summarized below and in Appendix A - Table S-A-1. See also Maps 30 through 38.

1. Allen Gulch: High

The streams in this area have water quality issues such as flow modifications, high sediment input, road impacts to streams, and critical coho habitat. The area also has possible Resource Natural Area (RNA) potential, survey and manage species, matrix lands, and late-successional tanoak forest. Cultural resource and recreation values are also high.

2. Bybee Gulch: Low

Although this area is critical coho habitat and has significant road impacts to streams, it has good water quality and the need to maintain that is high. There is very little mature and old growth forest habitat.

3. Cedar Gulch: Low

This is a small, isolated parcel with difficult access. Roads moderately impact streams and water quality. There is very little mature and old growth forest habitat.

4. Chapman Creek: High

This drainage contains two large Matrix parcels (280 acres and 94 acres) of older forest. There is also a high potential and need for restoration in water quality, fish habitat and road impacts to streams. This area is a lower priority for cultural and recreation values.

5. Chicago Creek: Low

This drainage contains old growth stands that have a low priority for treatment or restoration but high priority for maintenance. Critical fish habitat does not exist within Chicago Creek. The area has the highest potential for mass failure and has high road densities. Cultural resource values are also low.

6. Dunn Creek: High

Recreation values are high as well as biological values. This area contains low elevation old growth, black oak savannas, matrix lands with significant silvicultural needs, and critical coho habitat. There is high restorative potential for water temperature.

7. East Fork Illinois below Chapman Creek: Low

This area has water quality concerns and is critical fish habitat, but contains little federal land, resulting in the low priority.

8. Lower East Fork Illinois River: High

A portion of the French Flat Area or Critical Ecological Concern is within this drainage. It is otherwise allocated to matrix, has water quality issues, and is critical fish habitat.

9. East Fork Illinois, Scotch Gulch to Dunn Creek: Moderate

Cultural and recreation values are high. Most of the BLM lands in the matrix land allocation are not in the timber base. There is high restorative potential for water quality and critical fish habitat. The area is not very accessible due to private land.

10. East Fork Illinois, Bybee Gulch to Chicago Creek: Moderate

Recreation, cultural, and biological values are all moderate.

11. Upper East Fork: Unresolved

This area has high recreation value (Wilderness area), moderate terrestrial ecosystem value for restoration (high value for maintenance) and low value for restorative work in fisheries and hydrology.

12. Elder Creek: High

This area has high biological value and need for restoration treatments. It contains low elevation old growth, serpentine communities, including rare plants and Jeffery pine savannas. Streams rate highly for restoration work in fisheries and hydrology. The federal land allocation contains matrix.

13. Kelly Creek: Moderate

Although this area contains critical coho habitat and spawning reaches and has high restorative potential for water quality, it is mostly in private ownership. The federal land allocation contains matrix.

14. Khoeery Creek: High

This drainage contains low elevation old growth, serpentine communities, including rare plants and Jeffery pine savannas. Road impacts to streams are considerable and the area contains coho habitat. Old growth stands occur on BLM and adjacent FS lands. However, this watershed is mostly in private ownership.

15. Little Elder Creek: High

Rare plants, Jeffery pine communities, commercial timber, low elevation mature and old growth forest are found here. Critical coho salmon habitat and recreation/cultural values add to the area's priority status. The federal land allocation contains matrix. Cultural resource values are high and recreation values, moderate.

16. Long Gulch: High

Although recreation, cultural, and terrestrial ecosystem concerns are low, fisheries and hydrology values and needs for restoration treatments are high, given the occurrence of slides, past wildfire, road impacts and associated effects on water quality.

17. Page Creek: High

Cultural resource and recreation values and concerns are high. Old growth, meadows and black oak savannas result in high terrestrial value and critical coho salmon habitat is also found here.

18. Sanger Creek: Unresolved

This watershed is adjacent to the Siskiyou Wilderness and recreation values are very high. However, biological restoration needs are low; a goal for this area is maintenance of old growth, large wood delivery potential and water quality values.

19. Scotch Gulch: High

This area has very high cultural resource value for both FS and BLM. Maintenance of the current large wood delivery potential is of high priority. Water quality values and need for restoration are high, as are fish habitat maintenance needs. Terrestrial values are also high (Del Norte salamander habitat, a proposed RNA, rare plants, and unique serpentine habitat The federal land allocation contains matrix.

20. Tycer Creek: Moderate

This drainage is mostly privately owned but contains a small amount of federal matrix land. The drainage has high fisheries values and a high need for improving water quality. Terrestrial values are moderate. Cultural and recreation values are low.

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Appendix A: Resource Value Maintenance and Restoration Ratings

Table S-A-1: Resource Value Maintenance and Restoration Ratings										
Drainage Analysis Area	Critical Fish Habitat [1]	Cultural Resources [1]	Fire Hazard [1]	Forest Products [1]	Old Growth [1]	Large Wood Delivery Potential [1]	Rare Plants [1]	Recreation [1]	Savannas and Grass/forb Habitats [1]	Water Quality F=Flow T=Temp C=Clarity and Roadlessness [1]
Allen Gulch	L / H	H / H	H / H	H / H	H / H	L / L	H / H	H / H	L / H	L / H
Bybee Gulch	H / L	M / L	L / L	NA [1]	L / H	M / M		L / L	L / H	H / L C=H / H
Cedar Gulch	H / L	H / L	H / H	L / H	L / M	L / H		L / L	L / H	M / M
Chapman Creek	M / H	M / L	M / M	H / H	H / H	M / M	L / L	L / L	L / M	F=M / M T=M / H C=L / H
Chicago Creek	H / L	L / L	L / L	NA		L / H		H / M	L / M	F=H / L T=M / M C=L / H
Dunn Creek	H / H	H / L	H / H (by Sunstar)	H / H	M / H	M / M		H / H	L / H	F=M / M T=L / H C=M / M
East Fork below Chapman	L / H	L / L	M / M	H / H	H / H	L / L	L / L	L / L	L / L	L / H
Lower EF Illinois	L / H	H / L	H / H	H / H	H / H	L / L	H / H	M / L	M / M	L / H
East Fork; Scotch to Dunn	L / H	M / L	H / H	L / L		L / L		M / L	L / H	L / H
East Fork; Bybee to Chicago	H / L	M / L	L / L	NA		L / L		M / M	L / M	H / L
Upper East Fork	H / L	L / L	L / L	NA	H / L	H / L		H / H	L / M	H / L
Elder Creek	L / H	M / L	M / M	H / H	H / H	M / H		M / L	L / H	M / M C=L / H
Kelly Creek	H / H	L / L	M / M	H / H	H / H	M / M	L / L	L / L	L / L	L / H
Khoeery Creek	H / H	L / L	M / M	H / H	H / H	M / M		M / L	L / H	F=M / M T=M / H C=L / H

Table S-A-1: Resource Value Maintenance and Restoration Ratings										
Drainage Analysis Area	Critical Fish Habitat [1]	Cultural Resources [1]	Fire Hazard [1]	Forest Products [1]	Old Growth [1]	Large Wood Delivery Potential [1]	Rare Plants [1]	Recreation [1]	Savannas and Grass/forb Habitats [1]	Water Quality F=Flow T=Temp C=Clarity and Roadlessness [1]
Little Elder Creek	M / H	H / L	H / H	H / H	H / H	M / M	M / M	M / L	L / H M / M	M / M C=L / H
Long Gulch	L / H	M / L	H / H	NA	L / H	L / H		L / L	L / H	L / H
Page Creek	M / H	H / M	H / H	H / M	H / H	M / M		H / H	L / H	L / H C=L / M
Sanger Creek	H / L	L / L	L / L	NA	H / M	H / L		H / H	L / M	H / L
Scotch Gulch	H / M	H / H	H / H	M / M	L / H L / M	H / M	H / H	H / H	L / H M / H	L / H C=M / M
Tycer Creek	H / H	L / L	M / H	H / H	M / H	M / M	L / L	L / L	L / M	F=M / M T=L / H C=L / H

1. The first letter pertains to the priority of the need for maintenance of existing values. The second pertains to the priority for the need for restoration or improvement of the existing condition.
2. Late-Successional Reserves are not rated for their timber value; timber harvesting is not programmed to occur there.
3. Blank cells indicate unknown value.

Appendix B: Drainage Analysis Area Attribute Ranking

The different drainage area attributes that affect riparian conditions for tributaries to the East Fork Illinois River watershed are summarized in the following table. For convenience of making comparisons, the drainages are arranged into three "levels" based on the value of each attribute. Drainage rankings are independent of each other.

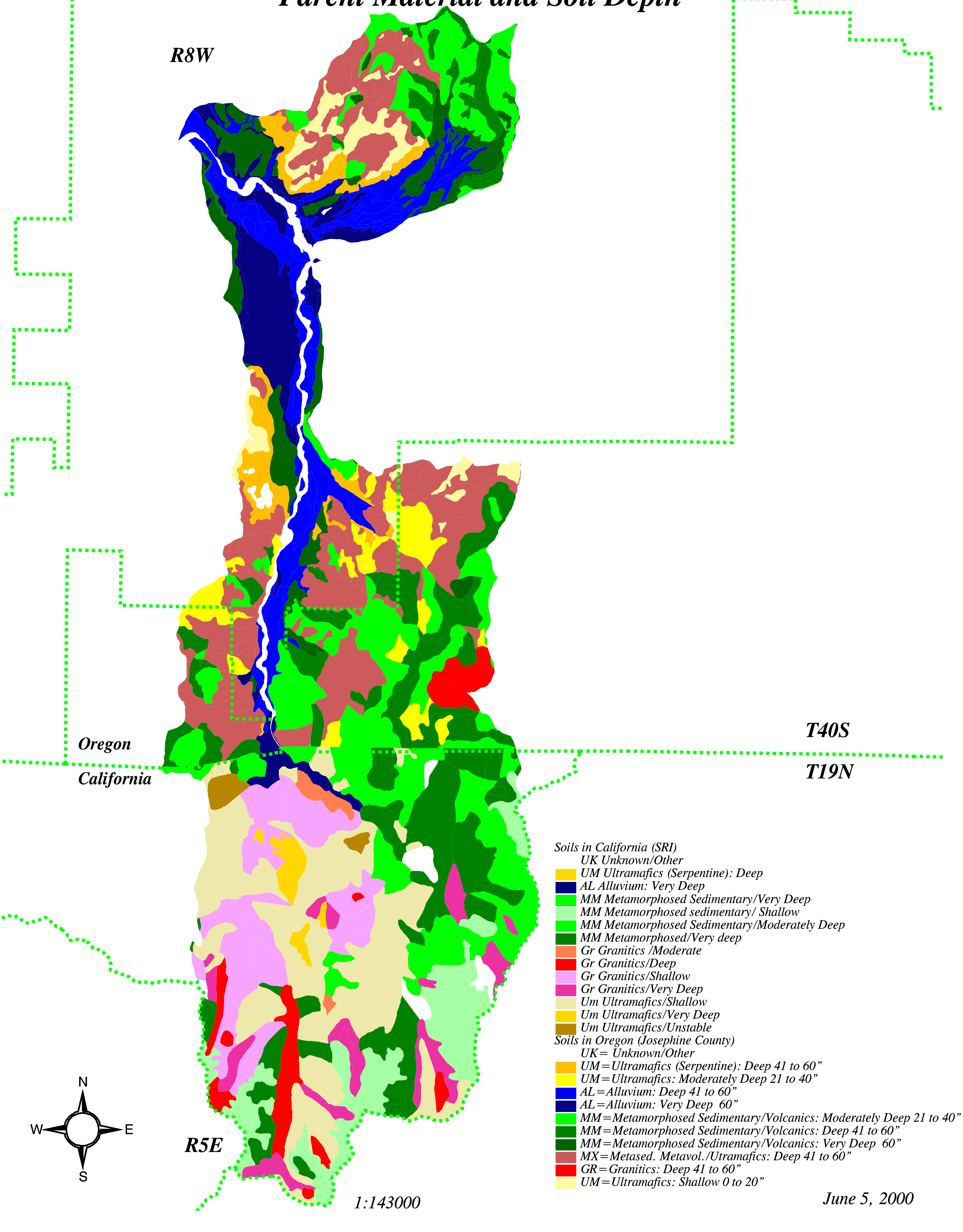
Table S-B-1: Drainage Analysis Area Attribute Ranking
(From Aquatic Module Table A-2)

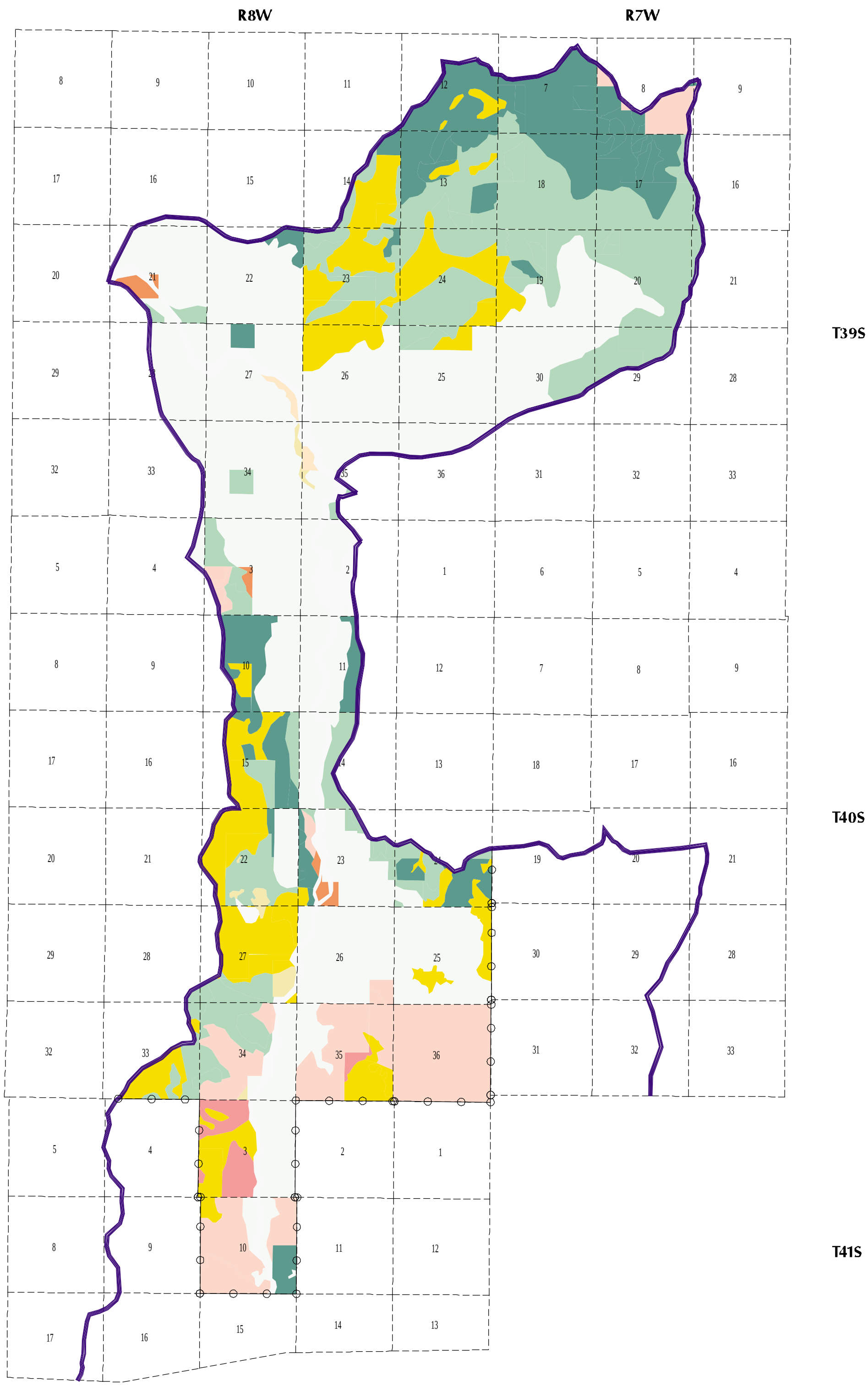
Attribute	Higher levels	Middle	Lower levels
Watershed Area (mi^2)	Dunn Creek 25.8 Lower East Fork Illinois 8.45 Upper East Fork Illinois 7.5 Elder Creek 6.1 Kelly Creek 4.16 Chapman Gulch 3.97 EF Ill. (Bybee–Chicago) 3.80	Tycer Creek 3.73 Little Elder Creek 3.56 EF Illinois below Chapman 3.55 Page Creek 3.39 EF Illinois (Scotch - Dunn) 2.32 Khoeery Creek 2.68	Bybee Gulch 0.64 Cedar Gulch 1.14 Scotch Gulch 1.56 Long Gulch 1.64 Sanger Canyon 1.78 Allen Gulch 2.05 Chicago Creek 2.13
Stream Density (mi / mi^2)	Page Creek 7.5 Scotch Gulch 6.5 Tycer Creek 6.1 Cedar Gulch 5.7 EF Ill. (Scotch – Dunn) 5.7 Elder Creek 5.7 Kelly Creek 5.2	Dunn Creek 5.0 Chicago Creek 4.8 East Fork Ill (Bybee-Chicago)4.8 Long Gulch 4.7 Little Elder Creek 4.7 Chapman Creek 4.7	Lower EF Illinois 2.1 EF Ill. below Chapman. 3.0 Allen Gulch 3.4 Bybee Gulch 3.6 Khoeery Creek 3.8 Sanger Canyon 4.3 Upper East Fork Illinois 4.5
Road Miles w/in Riparian Reserve per stream mile	Allen Gulch 0.54 Khoeery Creek 0.38 Elder Creek 0.29 Long Gulch 0.29 Tycer Creek 0.28 Lower EF Illinois 0.25 Chapman Creek 0.25 Chicago Creek 0.25	East Frk Ill below Chapman 0.24 Cedar Gulch 0.22 Little Elder Creek 0.21 Scotch Gulch 0.21 Kelly Creek 0.20	Bybee Gulch 0 Upper East Fork Illinois 0.03 EF Ill(Bybee–Chicago) 0.05 Sanger Canyon 0.08 Page Creek 0.12 Dunn Creek 0.17 EF Ill. (Scotch - Dunn) 0.19
Road crossings per stream mile	Khoeery Creek 3.14 Tycer Creek 2.66 Allen Gulch 1.71 Kelly Creek 1.56 EF Ill. below Chapman. 1.50 EF Ill. (Scotch – Dunn) 1.50 Chapman Creek 1.47	Lower EF Illinois 1.24 Elder Creek 1.04 Long Gulch 0.91 Little Elder Creek 0.89 Chicago Creek 0.78 Cedar Gulch 0.77	Upper EF Illinois 0.03 EF Ill.(Bybee–Chicago)0.11 Sanger Canyon 0.26 Scotch Gulch 0.30 Bybee Gulch 0.44 Page Creek 0.51 Dunn Creek 0.56
Rd Density [a] (mi / mi^2)	EF Illinois below Chapman. 5.3 Khoeery Creek 5.3 Lower EF Illinois 4.9 EF Ill. (Scotch – Dunn) 4.9 Chapman Creek 4.8 Allen Gulch 4.8 Tycer Creek 4.2	Kelly Creek 3.8 Elder Creek 3.8 Chicago Creek 3.4 EF Ill. (Bybee–Chicago) 2.6 Long Gulch 2.4 Little Elder Creek 2.4	Upper EF Illinois 0.26 Sanger Canyon 0.5 Page Creek 1.2 Cedar Gulch 1.6 Dunn Creek 2.0 Bybee Gulch 2.0 Scotch Gulch 2.2
% RR affected by Mgmt. [b]	Long Gulch 100 Elder Creek 48 Little Elder Creek 43	Cedar Gulch 40 Chicago Creek 38 Scotch Gulch 32 Dunn Creek 31	Upper EF Illinois 5 Sanger Canyon 23 Page Creek 25 Bybee Gulch 25

Attribute	Higher levels	Middle	Lower levels
[c] % RR in Mature to Old Growth seral stage (PMR 1988)	EF Illinois below Chapman 89 Chapman Creek 85 Page Creek 61 Little Elder Creek 54 Kelly Creek 53 Upper EF Illinois 52 Khoeery Creek 52	Elder Creek 44 Dunn Creek 42 Scotch Gulch 42 Allen Gulch 39 Chicago Creek 36 Sanger Canyon 27 Tycer Creek 27	EF Ill. (Scotch – Dunn) 0 Cedar Gulch 7 Bybee Gulch 13 Lower EF Illinois 22
[c] %RR in serpentine / ultramaphic	Khoeery Creek 48 Scotch Gulch 36 Upper EF Illinois 29 Sanger Canyon 27 Bybee Gulch 27 Tycer Creek 23	Dunn Creek 22 Little Elder Creek 20 Elder Creek 16 Chicago Creek 11 Lower EF Illinois 10 Cedar Gulch 5	Kelly Creek 0 EF Illinois below Chapman 0 Allen Gulch 0 EF Ill. (Scotch – Dunn) 0 Chapman Creek 0.5 Page Creek 2
[d] %RR in risk of potential natural failure	Chicago Creek 38 Upper EF Illinois 23		Bybee Gulch 6 Dunn Creek 7 Sanger Canyon 9

[a] Road mileage and densities based on GIS data. Road mileage and density for analysis areas outside National Forest lands were calculated with BLM GIS maps containing BLM and non-BLM roads.
[b] For analysis areas outside National Forest lands, the percent affected by management is a DATAGAP, though much of the areas have been affected by historic mining.
[c] DATAGAP for EF Illinois Bybee to Chicago and for Long Gulch.
[d] Potential natural failure includes RR area in granitics / unstable soil, slopes >55%, and in transient snow zone. No BLM lands exist in this watershed that meets this criteria.

East Fork Illinois Watershed
Parent Material and Soil Depth





SCALE 1:110000

PLANT SERIES
ON LANDS OUTSIDE THE USFS BOUNDARY
IN THE EAST ILLINOIS WATERSHED

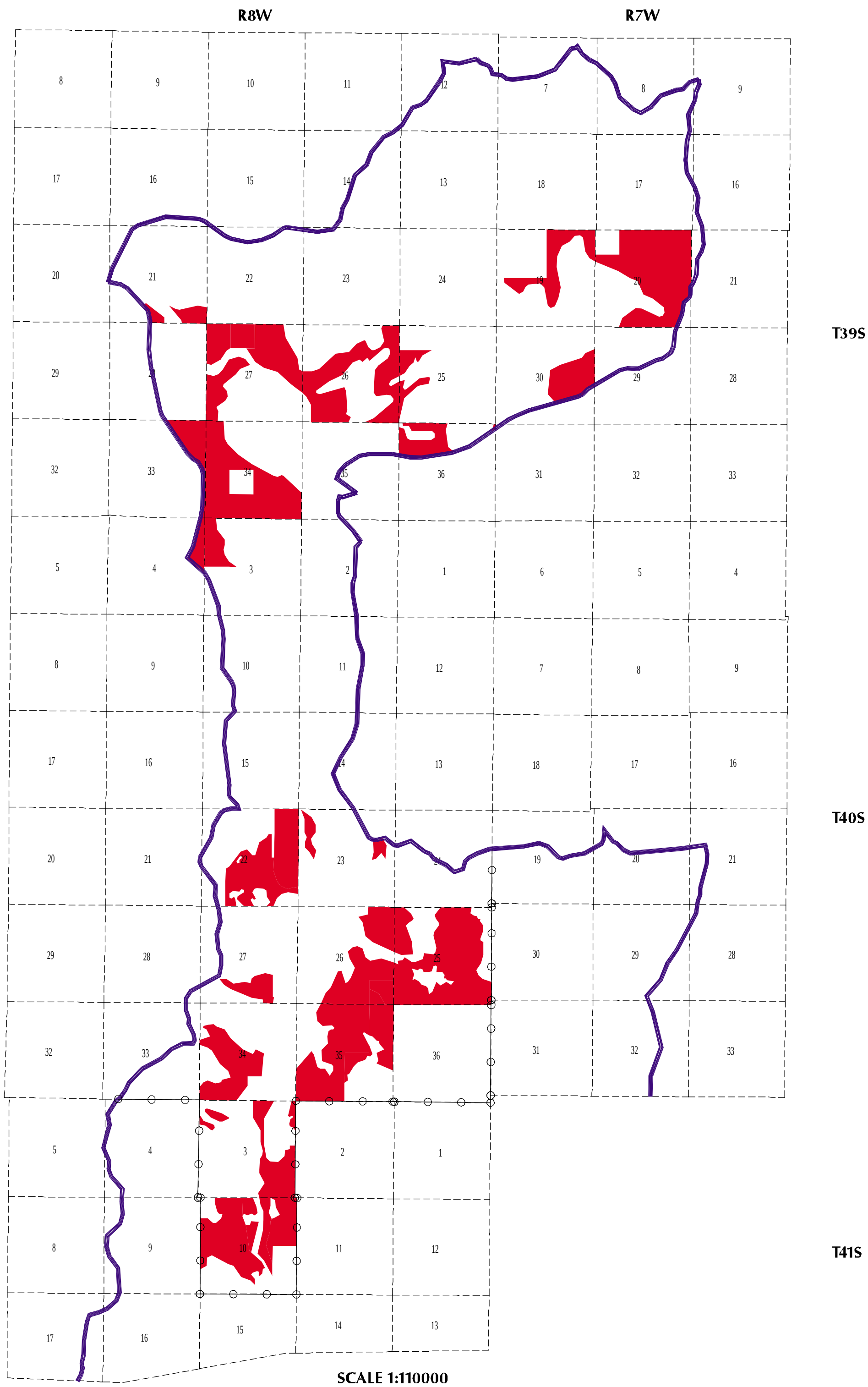
LEGEND

NON-VEG.
NON-FOREST
RIPARIAN HARDWOOD
TANOAK
TANOAK/D.FIR
W.OAK
J.PINE
P.PINE
D.FIR/PINE
D.FIR
WATERSHED BOUNDARY
USFS BOUNDARY

N

August 1999

John McGlothlin



SCALE 1:110000

POTENTIAL HIGH PRIORITY HAZARD REDUCTION TREATMENT AREAS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

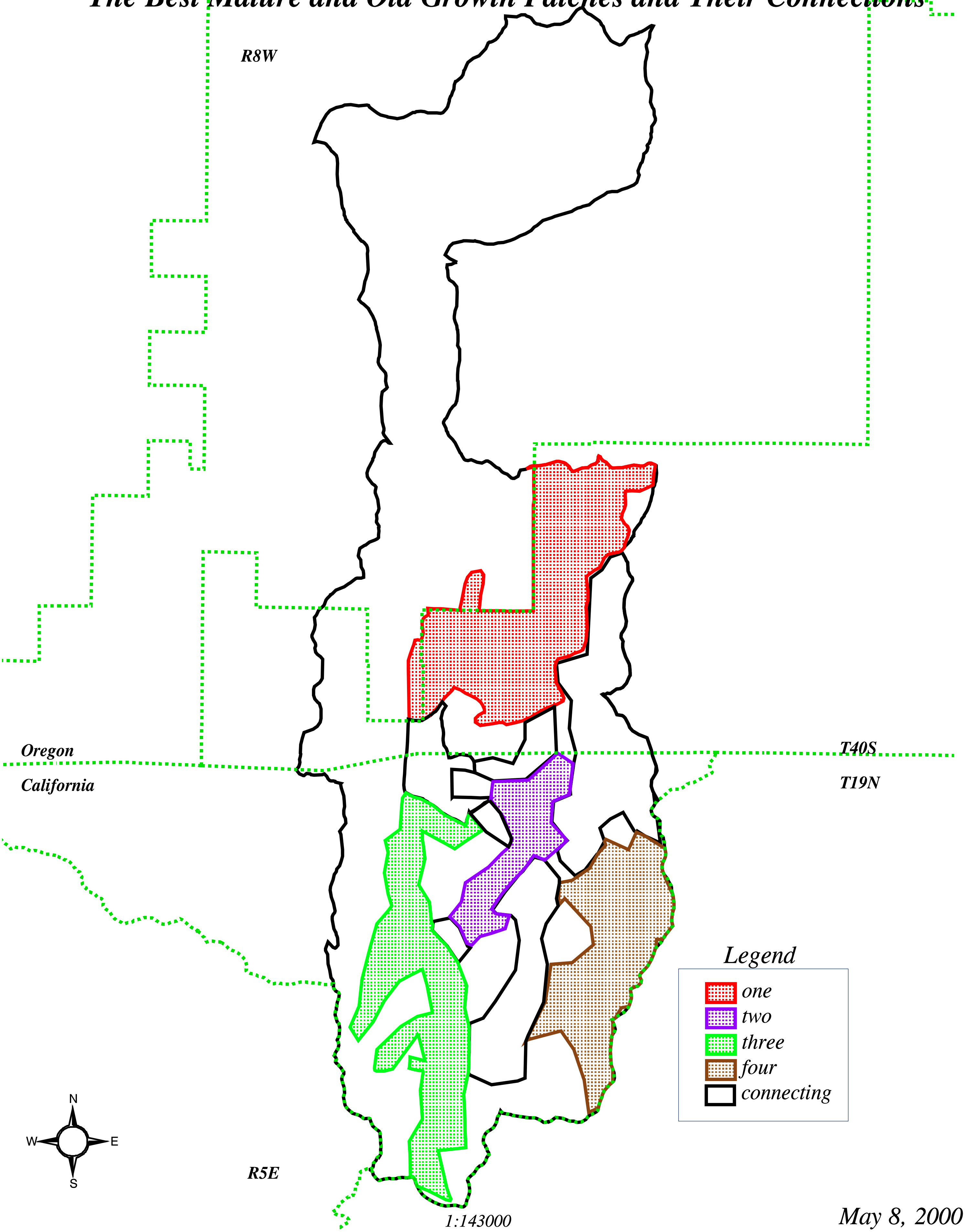
- Areas With High Ratings
- WATERSHED BOUNDARY
- USFS BOUNDARY

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

August 1999

John McGlothlin

East Fork Illinois Watershed
The Best Mature and Old Growth Patches and Their Connections



May 8, 2000

East Fork Illinois Watershed
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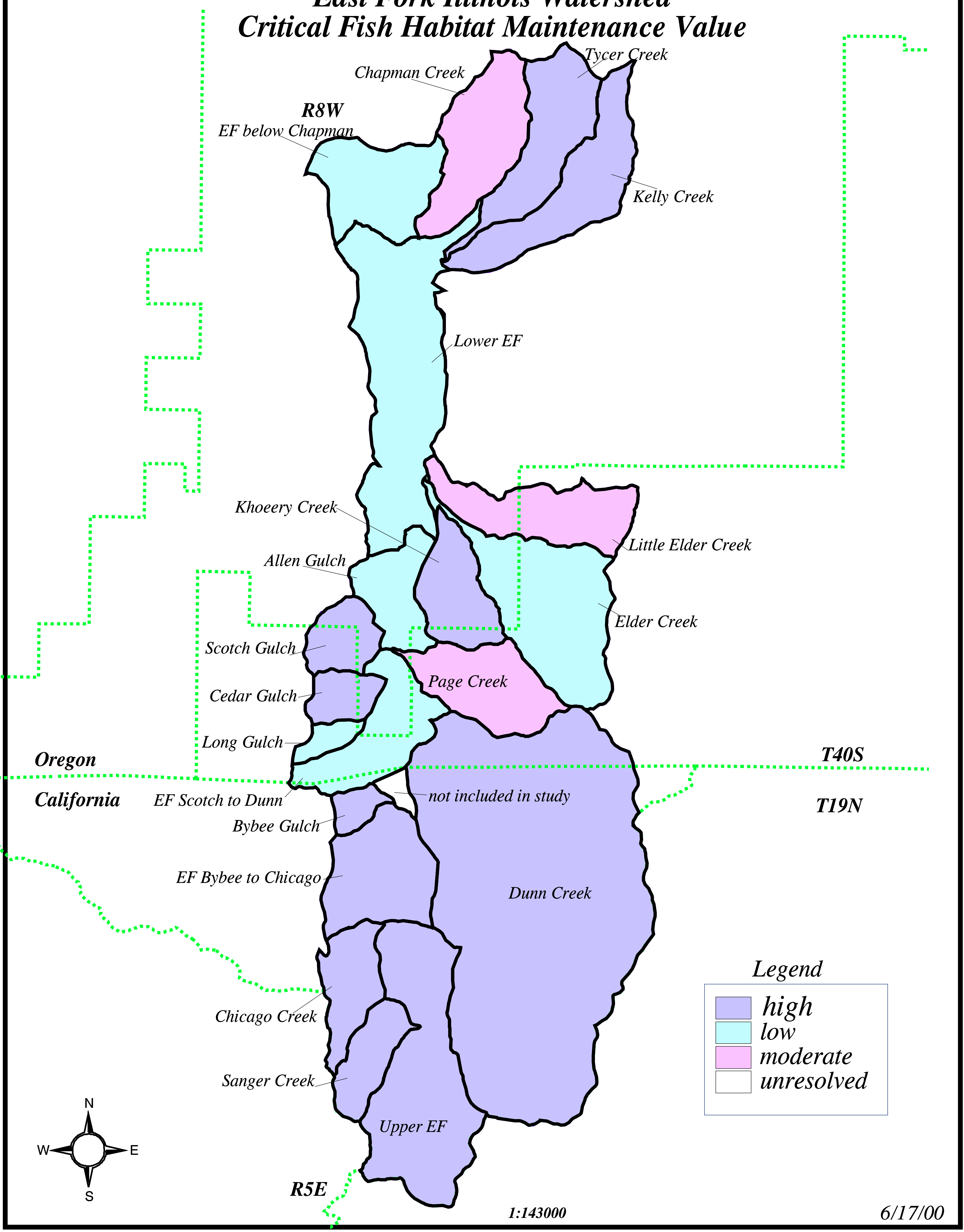

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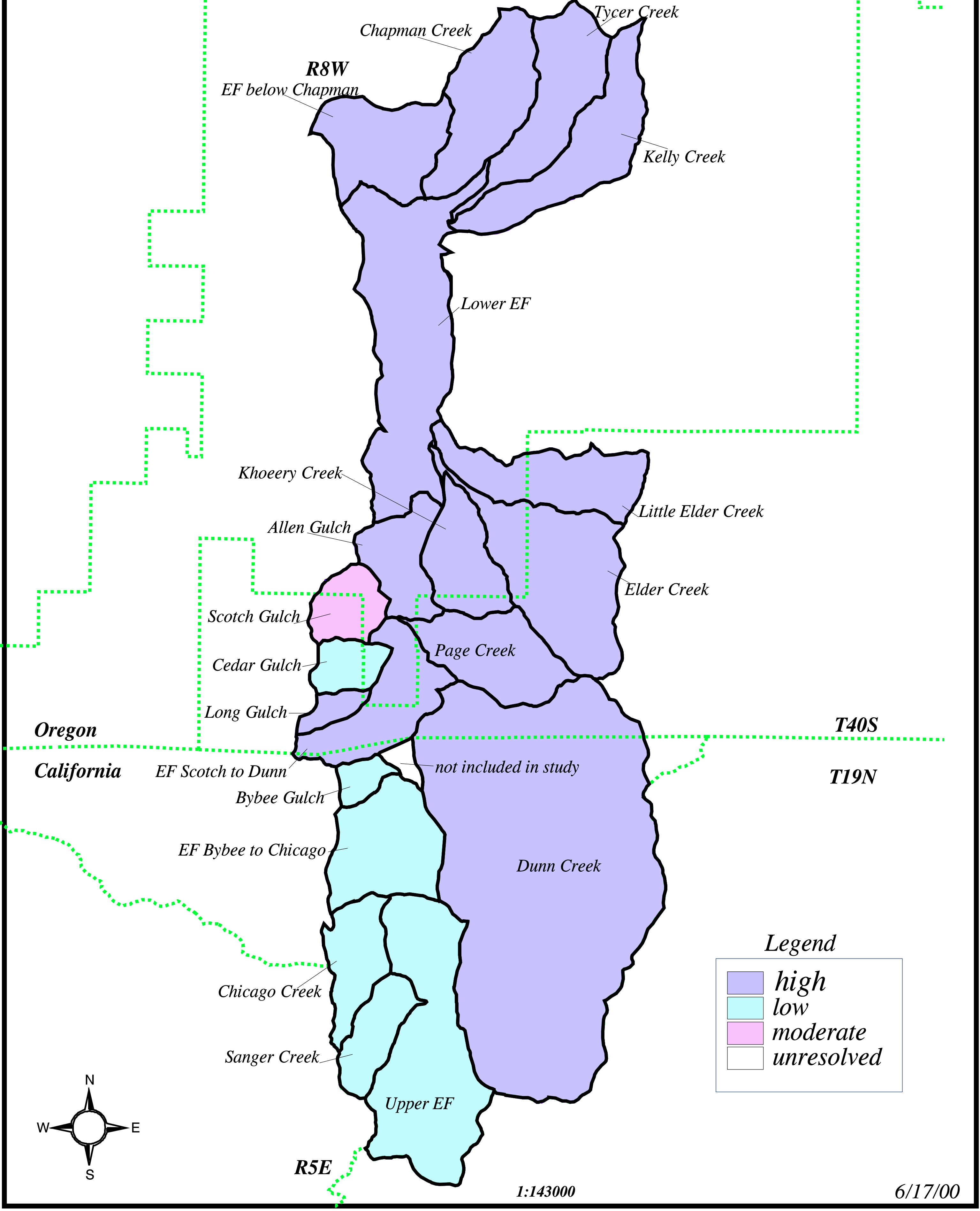

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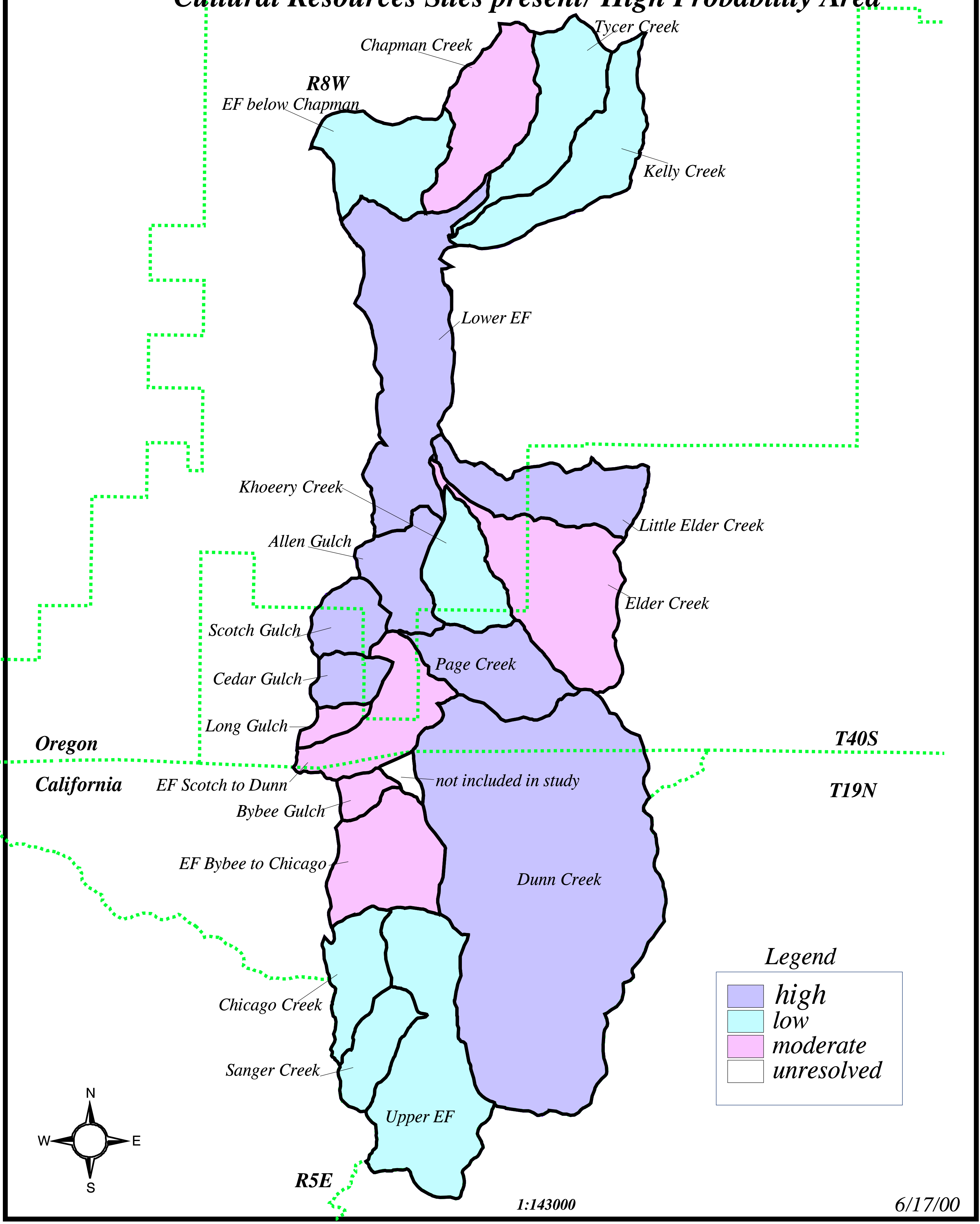
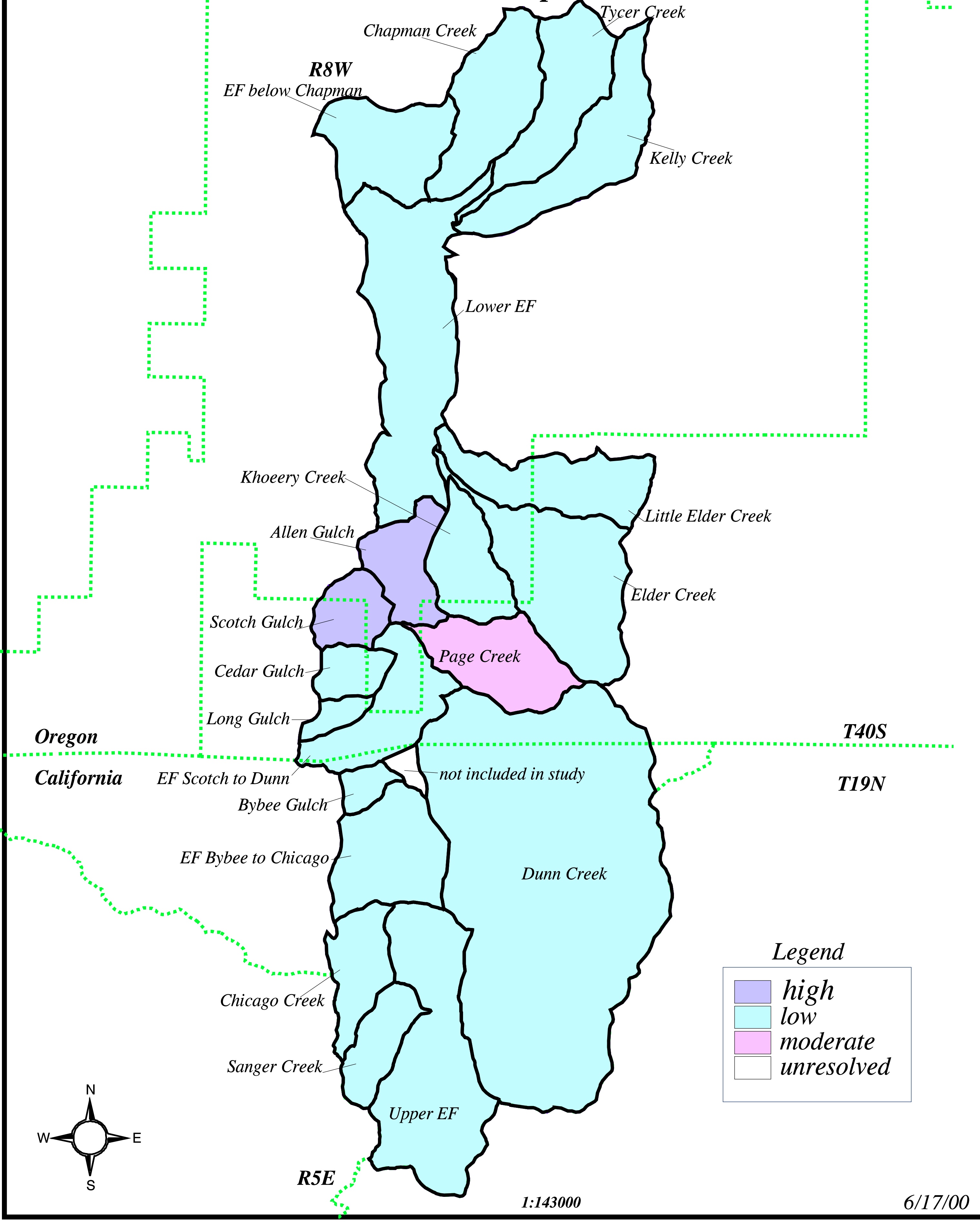
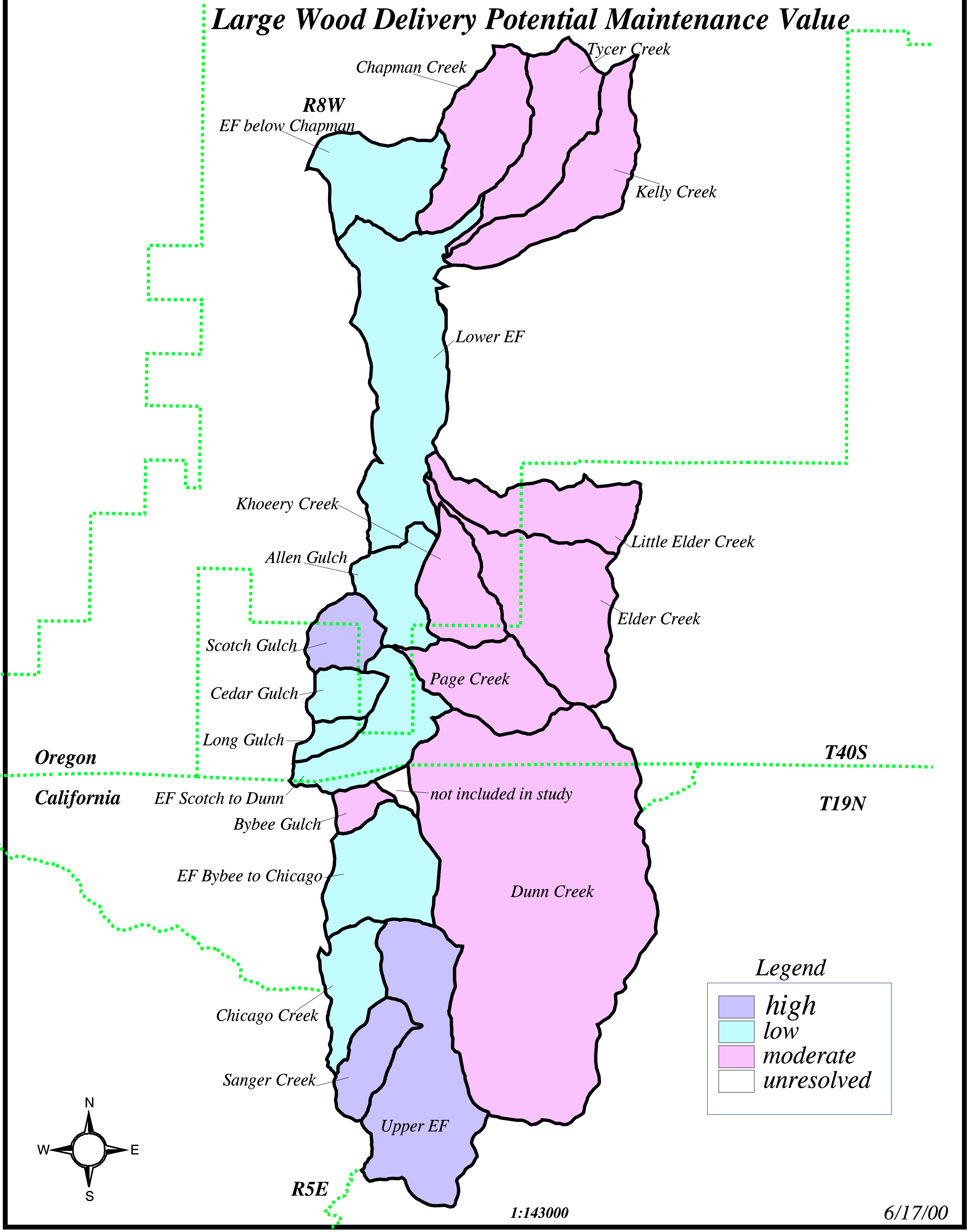
Cultural Resources Sites present/ High Probability Area

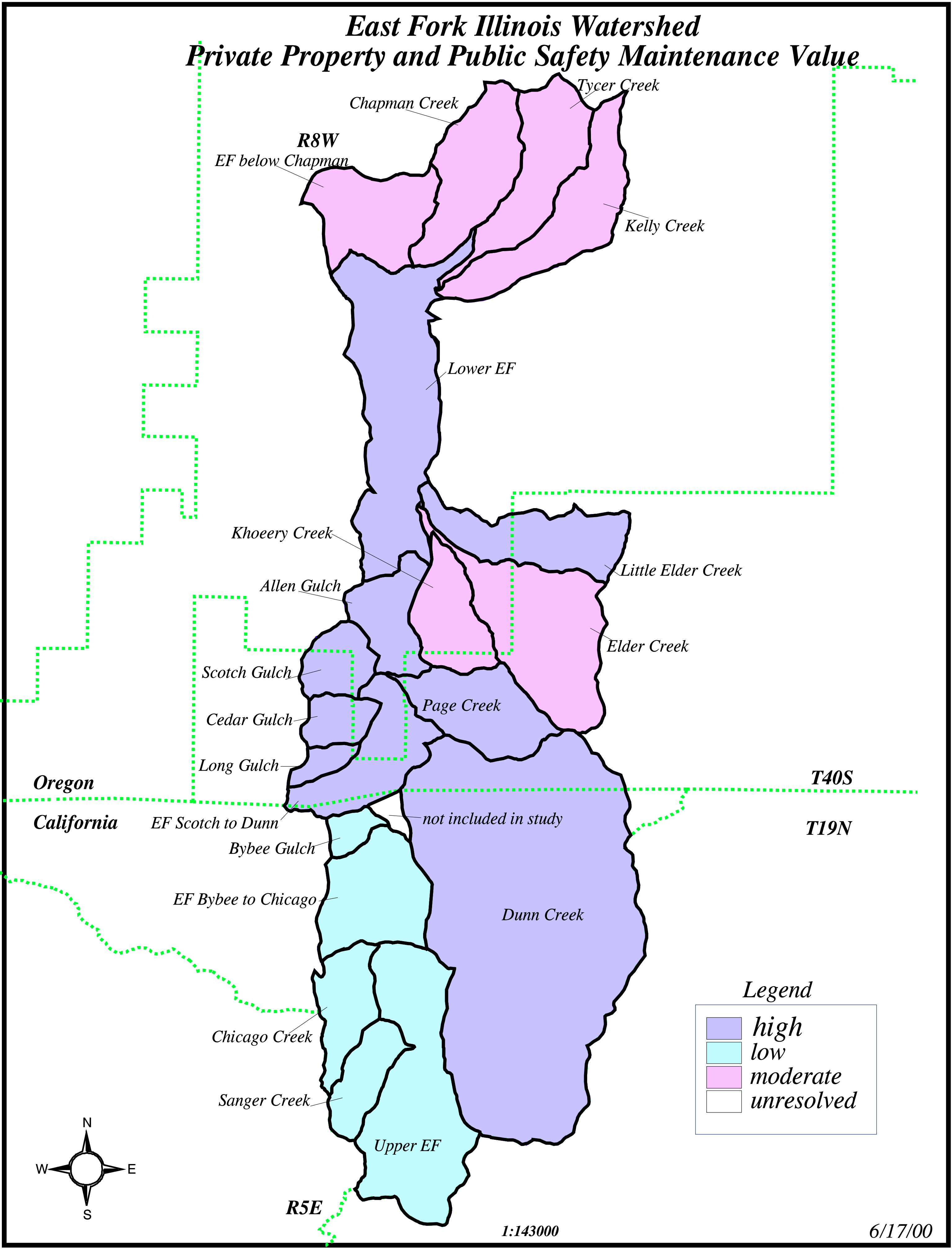


East Fork Illinois Watershed
Cultural Resources Interpretation Value

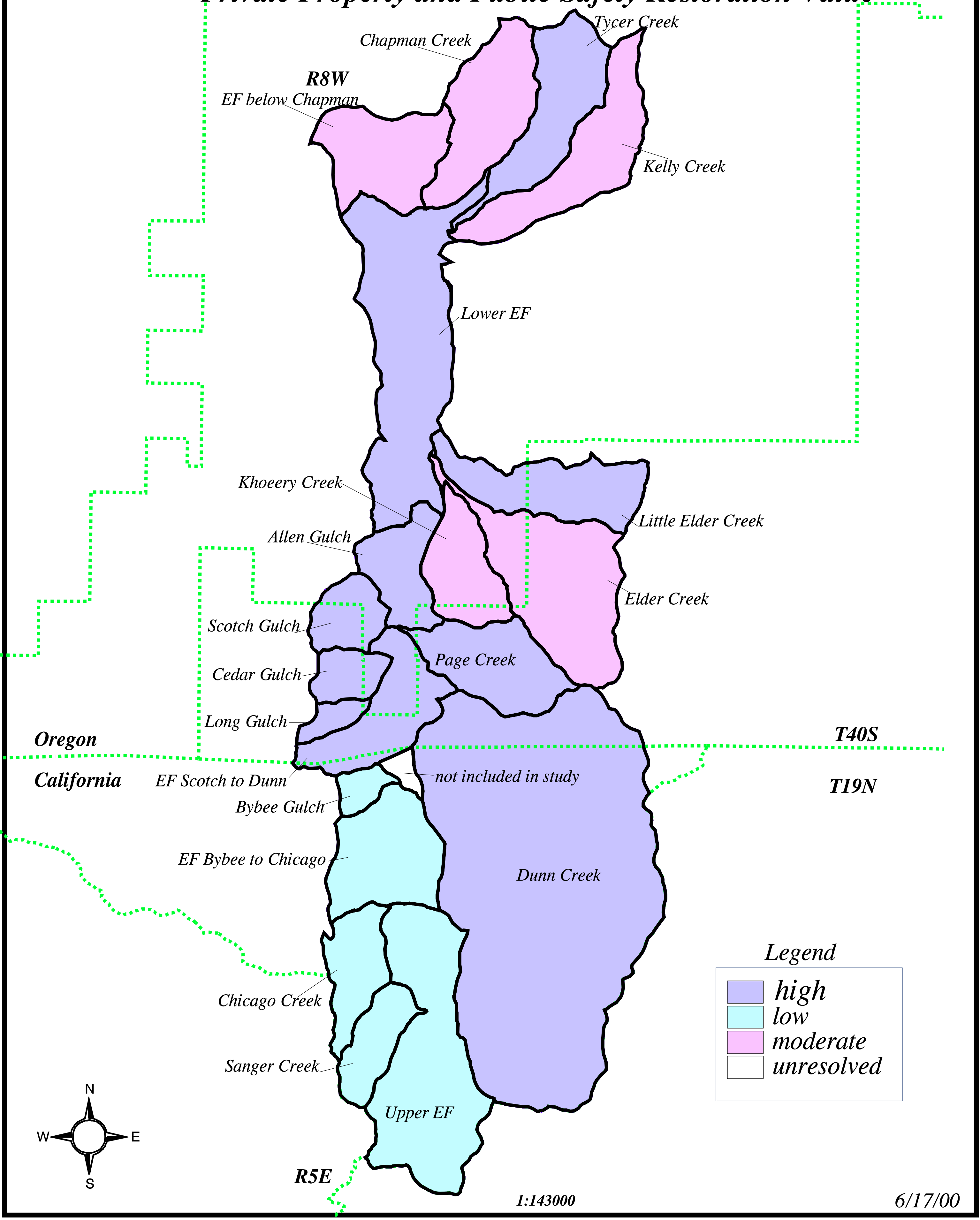


East Fork Illinois Watershed
Large Wood Delivery Potential Maintenance Value




East Fork Illinois Watershed
Private Property and Public Safety Maintenance Value
Tycer Creek
Chapman Creek
R8W
EF below Chapman
Kelly Creek
Lower EF
Khoeery Creek
Little Elder Creek
Allen Gulch
Elder Creek
Scotch Gulch
Page Creek
Cedar Gulch
Long Gulch
Oregon
T40S
California
EF Scotch to Dunn
not included in study
T19N
Bybee Gulch
EF Bybee to Chicago
Dunn Creek
Legend
high
low
moderate
unresolved
Chicago Creek
Sanger Creek
N
W
E
S
Upper EF
R5E
1:143000
6/17/00

East Fork Illinois Watershed
Private Property and Public Safety Restoration Value



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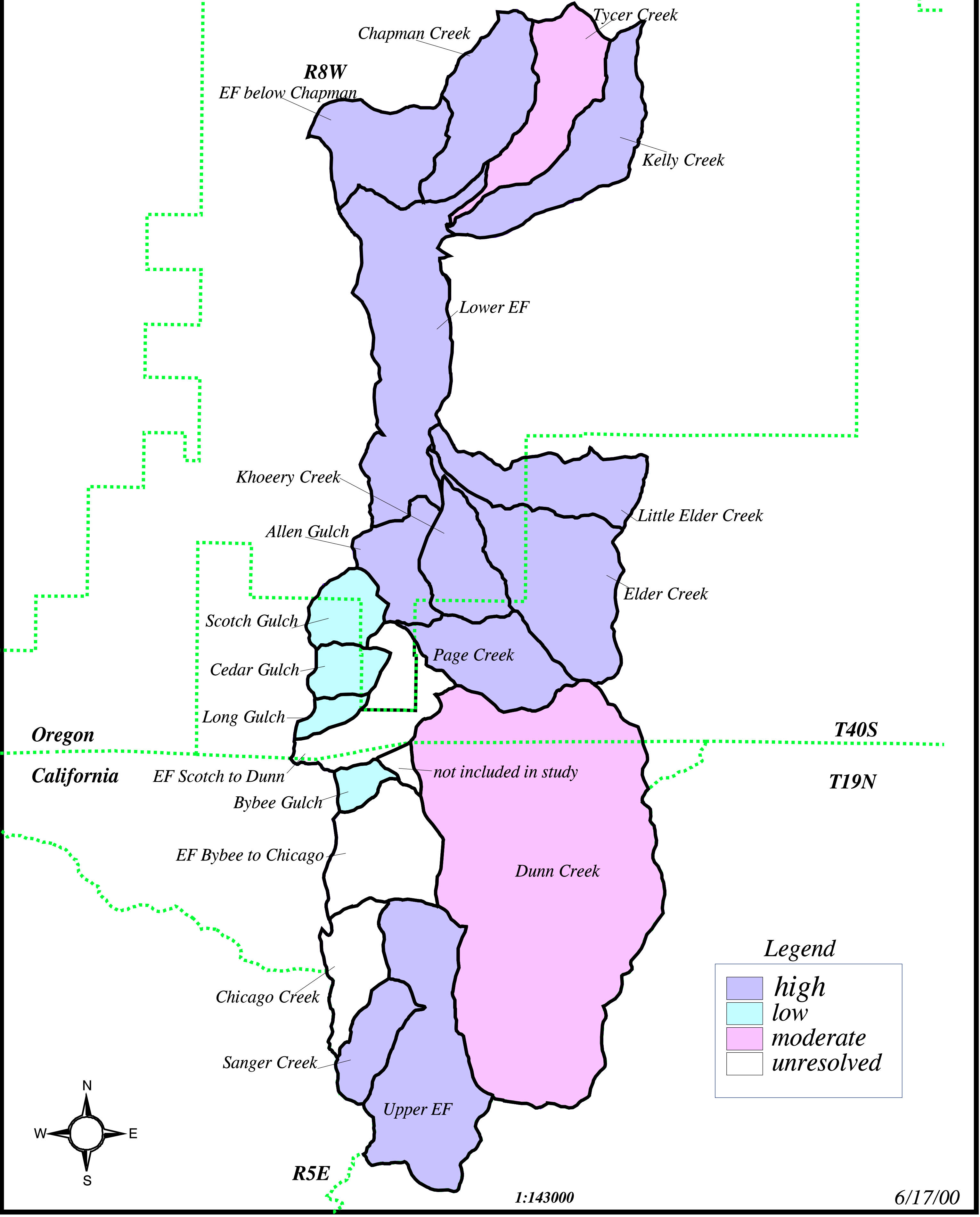

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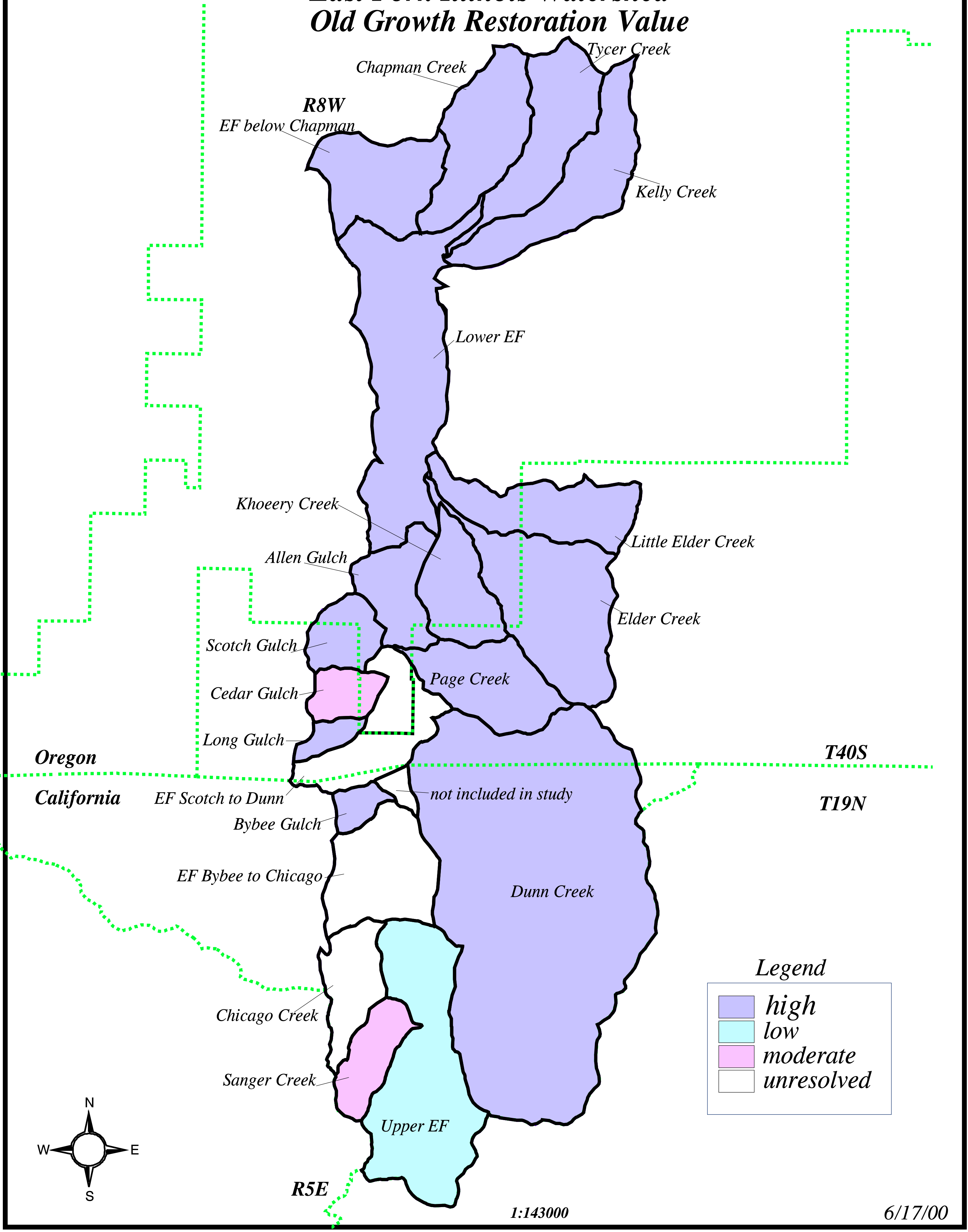
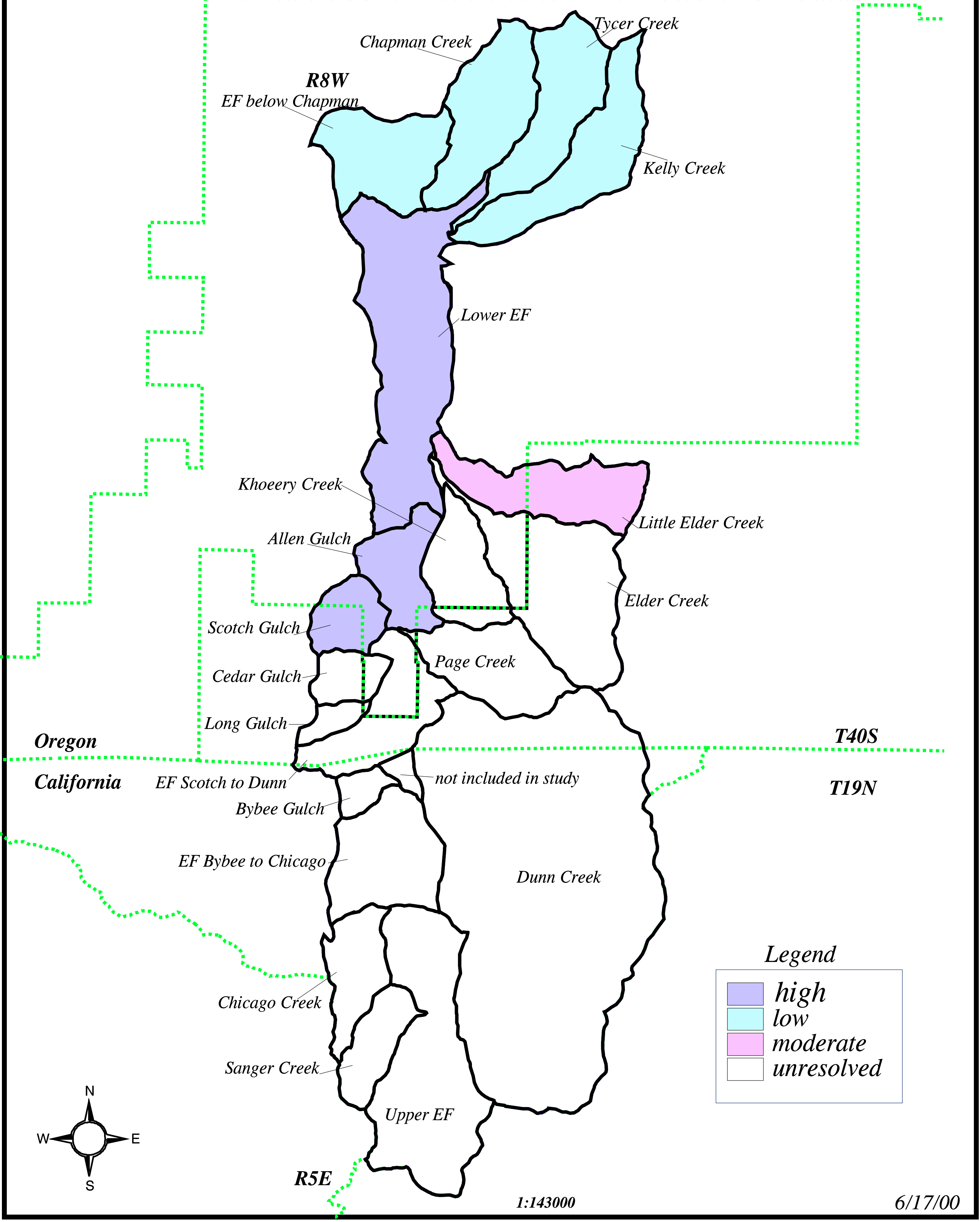
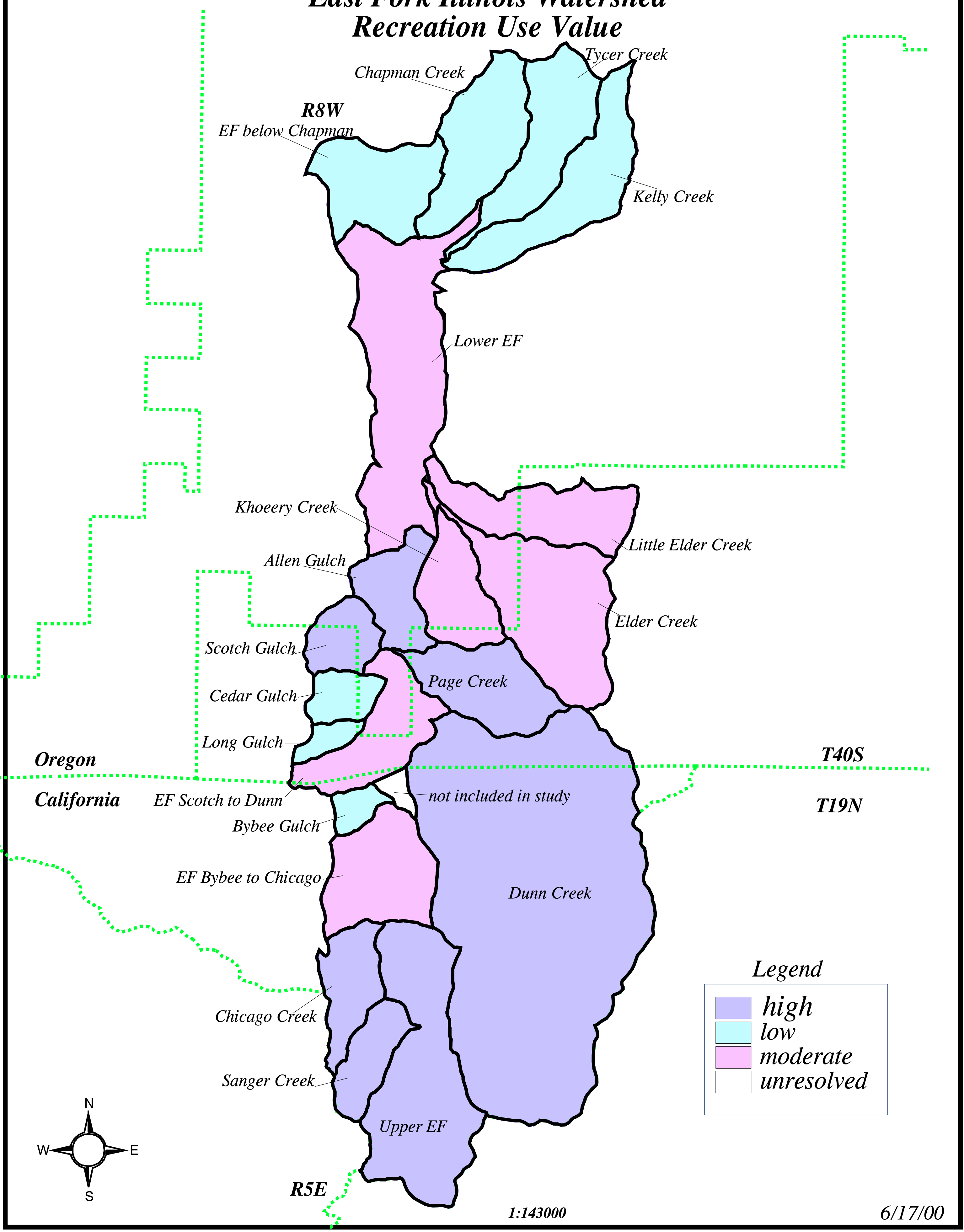


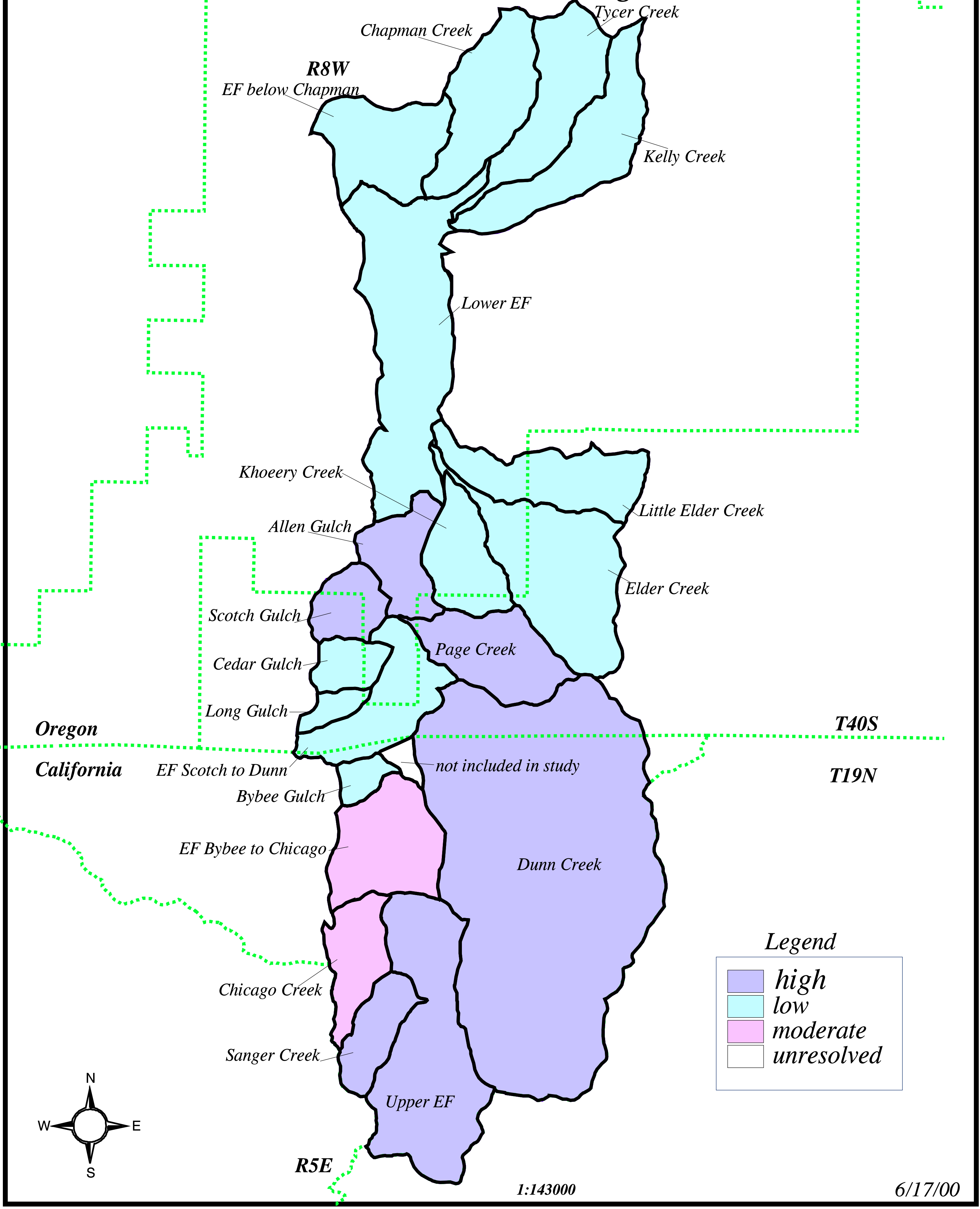
East Fork Illinois Watershed
Rare Plants both Maintenance and Restoration Value



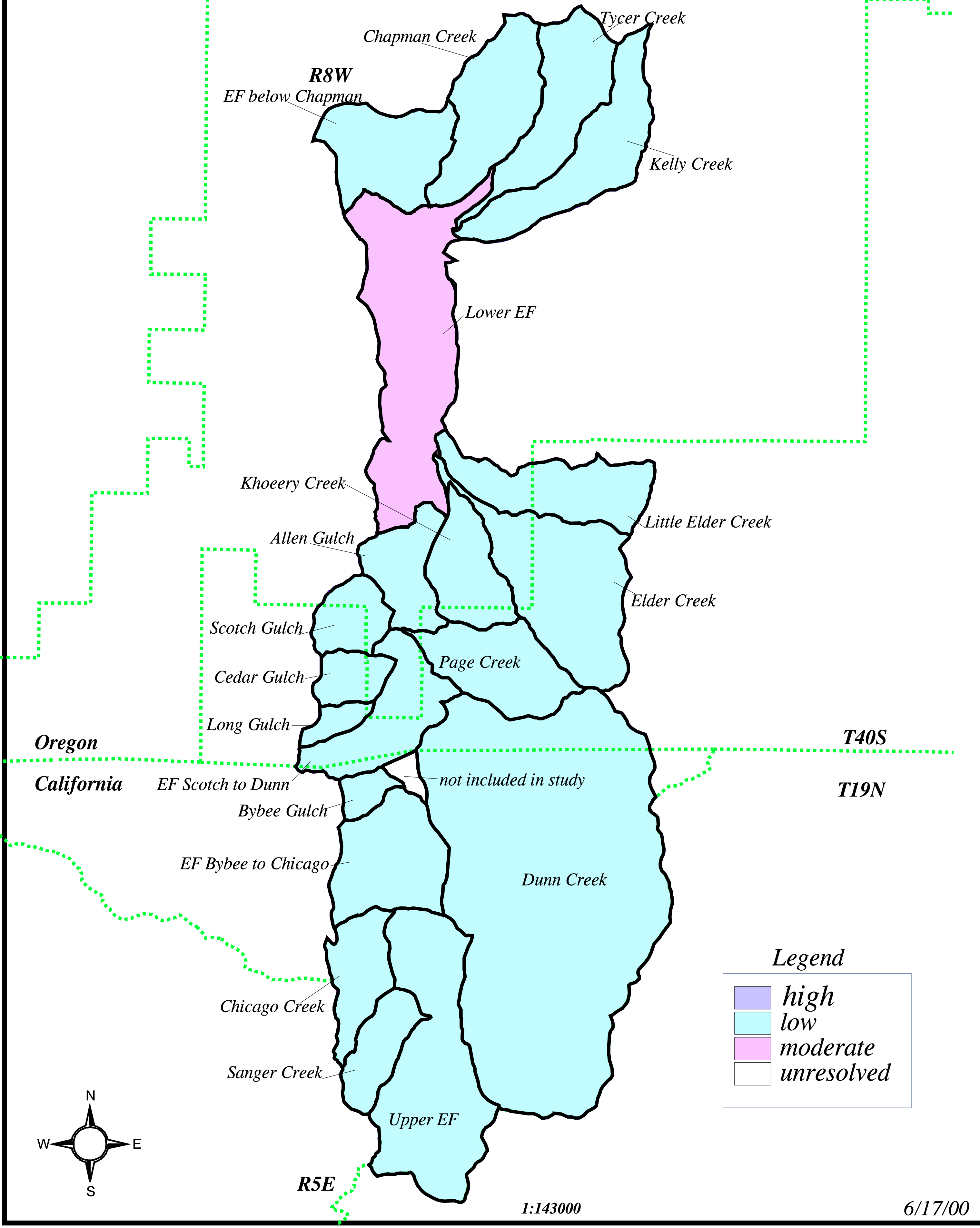
East Fork Illinois Watershed Recreation Use Value



East Fork Illinois Watershed
Recreation Increased Management Value



East Fork Illinois Watershed
Savannas and Grass/Forb Habitats Maintenance Value



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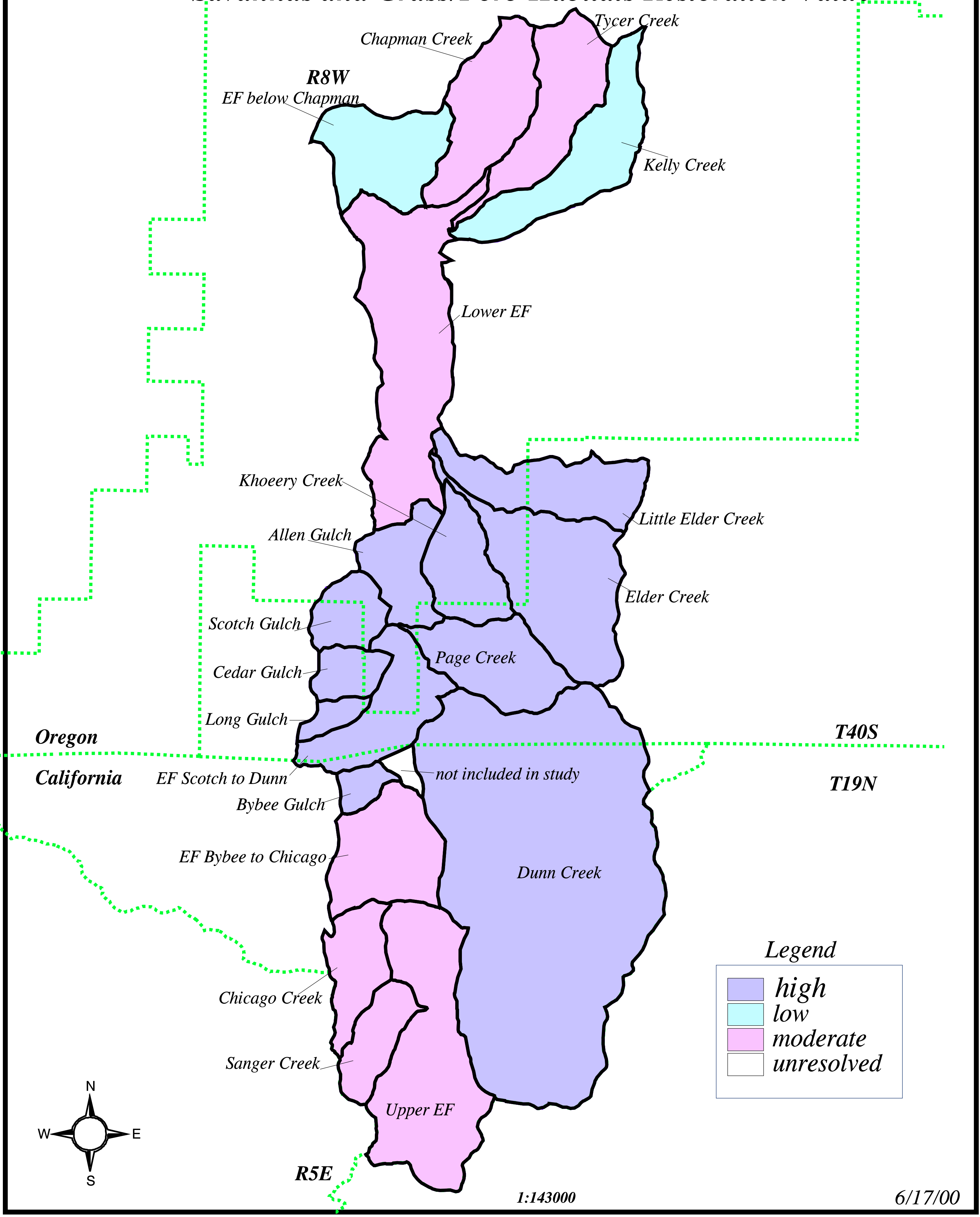
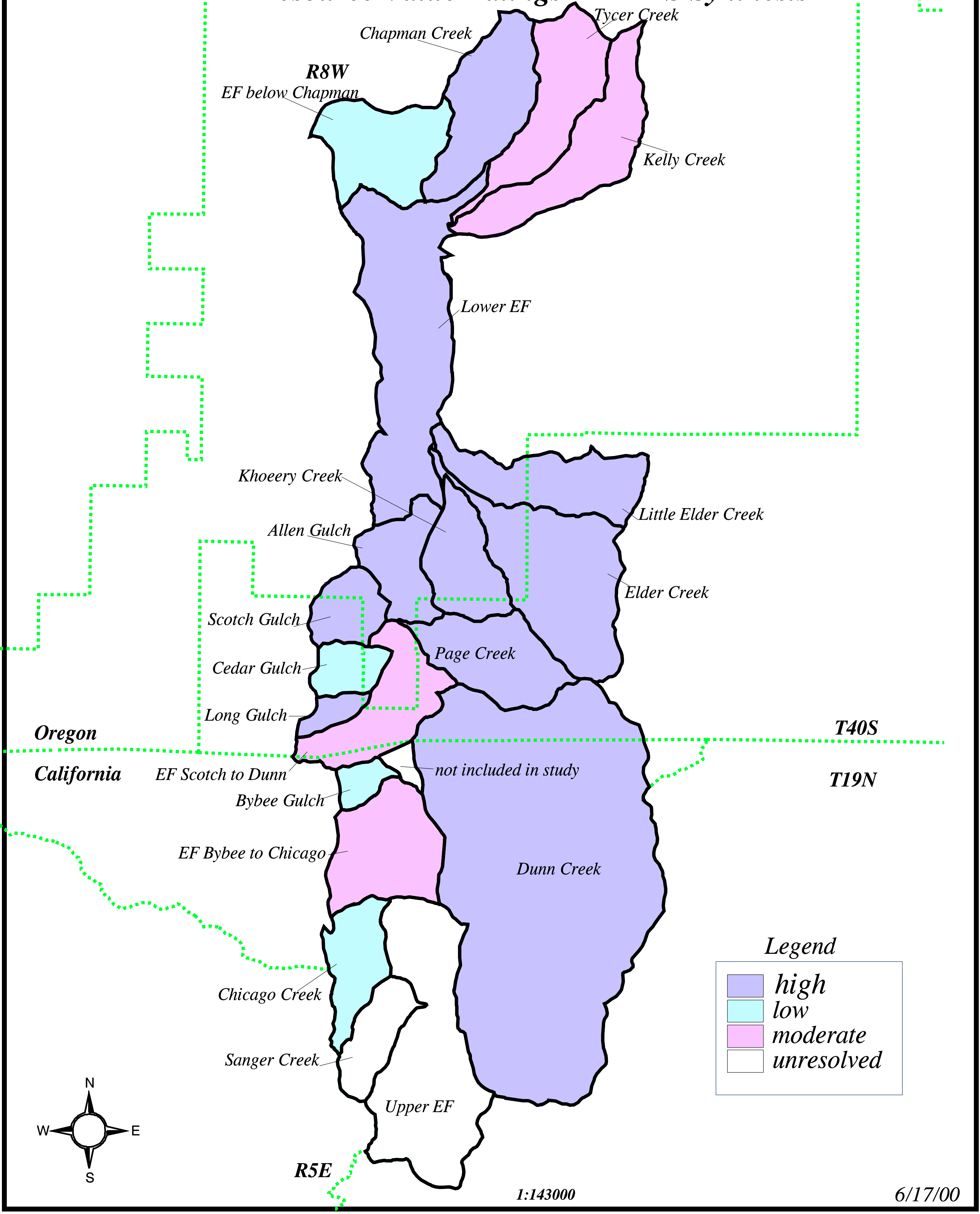
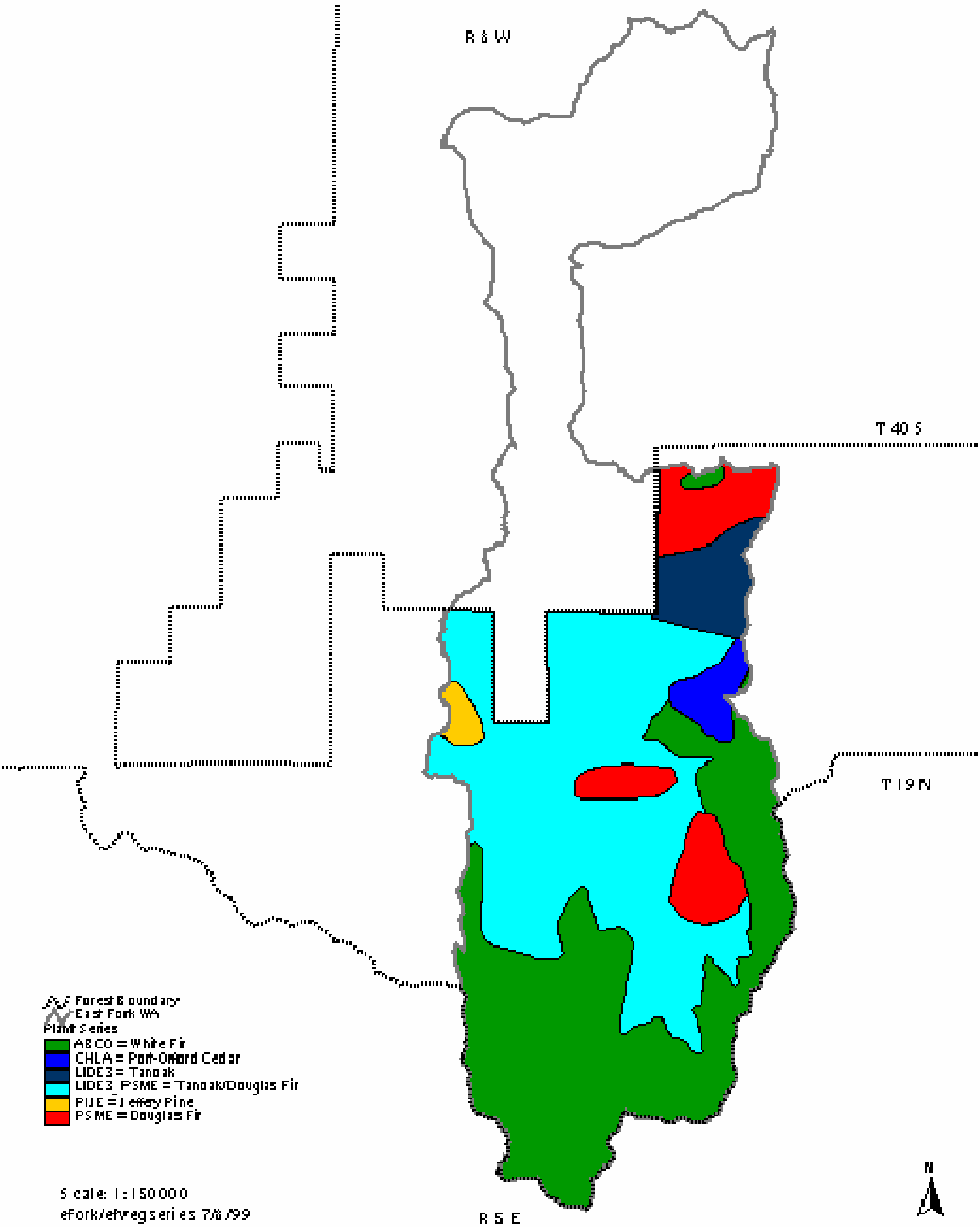
Savannas and Grass/Forb Habitats Restoration Value



East Fork Illinois Watershed Analysis
Resource Value Ratings BLM-FS Synthesis



East Fork Watershed Analysis
Plant Series



EAST FORK OF THE ILLINOIS RIVER

WATERSHED ANALYSIS

MAPS

US FOREST SERVICE
Illinois Valley Ranger District

BUREAU OF LAND MANAGEMENT
Grants Pass Resource Area

JULY 2000

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2 B	Government Ownership	BLM	S-8
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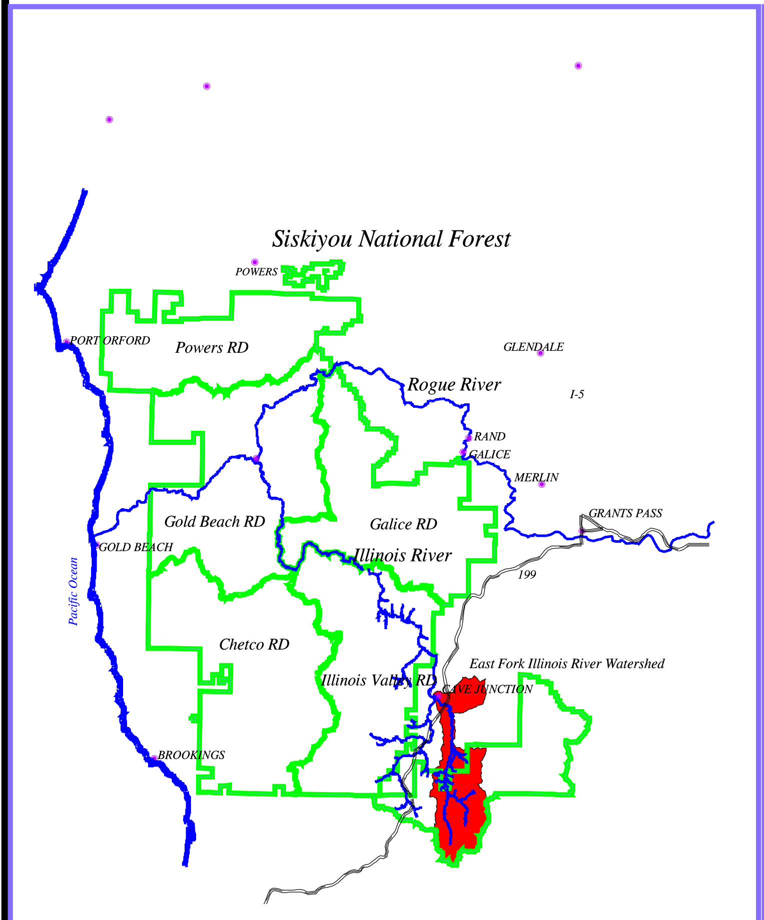
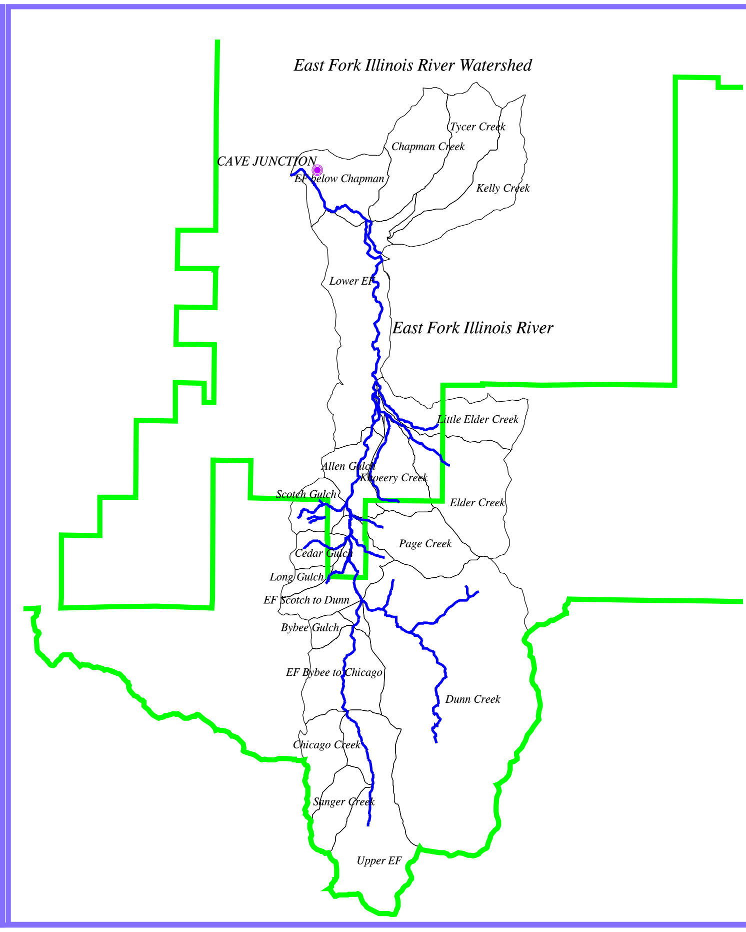
20 A	Wildfire Risk Analysis	FS	T-22, T-70
20 B	Fire Risk Rating	BLM	T-22, T-70
21 A	Fire Hazard Levels	FS	T-6, T-22, T-70
21 B	Fire Hazard Rating	BLM	T-6, T-22, T-70
22	Fire Value Rating	BLM	T-22, T-70

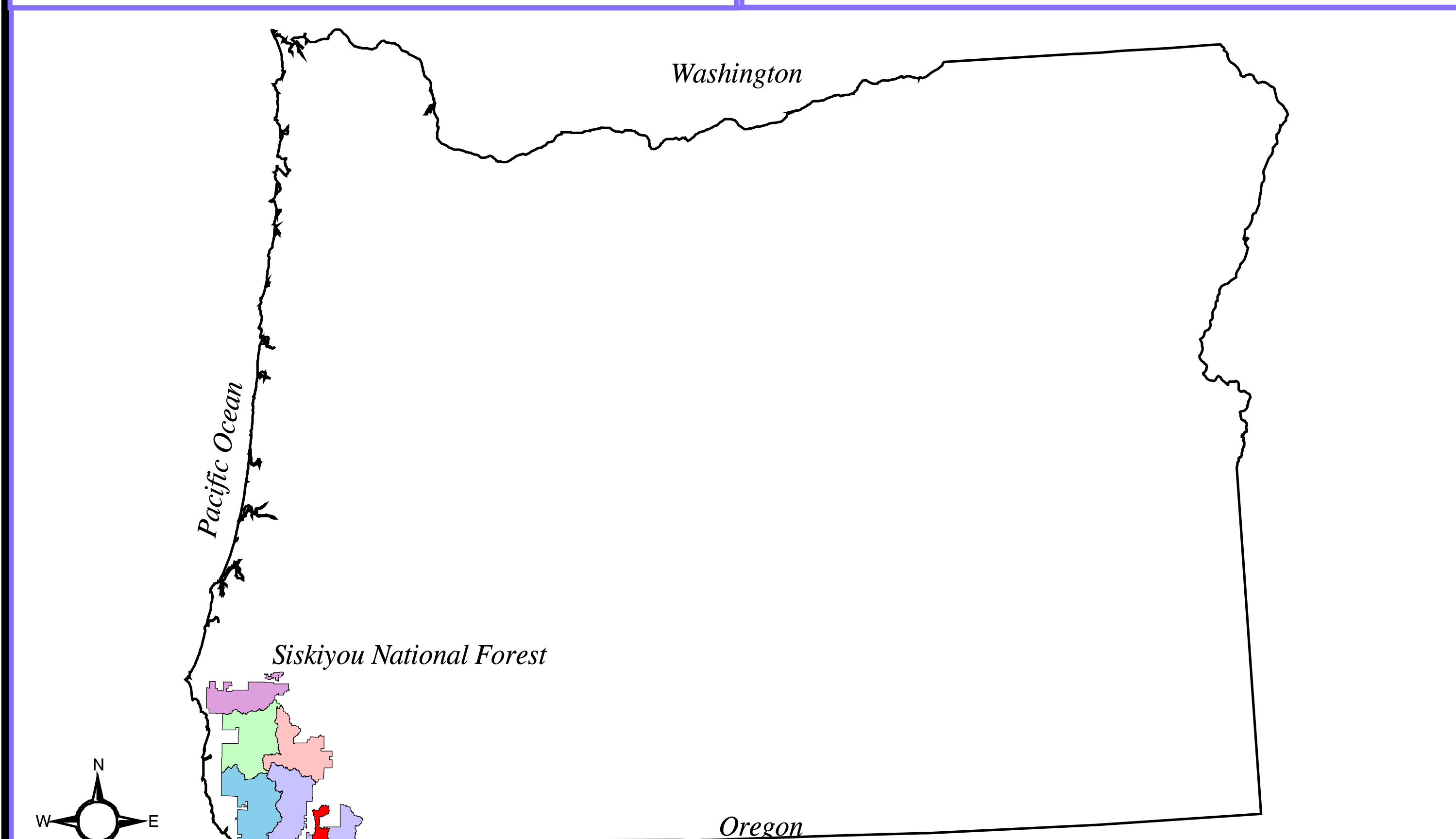
Map Directory: Coverage and Reference

Map #	Map Title	Coverage	Where Referenced
23	Fire History	FS	T-21, T-22
24	Potential High Priority Rating for Hazard Reduction	BLM	T-22
25	Special Wildlife Areas	FS	T-5, T-18
26	Spotted Owl Habitat Rating	BLM	
27	The Best Mature and Old Growth Patches and Their Connections	FS	Ss-5, Ss-6
28	Stream Orders	BLM	A-8
29	Perennial Streams and Fish Distribution	FS & BLM	A-35
30 A	Critical Fish Habitat Maintenance Value	FS & BLM	Ss-1
30 B	Critical Fish Habitat Restoration Value	FS & BLM	Ss-1
31 A	Cultural Resources Sites Present / High Probability Area	FS & BLM	Ss-1
31 B	Cultural Resources Interpretation Value	FS & BLM	Ss-1
32	Large Wood Delivery Potential Maintenance Value	FS & BLM	Ss-1
33 A	Private Property and Public Safety Maintenance Value	FS & BLM	Ss-1
33 B	Private Property and Public Safety Maintenance Value	FS & BLM	Ss-1
34 A	Old Growth Maintenance Value	FS & BLM	Ss-1
34 B	Old Growth Restoration Value	FS & BLM	Ss-1
35	High Plants - Maintenance and Restoration Value	FS & BLM	Ss-1
36 A	Recreation Use Value	FS & BLM	Ss-1
36 B	Recreation Increased Management Value	FS & BLM	Ss-1
37 A	Savannas and Grass / Forb Habitats Maintenance Value	FS & BLM	Ss-1
37 B	Savannas and Grass / Forb Habitats Restoration Value	FS & BLM	Ss-1
38	Resource Value Ratings - Aggregate	FS & BLM	Ss-1

East Fork Illinois River Watershed
Vicinity Map

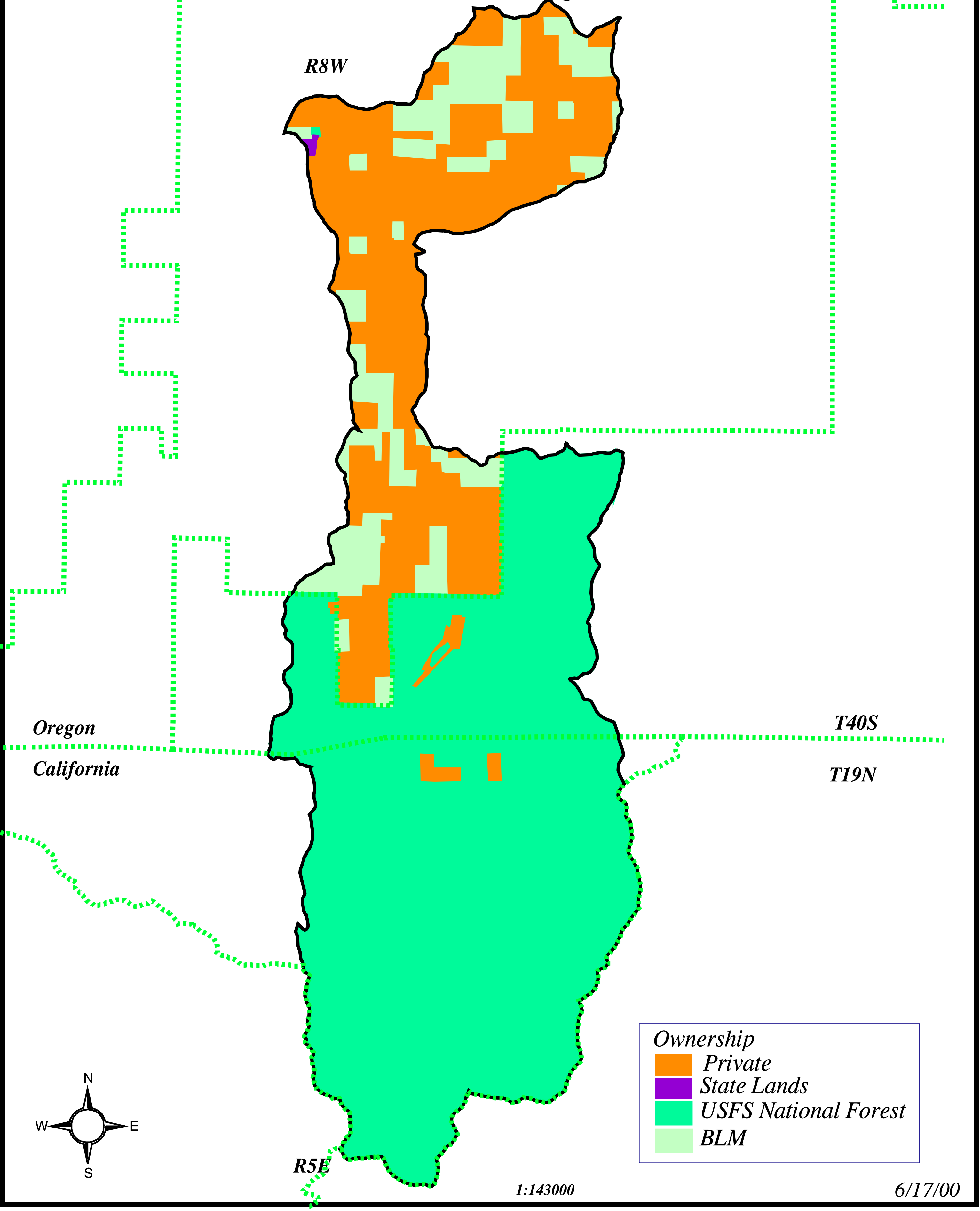


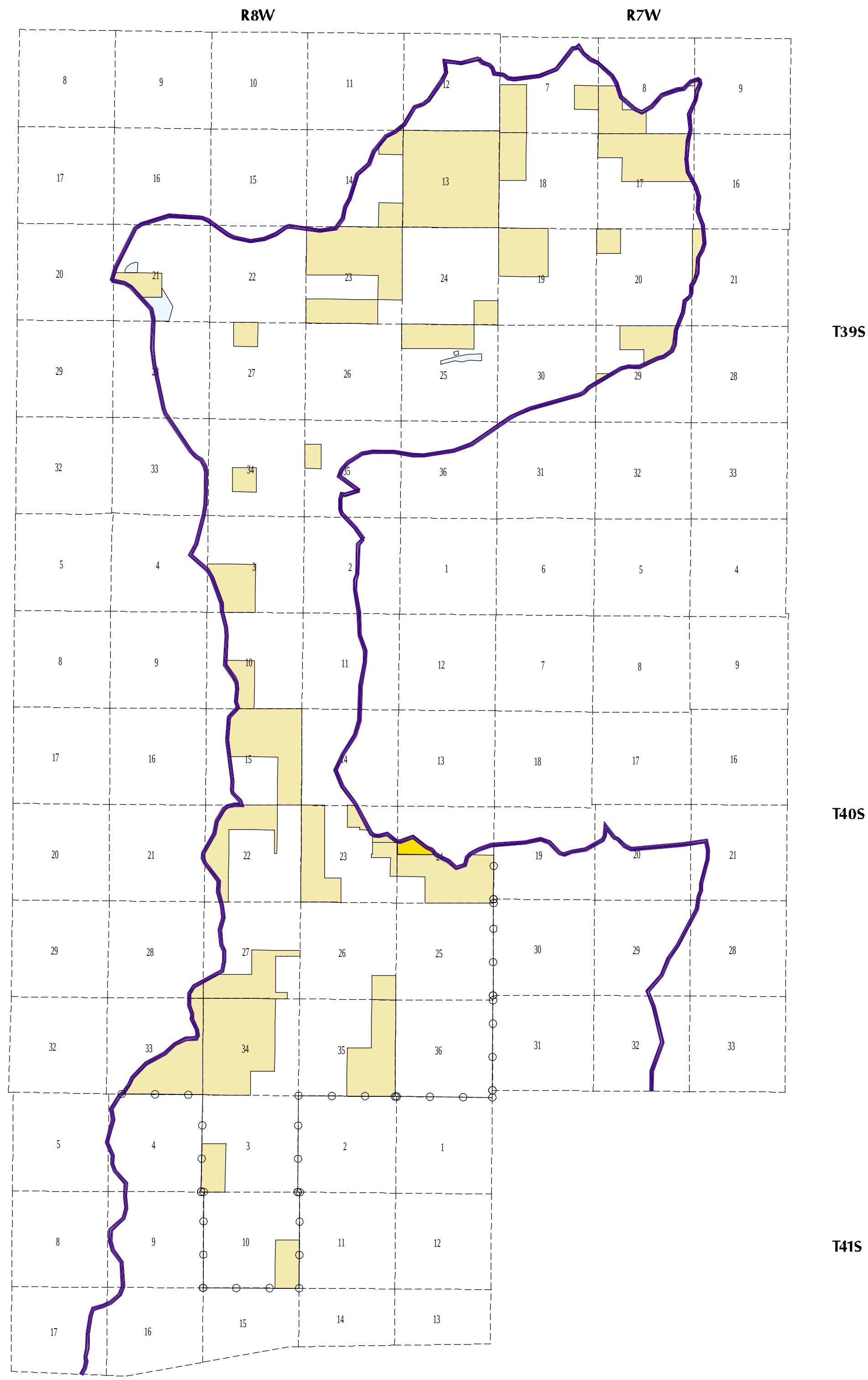




June 17, 2000

East Fork Illinois Watershed Land Ownership





SCALE 1:110000

GOVERNMENT OWNERSHIP OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- BLM
- STATE OF OREGON
- JOSEPHINE COUNTY
- WATERSHED BOUNDARY
- USFS BOUNDARY

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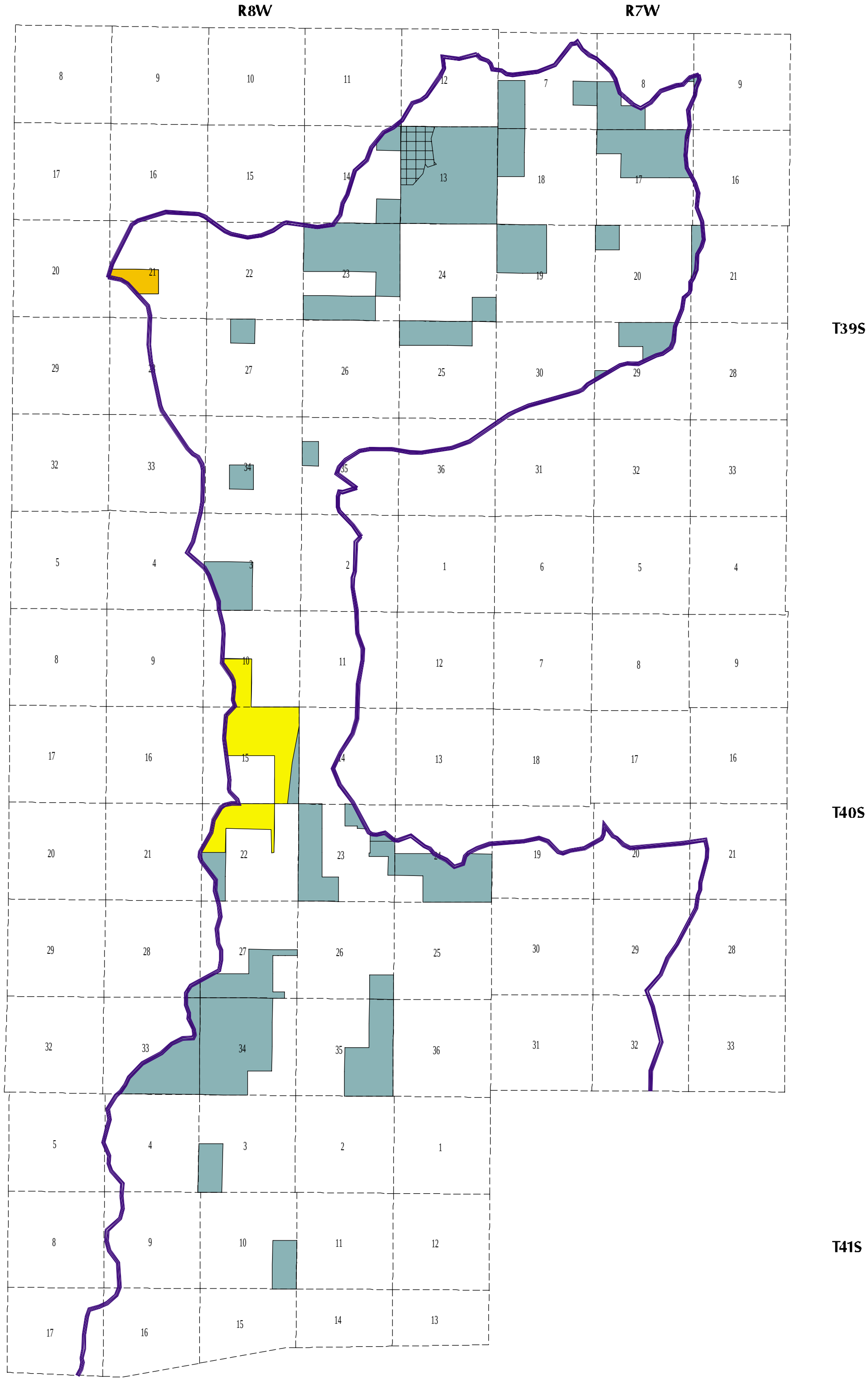

SCALE 1:110000

LAND USE ALLOCATIONS ON MEDFORD BLM DISTRICT LANDS IN THE EAST ILLINOIS WATERSHED

LEGEND

- MATRIX
- 100-ACRE OWL CORE
- WATERSHED BOUNDARY
- ACEC
- R & PP PARK LEASE

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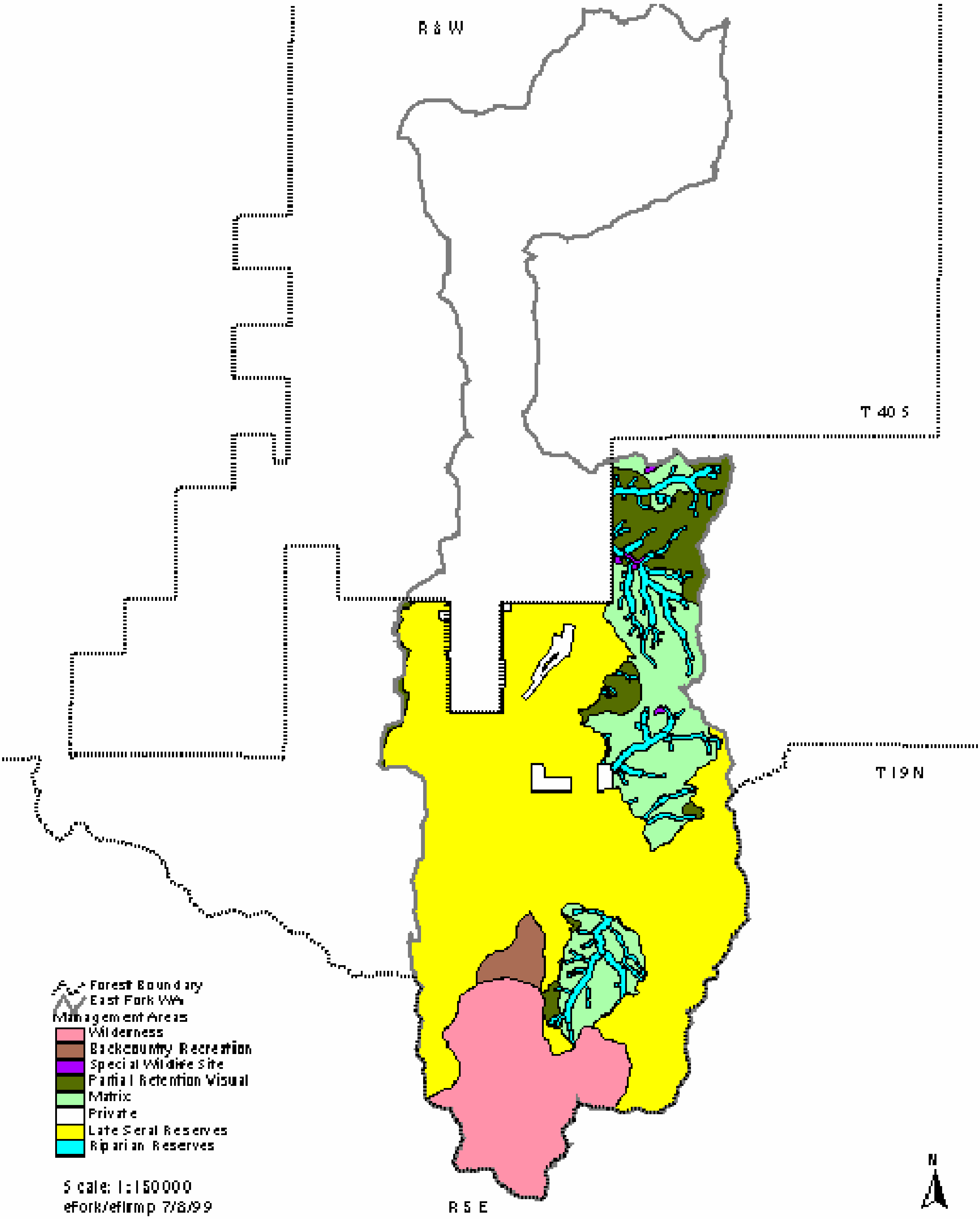
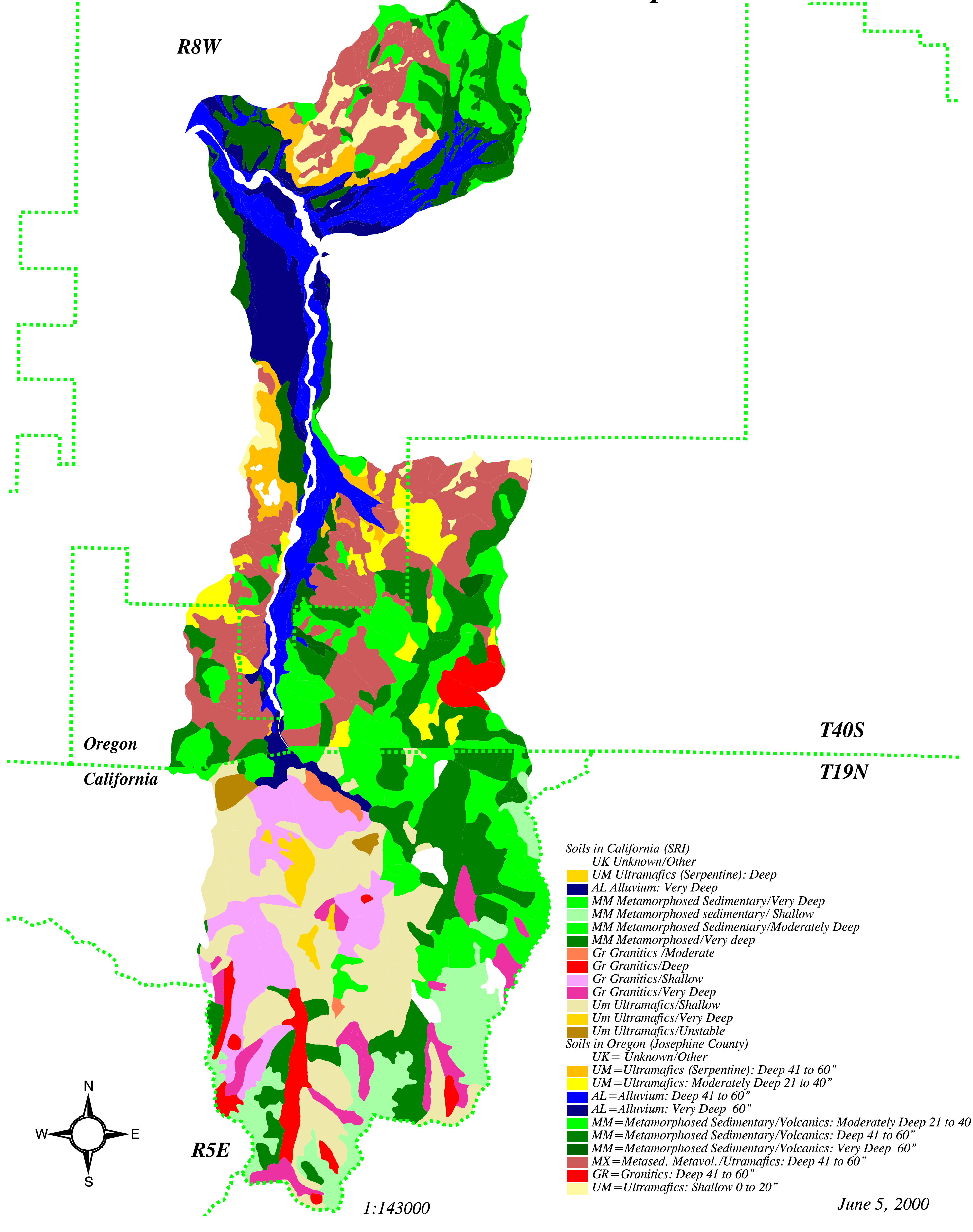
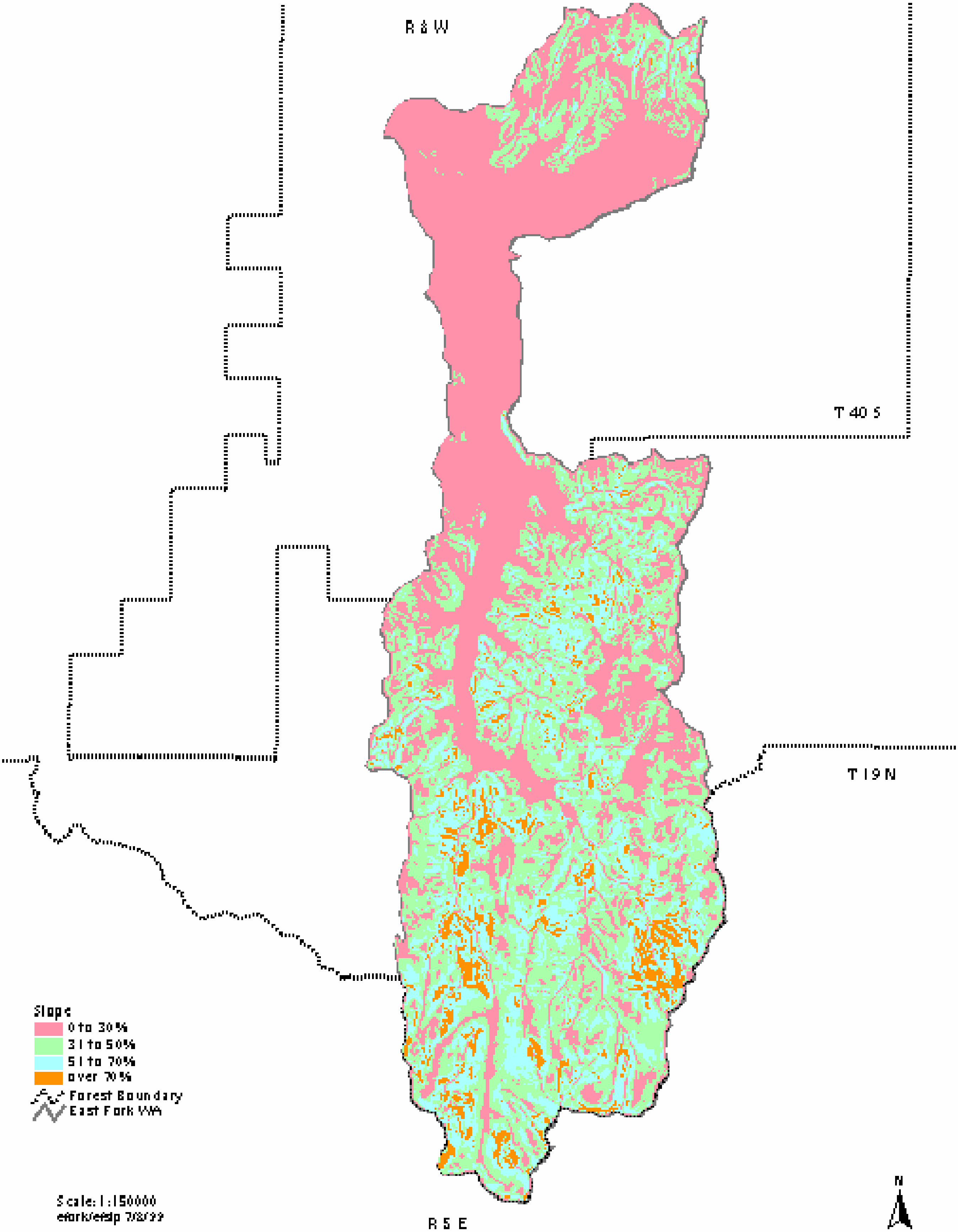
East Fork Watershed Analysis
Management Areas



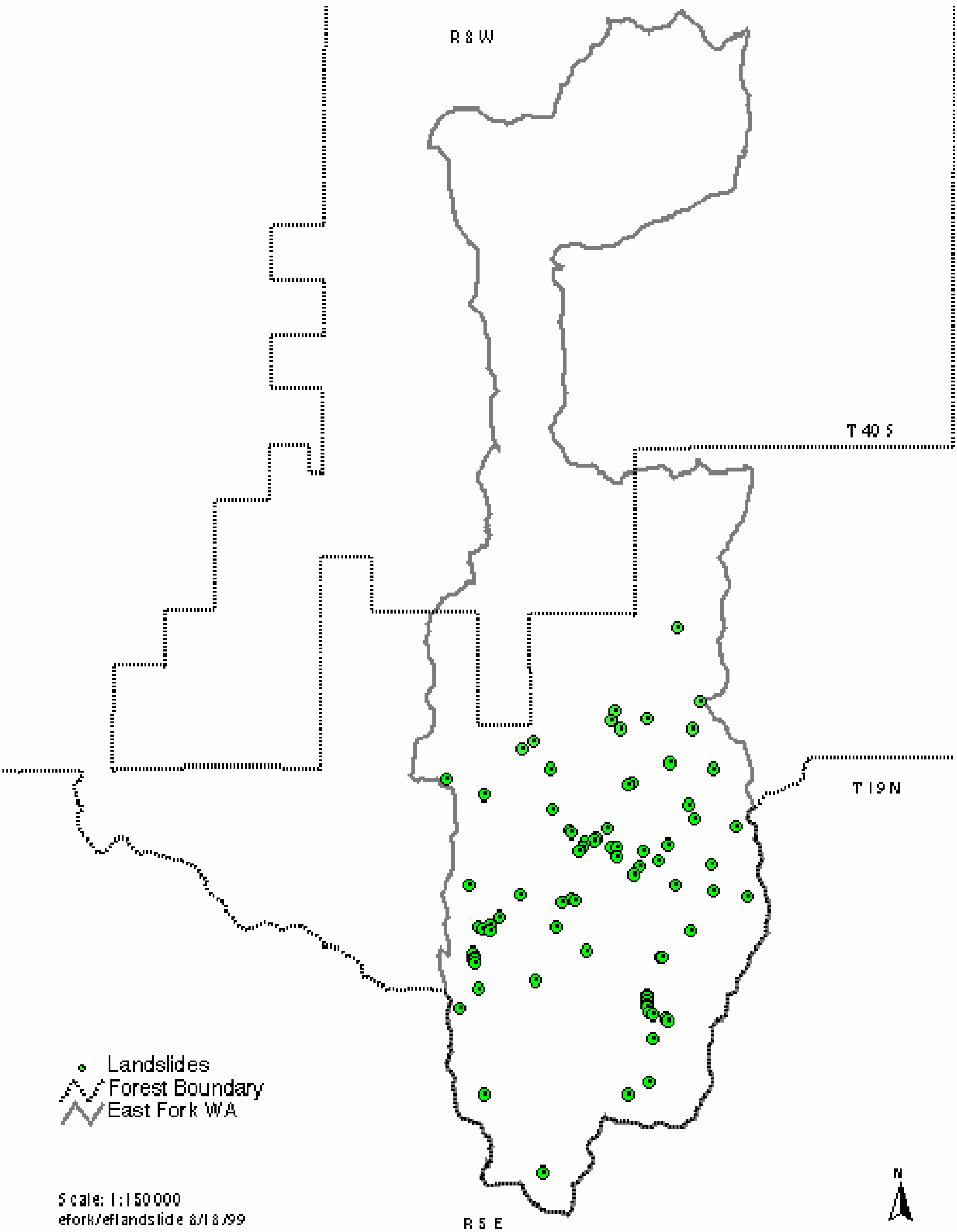
East Fork Illinois Watershed
Parent Material and Soil Depth

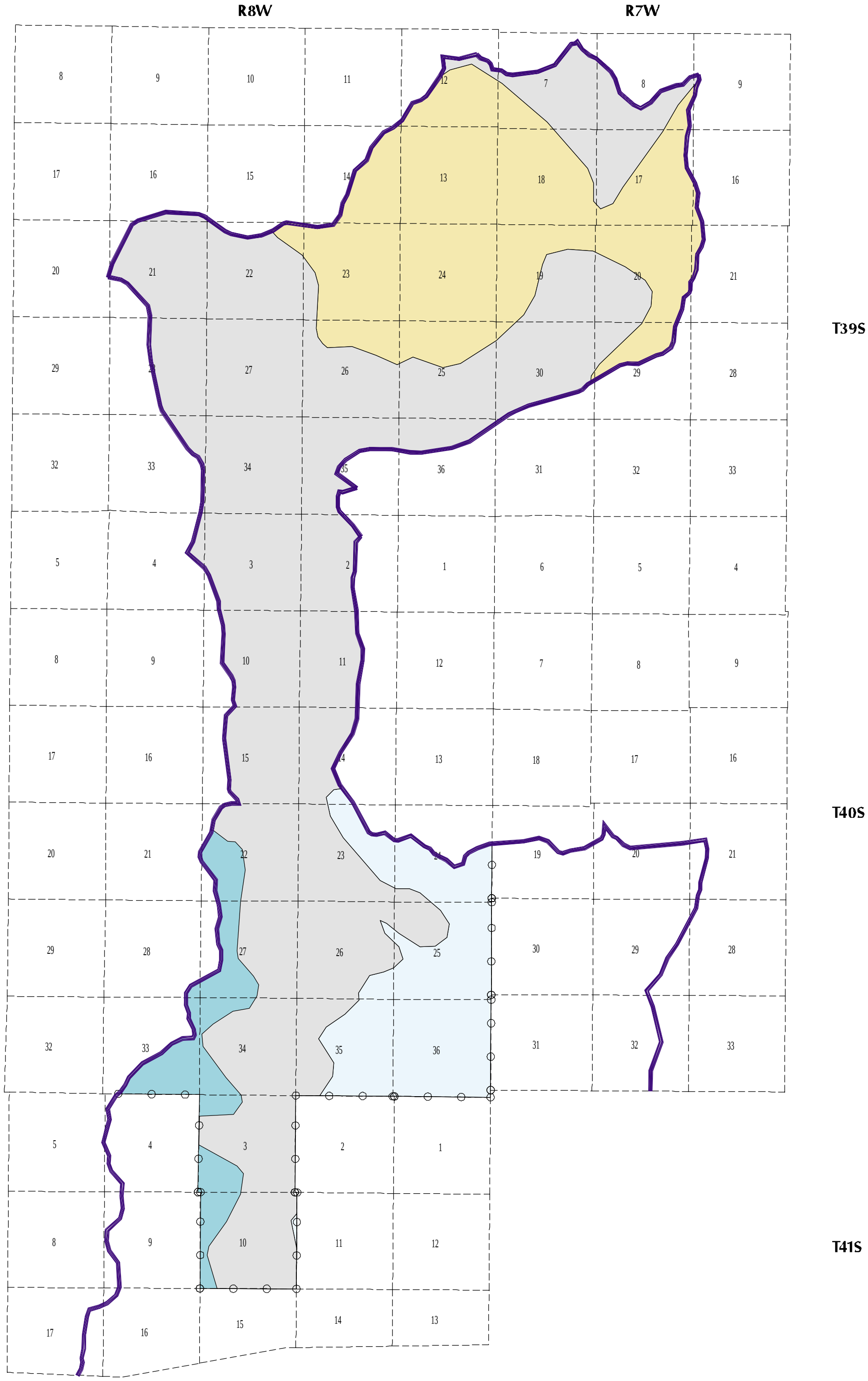


East Fork Watershed Analysis
Percent Slope



East Fork Watershed Analysis
Landslides





SCALE 1:110000

MINERAL POTENTIAL ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- Medium Potential: gold, limestone, silica sand
- Medium Potential: copper, chromite
- Medium Potential: copper, cobalt
- Low Potential: all minerals
- WATERSHED BOUNDARY
- USFS BOUNDARY

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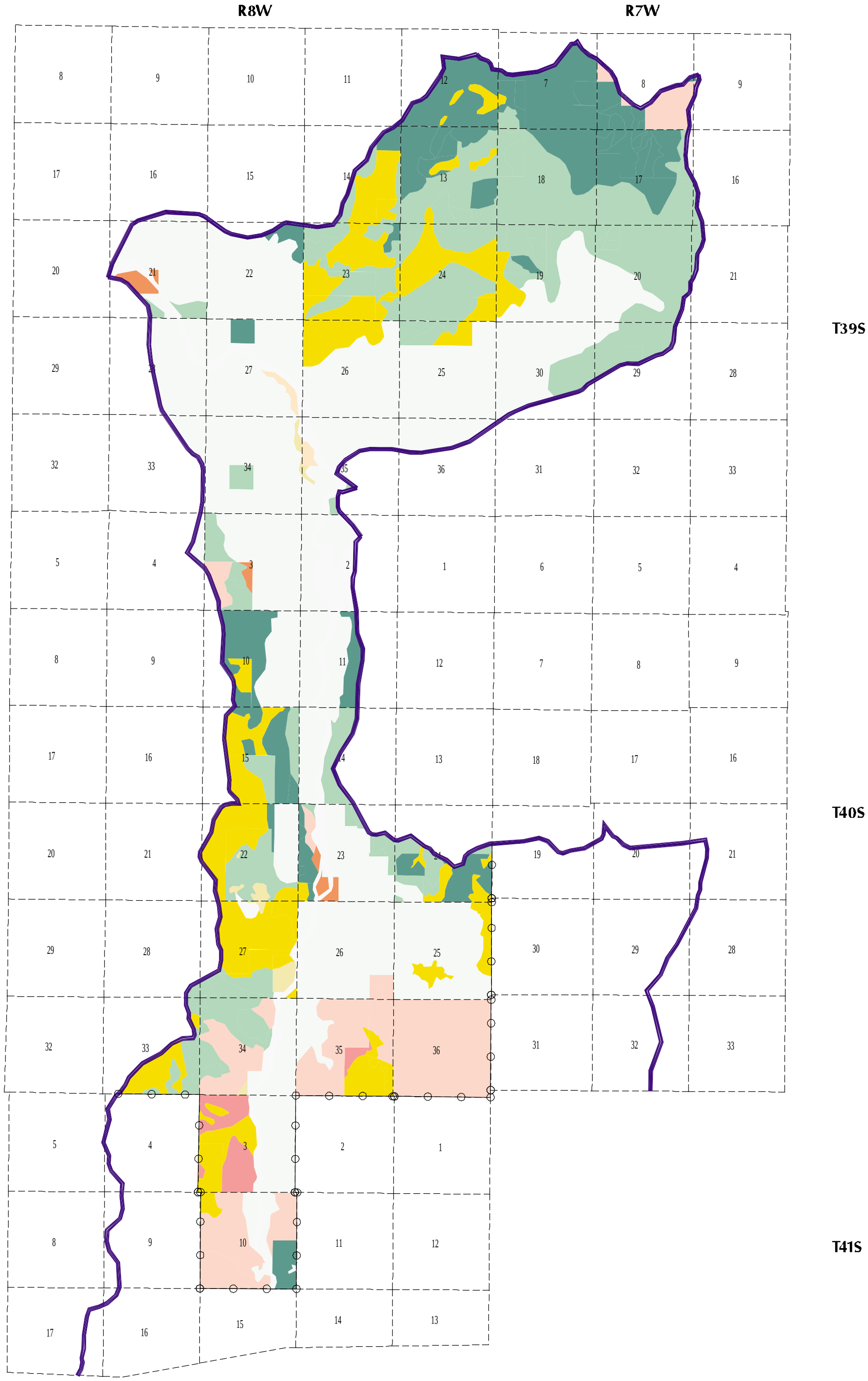

SCALE 1:110000

PLANT SERIES
ON LANDS OUTSIDE THE USFS BOUNDARY
IN THE EAST ILLINOIS WATERSHED

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LEGEND

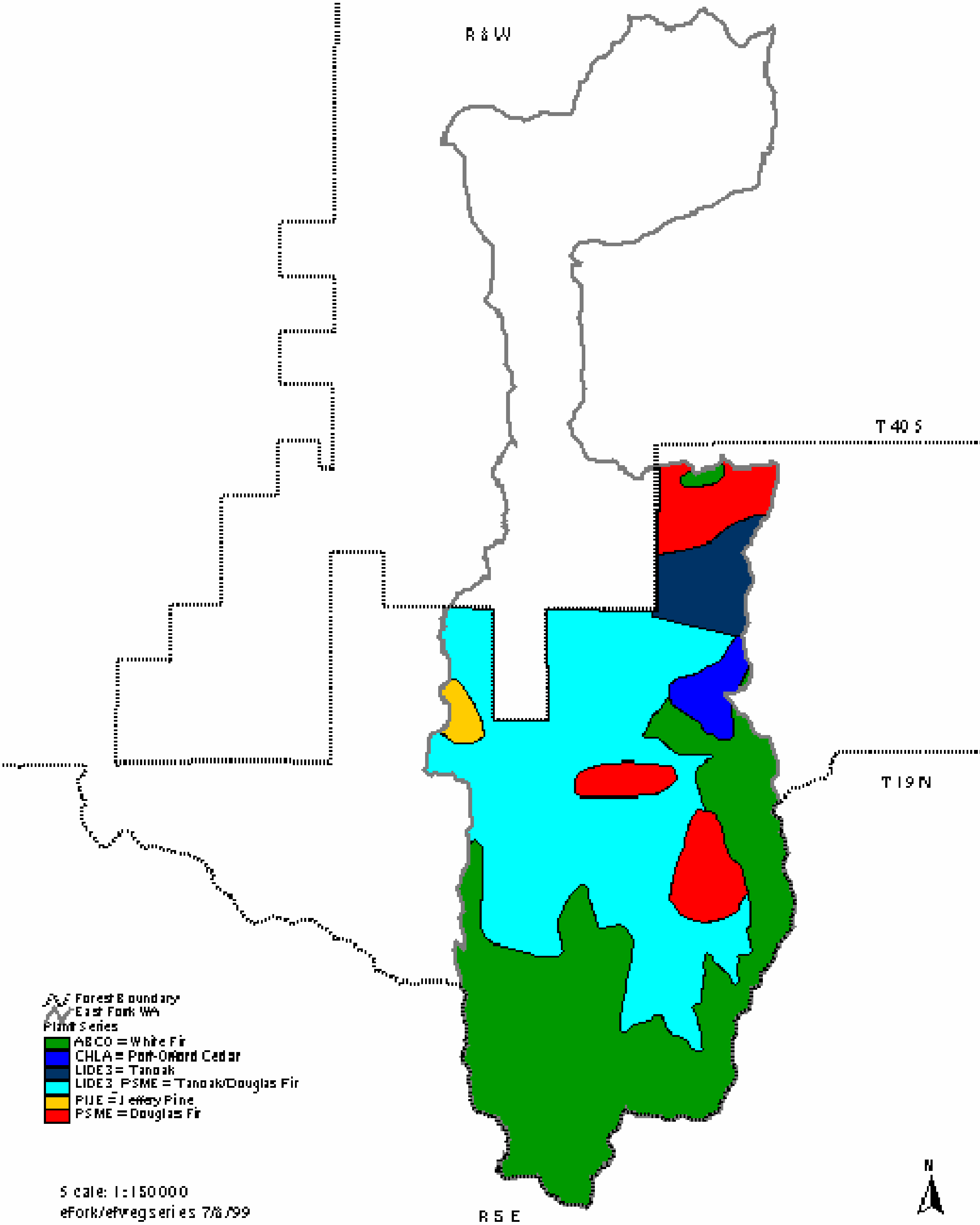
NON-VEG.	TANOAK	J.PINE	D.FIR
NON-FOREST	TANOAK/ D.FIR	P.PINE	
RIPARIAN HARDWOOD	W.OAK	D.FIR/ PINE	

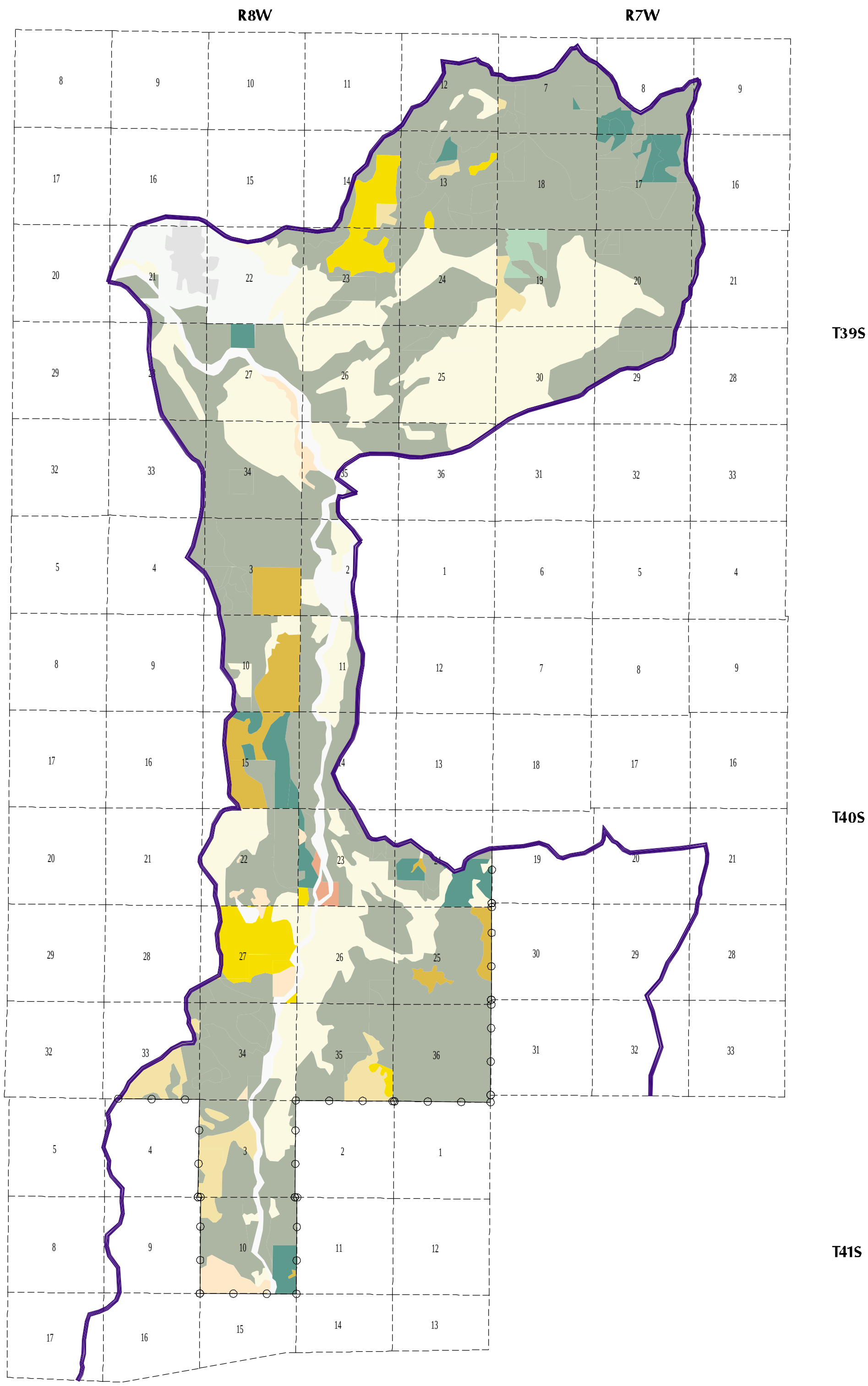
WATERSHED BOUNDARY

USFS BOUNDARY

N

East Fork Watershed Analysis
Plant Series





SCALE 1:110000

DOMINANT VEGETATION ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

NON-VEG.
GRASS
HARDWOOD/ CONIFER
J.PINE/ SHRUB
WATERSHED BOUNDARY
DEVELOPED, NON-VEG.
SHRUB
P.PINE/ GRASS
D.FIR/ PINE
USFS BOUNDARY
DEVELOPED, VEGETATED
HARDWOOD
J.PINE/ GRASS
D.FIR

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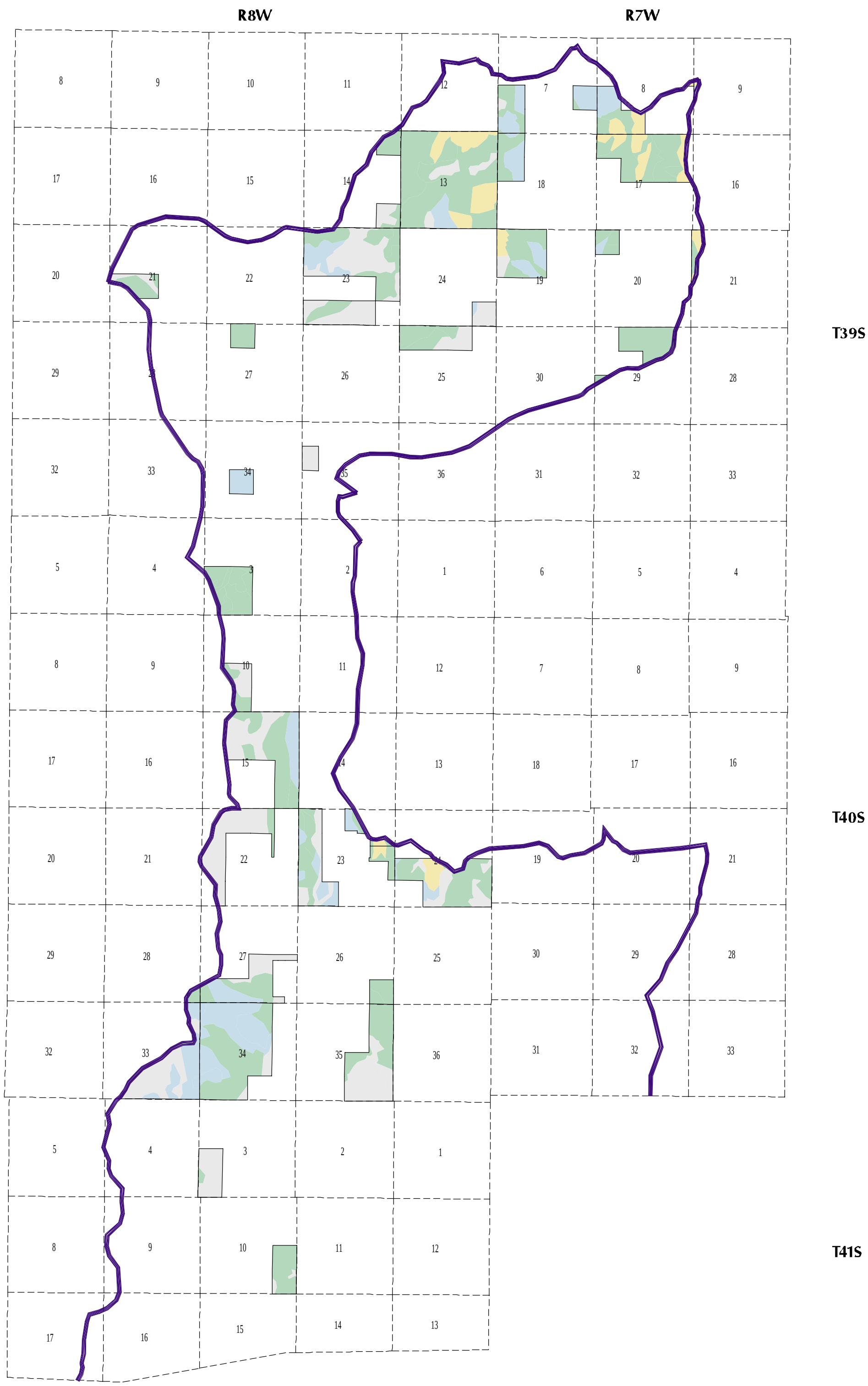

SCALE 1:110000

SERAL STAGES
ON BLM LAND
IN THE EAST ILLINOIS WATERSHED

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LEGEND

- MATURE
- NOT APPLICABLE
- WATERSHED BOUNDARY
- MID
- EARLY

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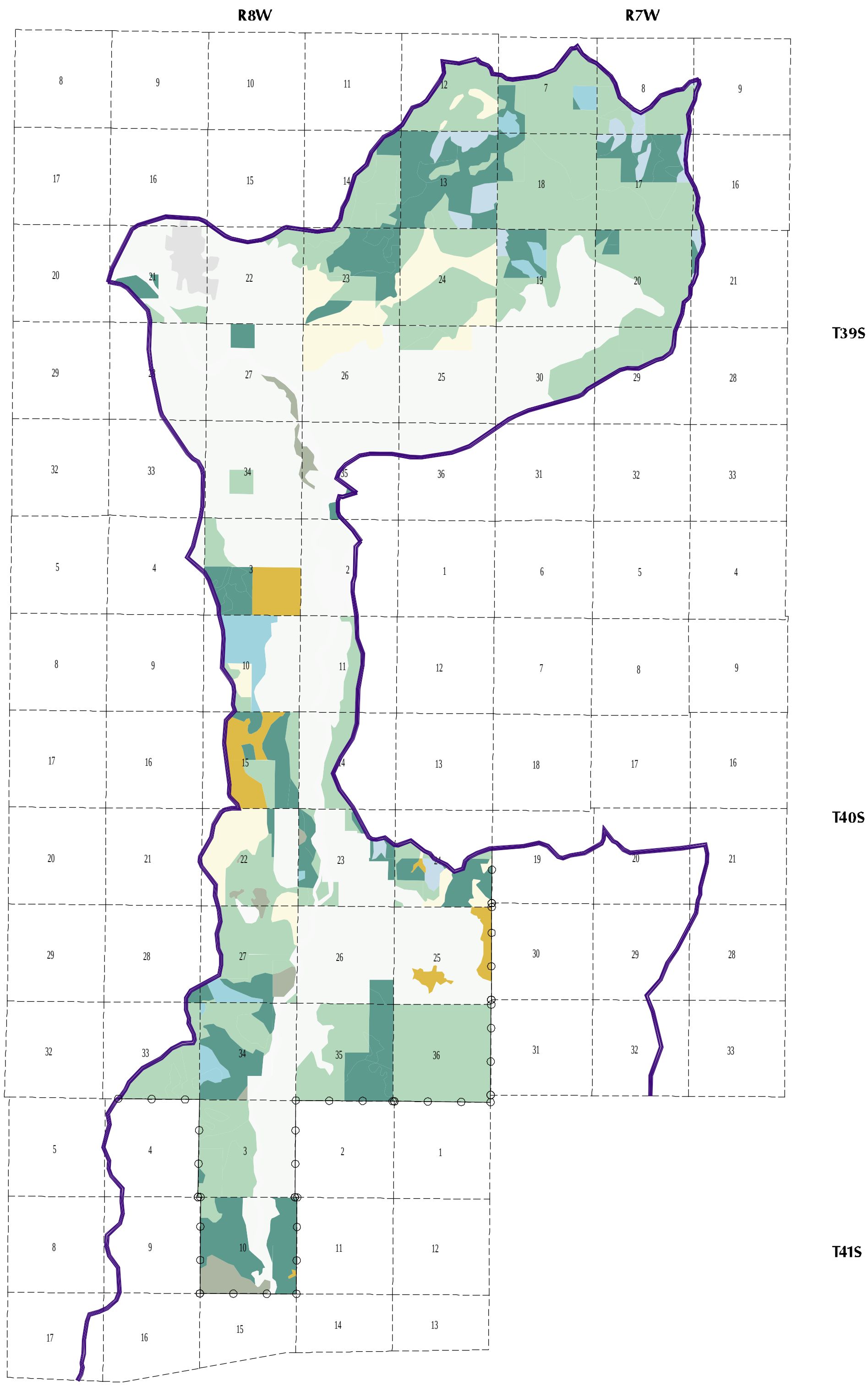

SCALE 1:110000

VEGETATIVE CONDITION CLASS ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- NON-VEG.
- GRASS
- SEEDLING/ SAPLING
- MATURE
- WATERSHED BOUNDARY
- DEVELOPED, NON-VEG.
- SHRUB
- POLES
- USFS BOUNDARY
- DEVELOPED, VEGETATED
- HARDWOOD
- MID-SERAL

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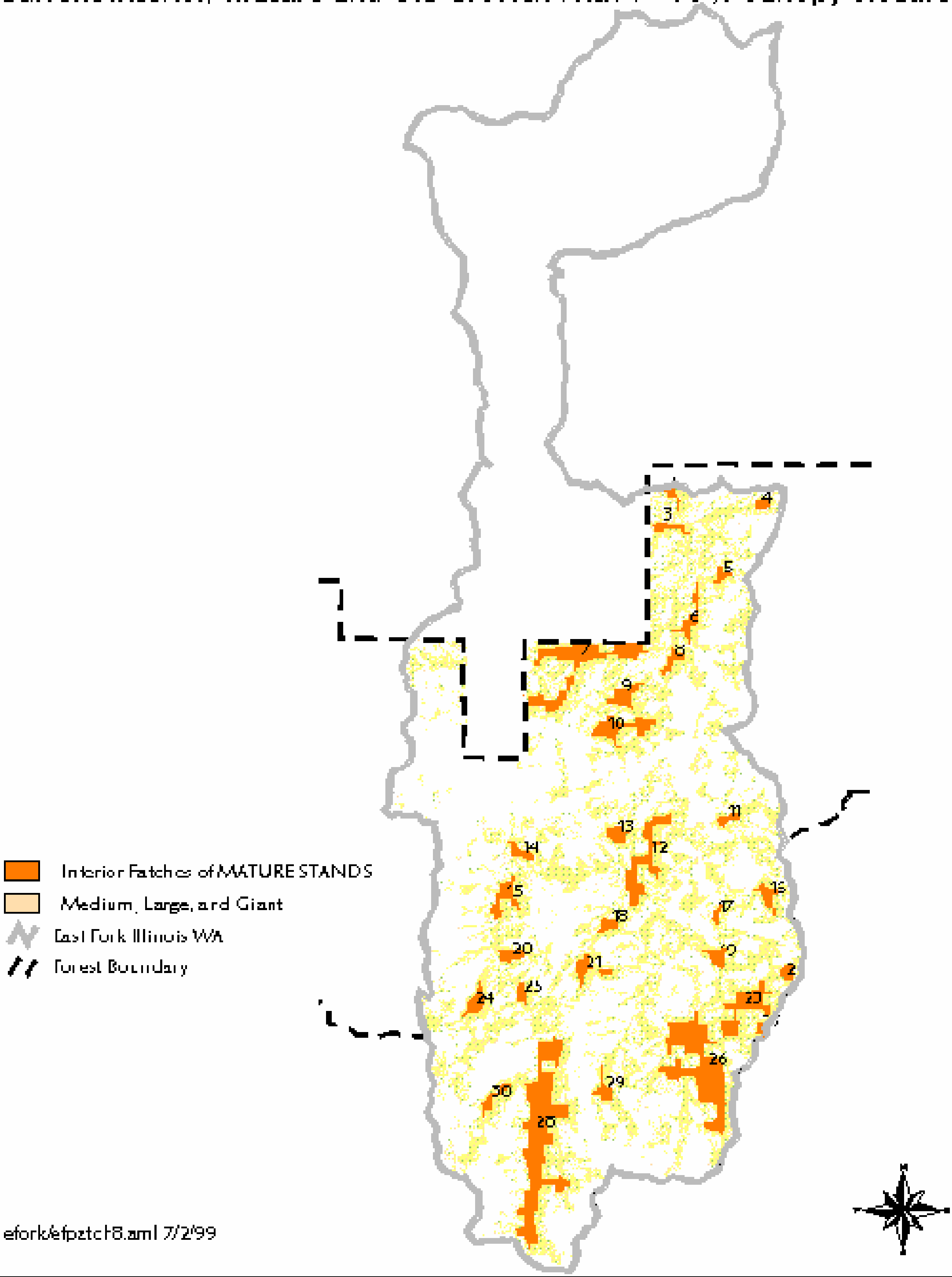
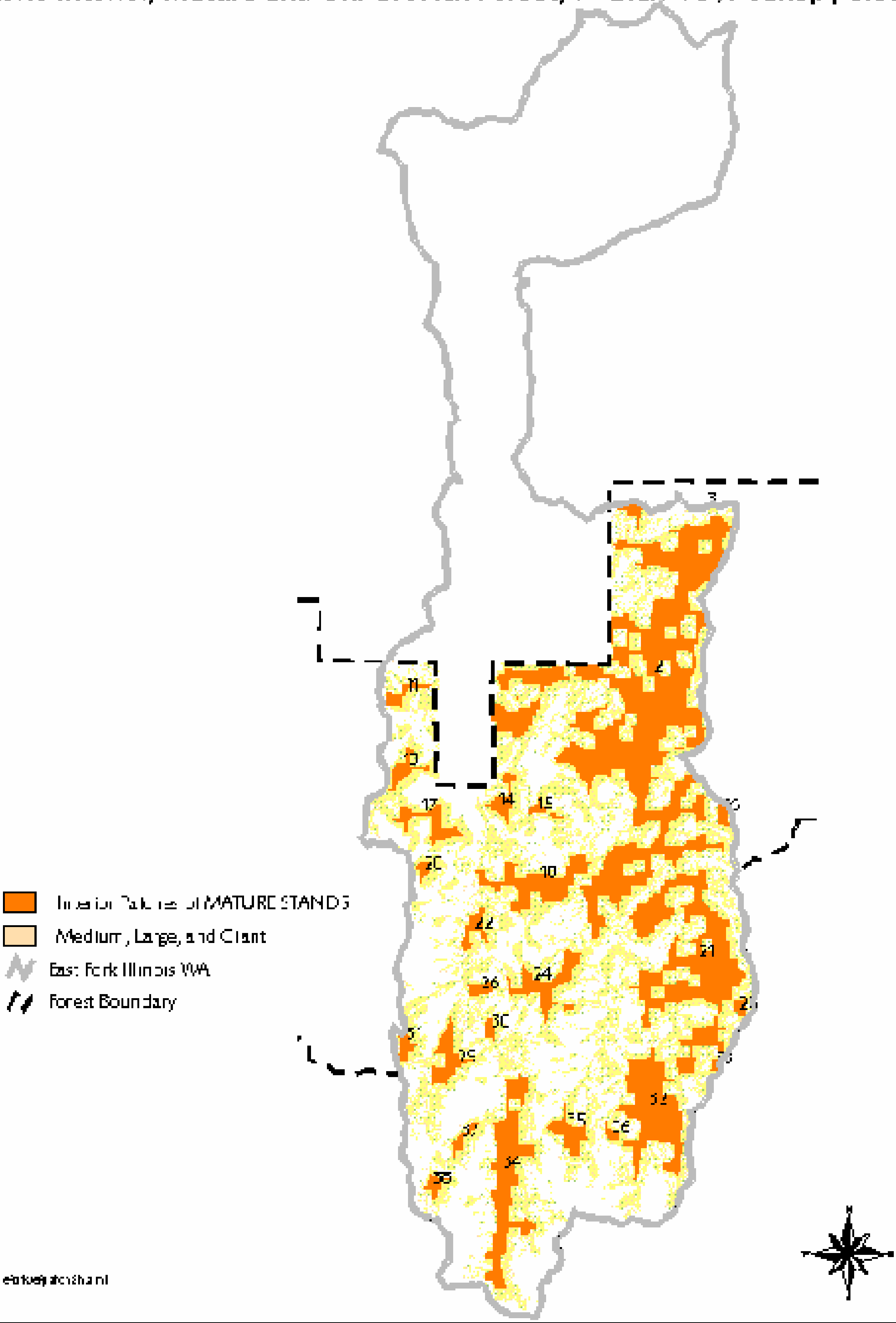
East Fork Watershed Analysis
Current Interior/ Mature and Old Growth with > 40% canopy closure



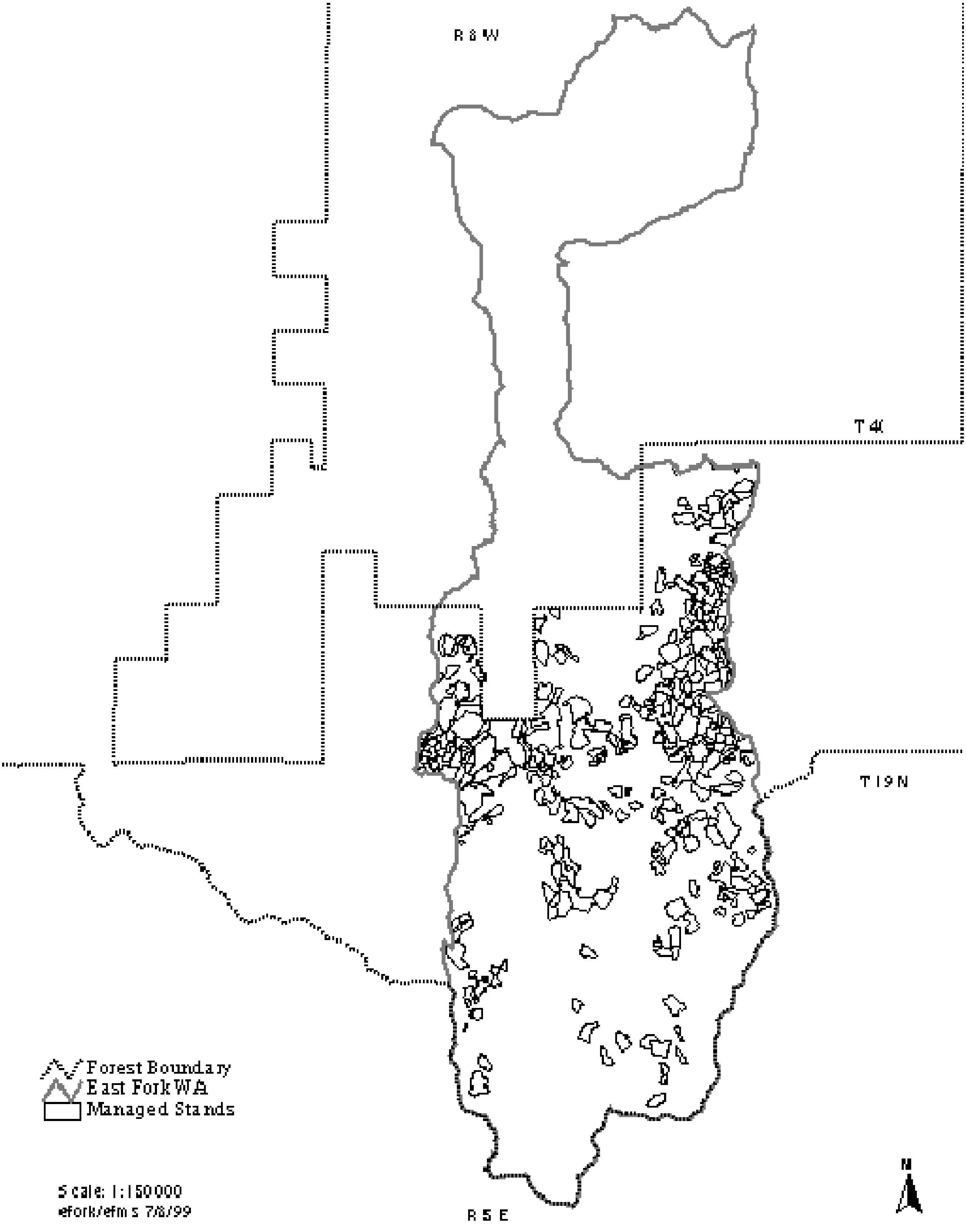
eforkefpatch8.aml 7/2/99

East Fork Watershed Analysis

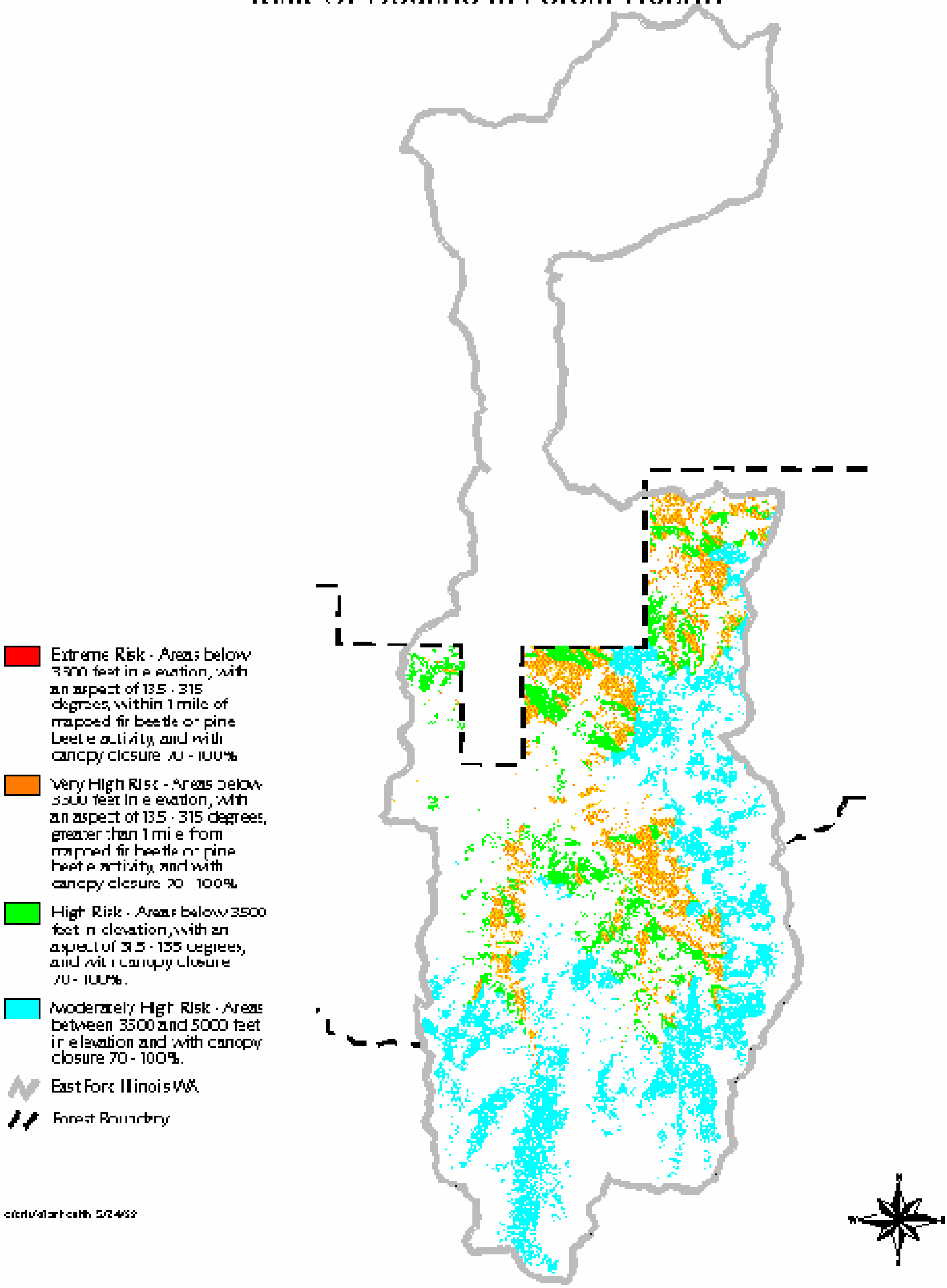
Historic Interior, Mature and Old Growth Forest, > than 40% canopy closure



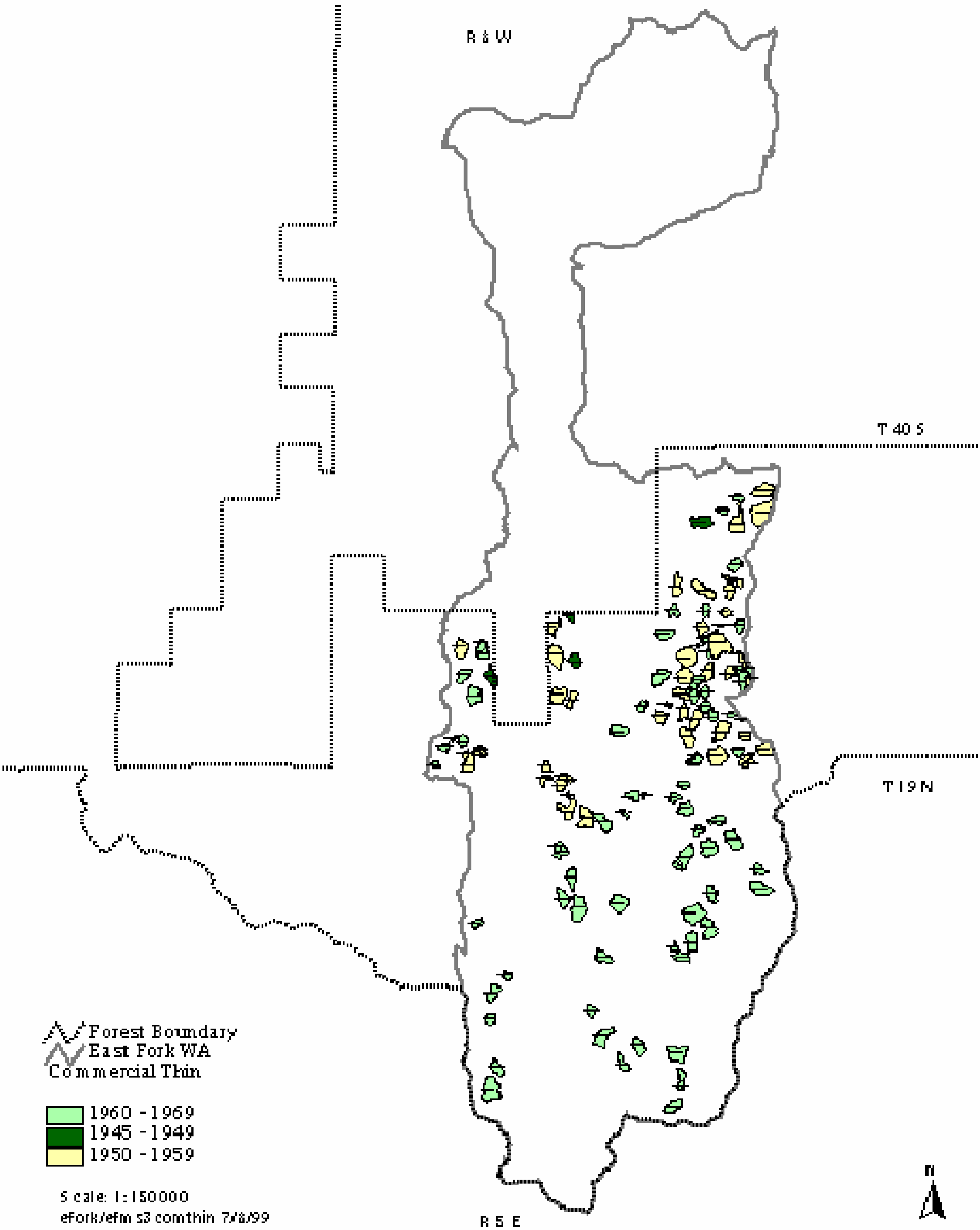
East Fork Watershed Analysis
Managed Stands



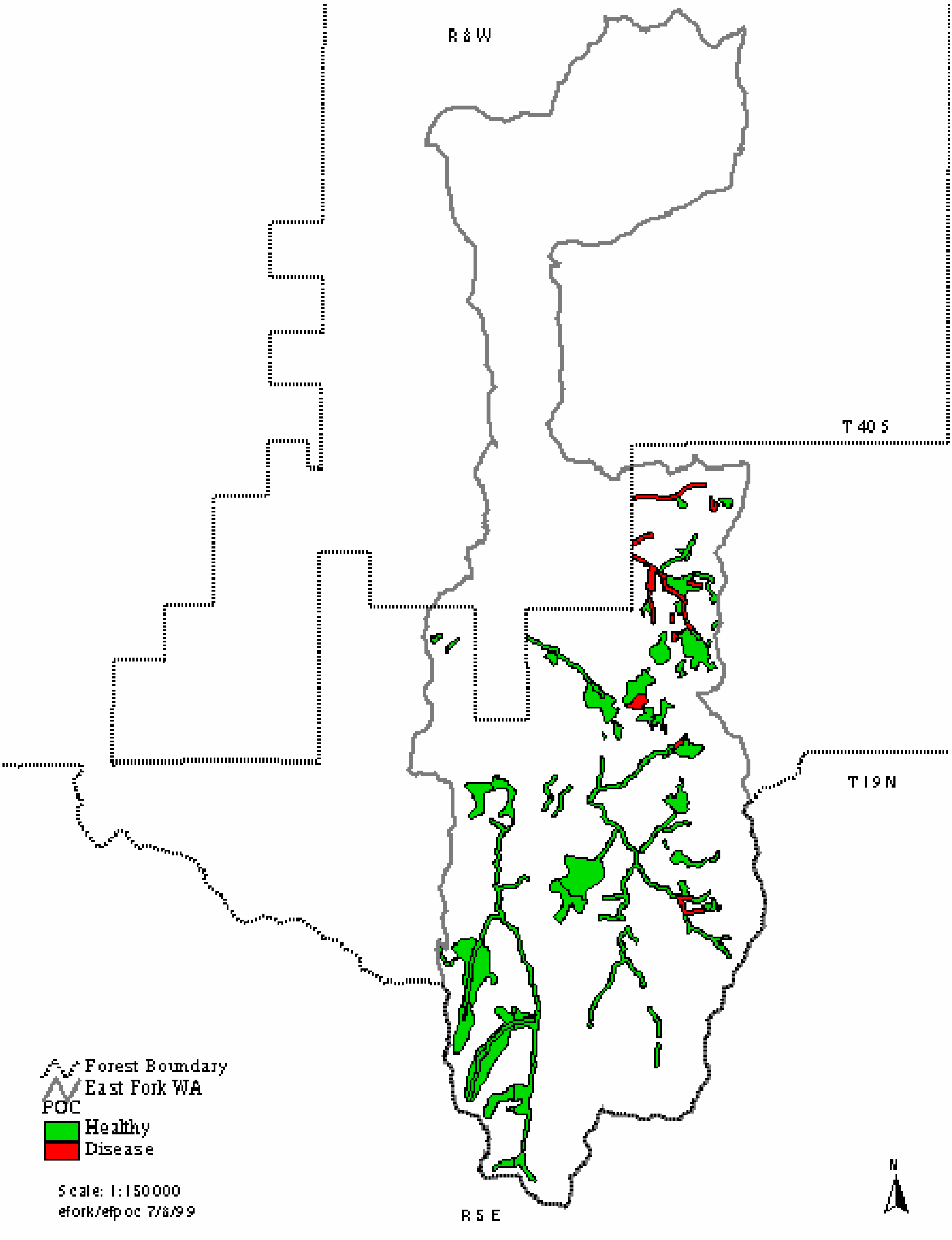
East Fork Watershed Analysis
Risk Of Decline In Forest Health



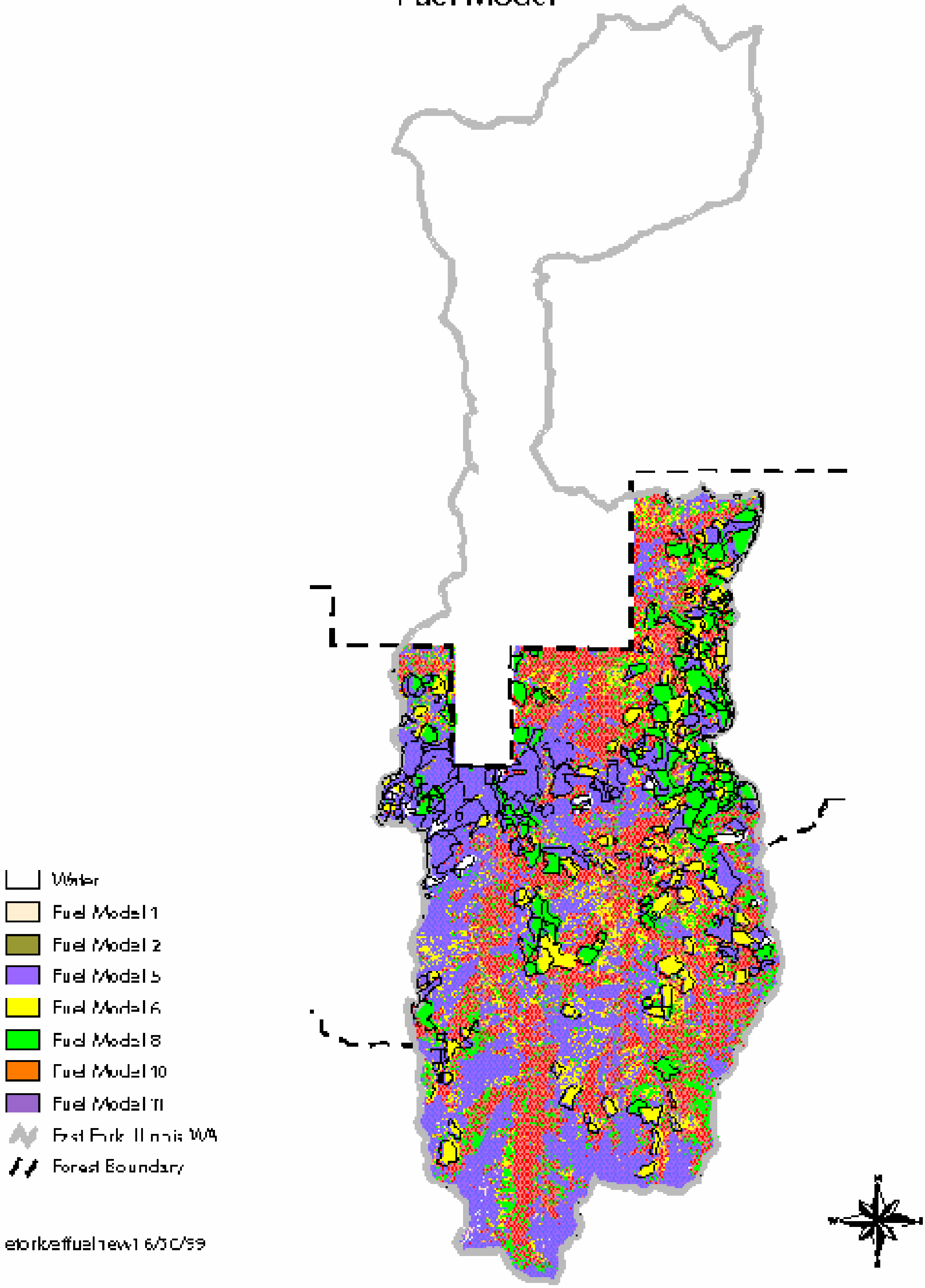
East Fork Watershed Analysis
Commercial Thins

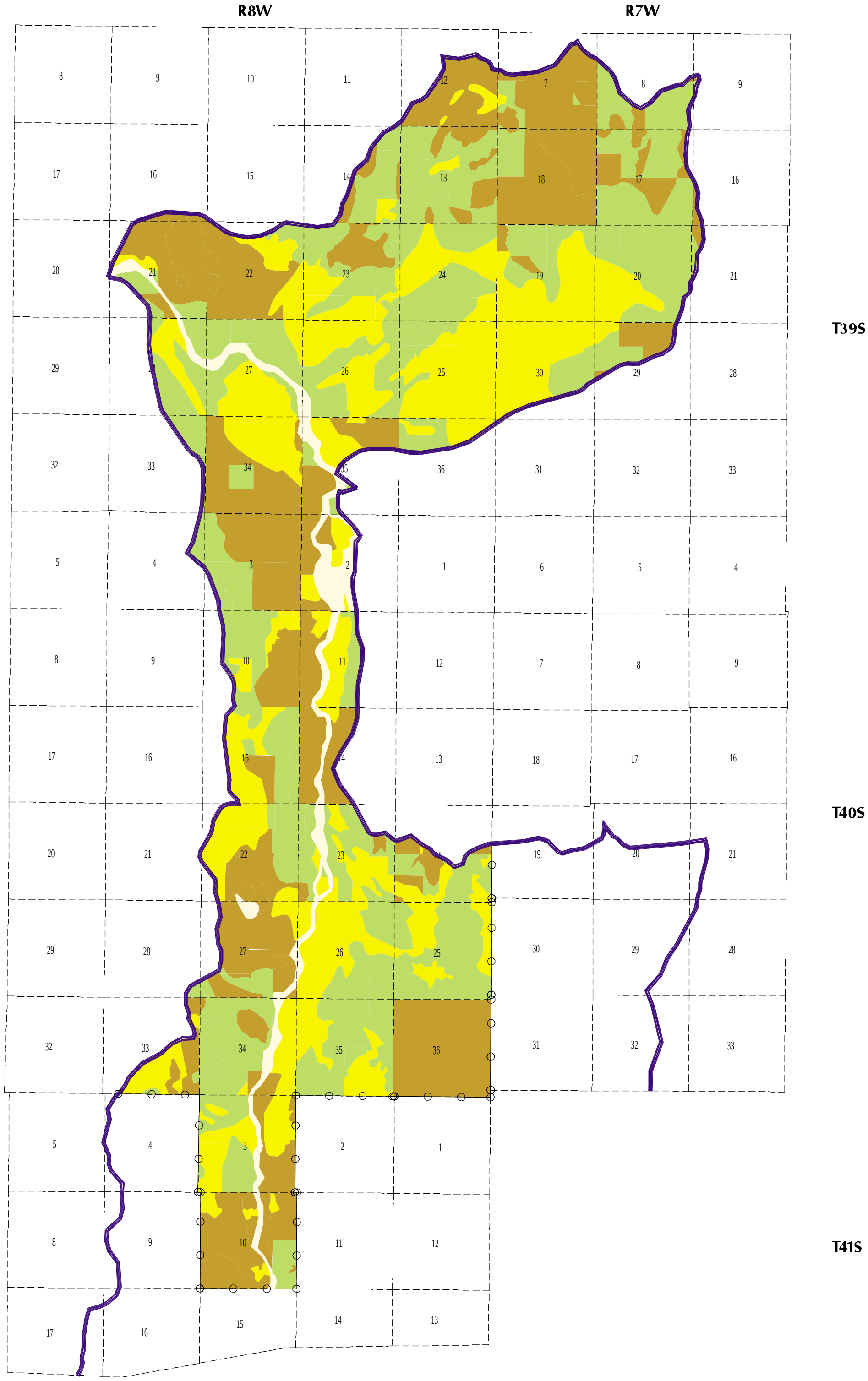


East Fork Watershed Analysis
Port Orford Cedar Detctions & Disease



East Fork Watershed Analysis
Fuel Model





SCALE 1:110000

FUEL MODELS FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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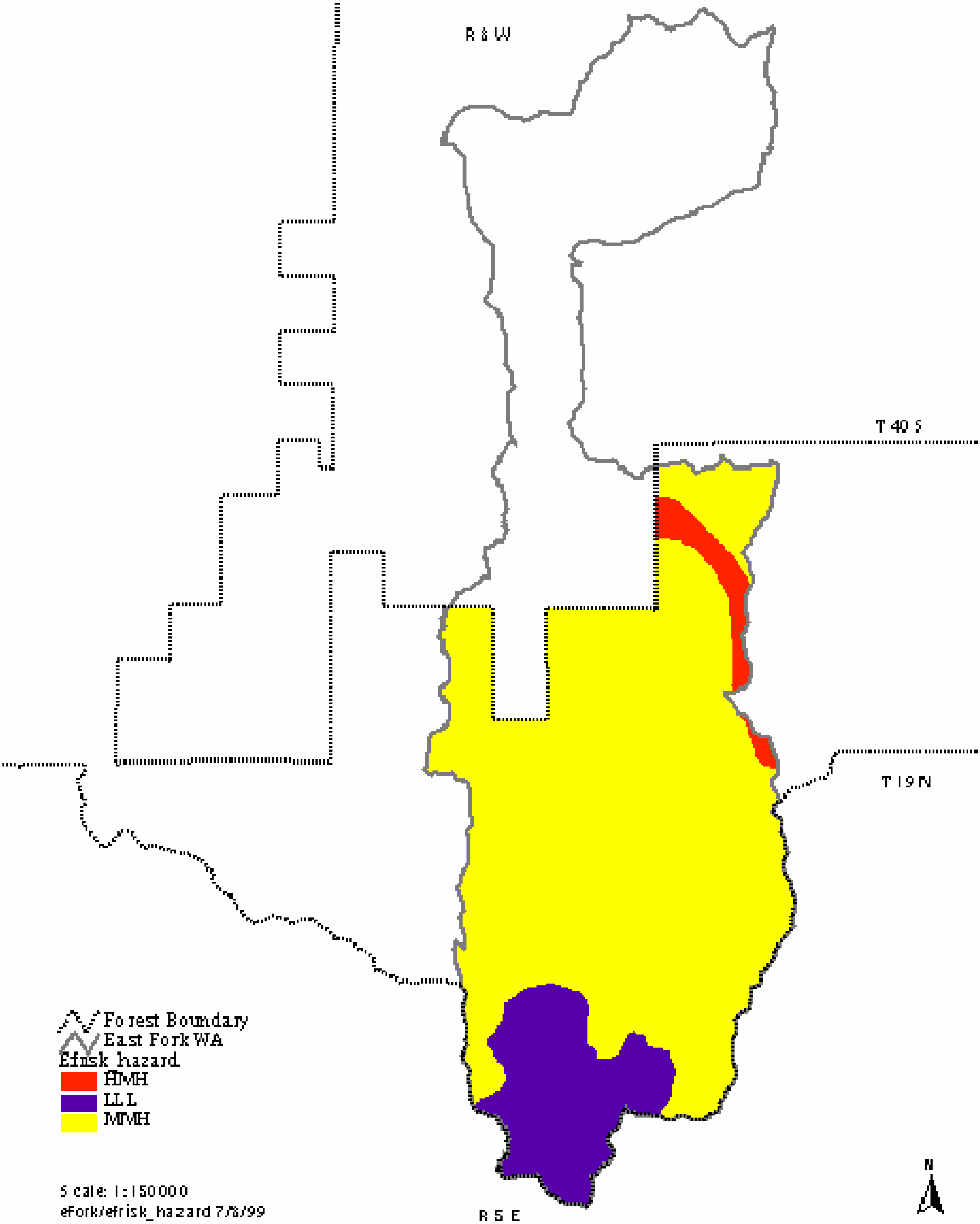
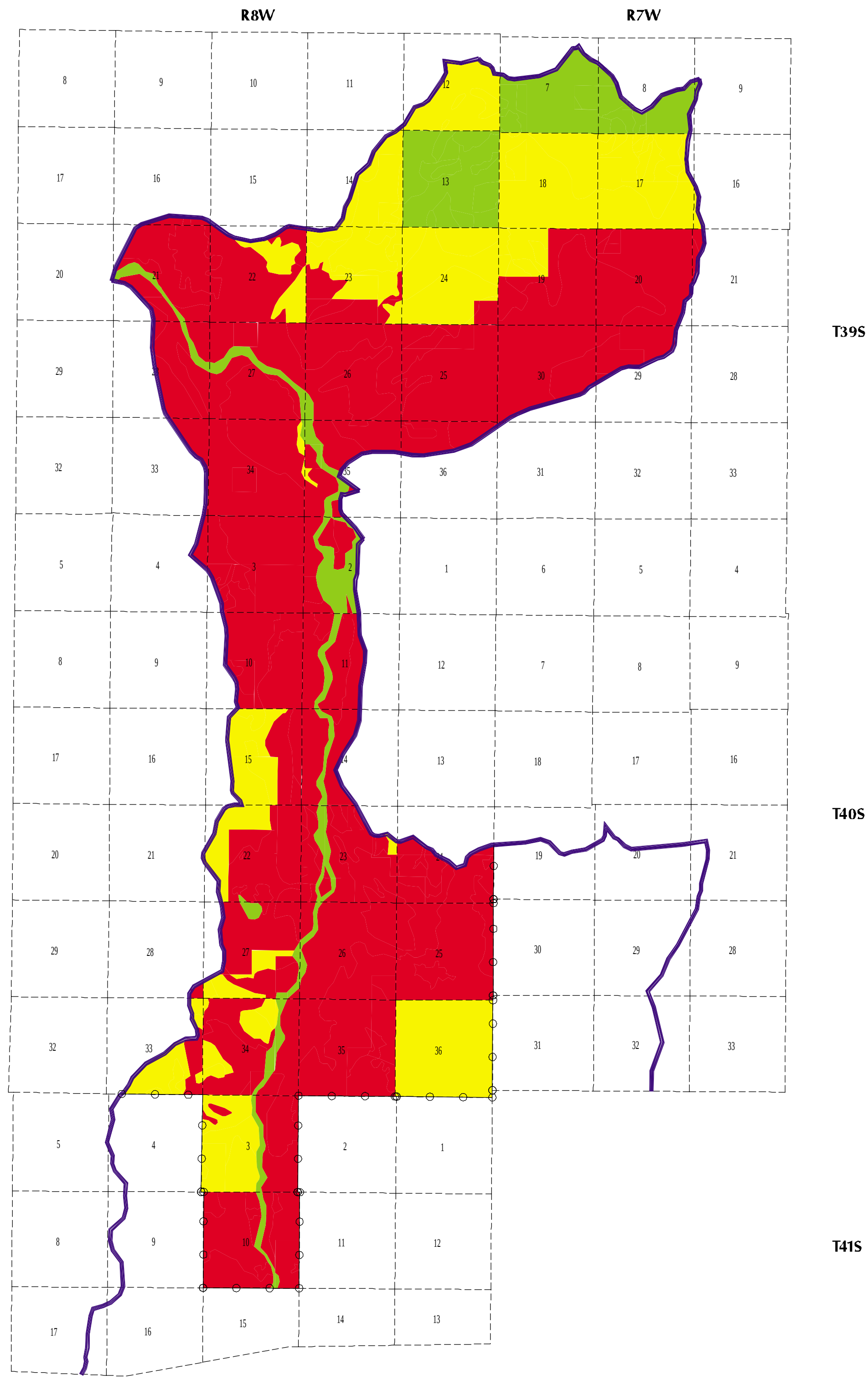
LEGEND

- GRASS AND GRASS DOMINATED
- CHAPARRAL AND SHRUB FIELDS
- TIMBER LITTER
- SLASH
- FUEL MODELING NOT APPLICABLE
- WATERSHED BOUNDARY
- USFS BOUNDARY

East Fork Watershed Analysis
Wildfire Risk Analysis Map





SCALE 1:110000

FIRE RISK RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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LEGEND

- HIGH
- MEDIUM
- LOW
- WATERSHED BOUNDARY
- USFS BOUNDARY

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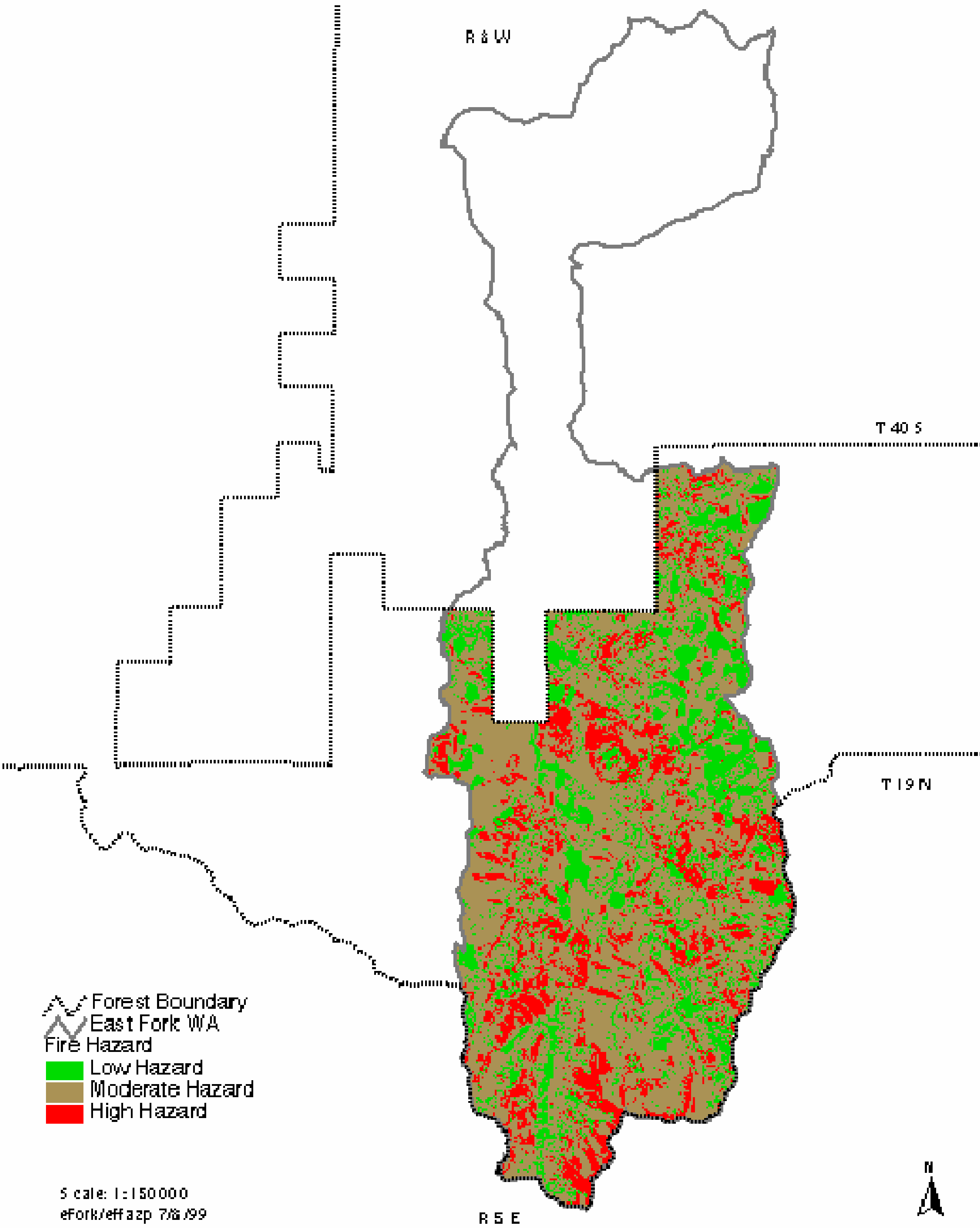
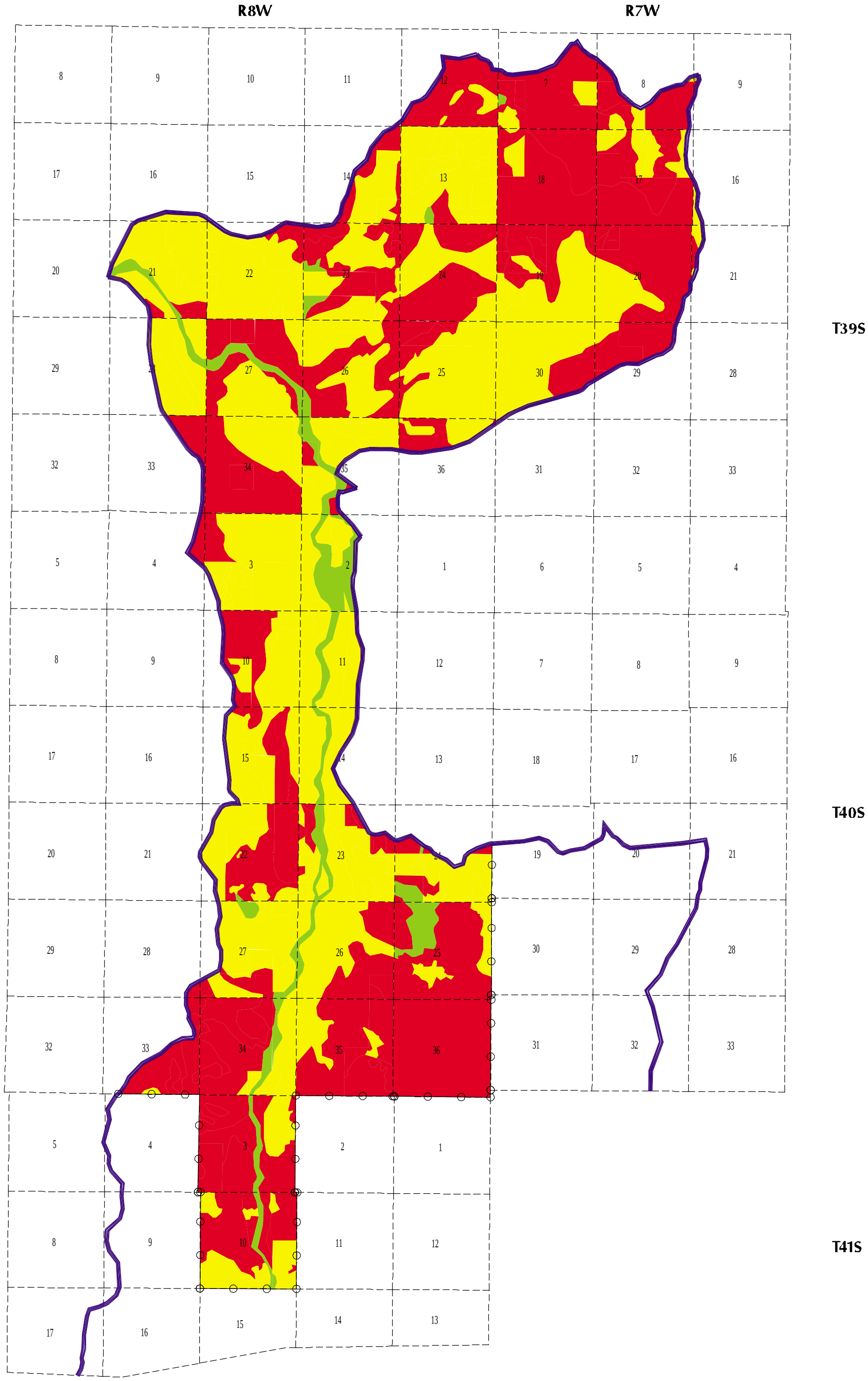
East Fork Watershed Analysis
Fire Hazard Levels





SCALE 1:110000

FIRE HAZARD RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- HIGH
- MEDIUM
- LOW
- WATERSHED BOUNDARY
- USFS BOUNDARY

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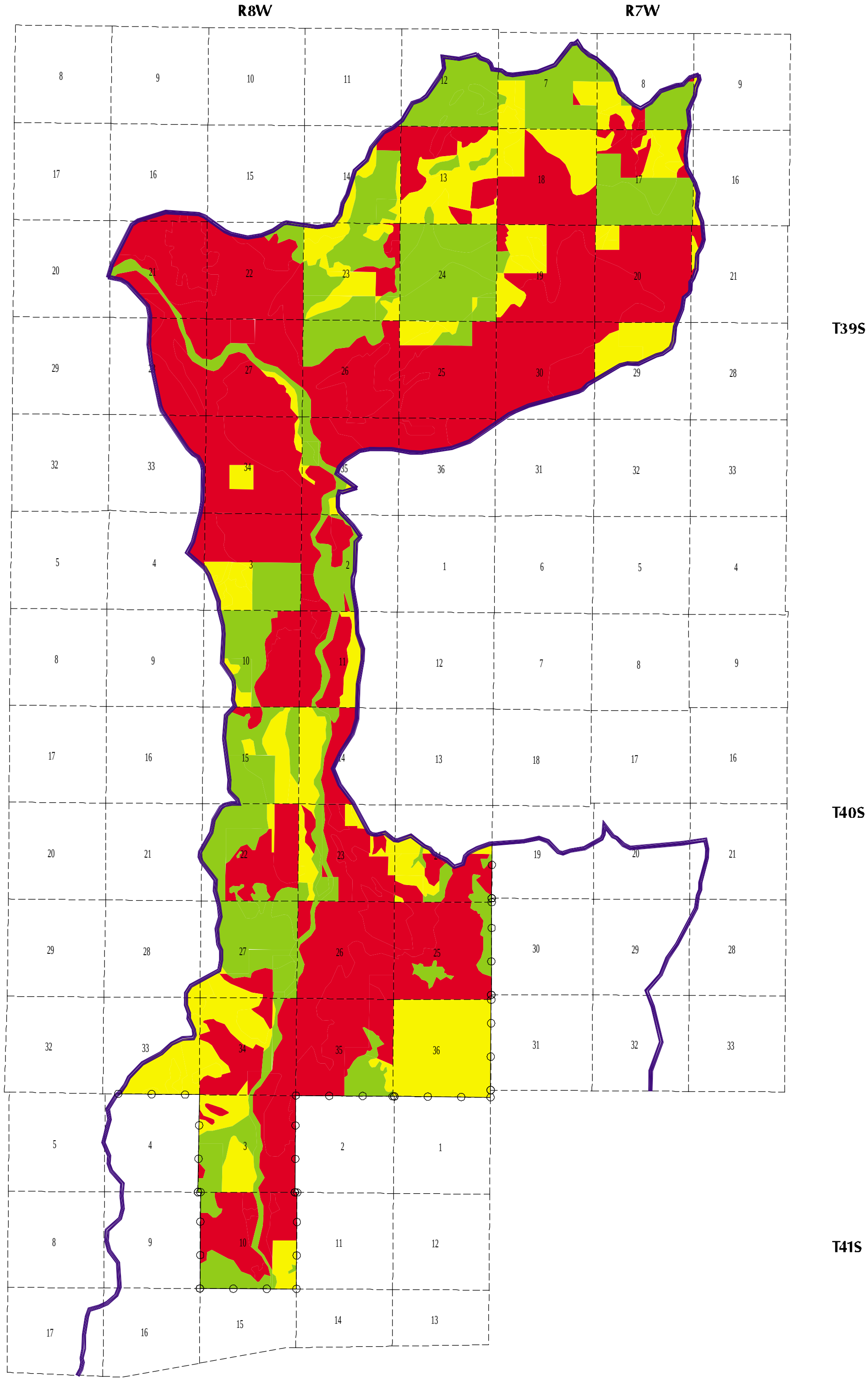

SCALE 1:110000

FIRE VALUE RATING FOR LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- HIGH
- MEDIUM
- LOW
- WATERSHED BOUNDARY
- USFS BOUNDARY

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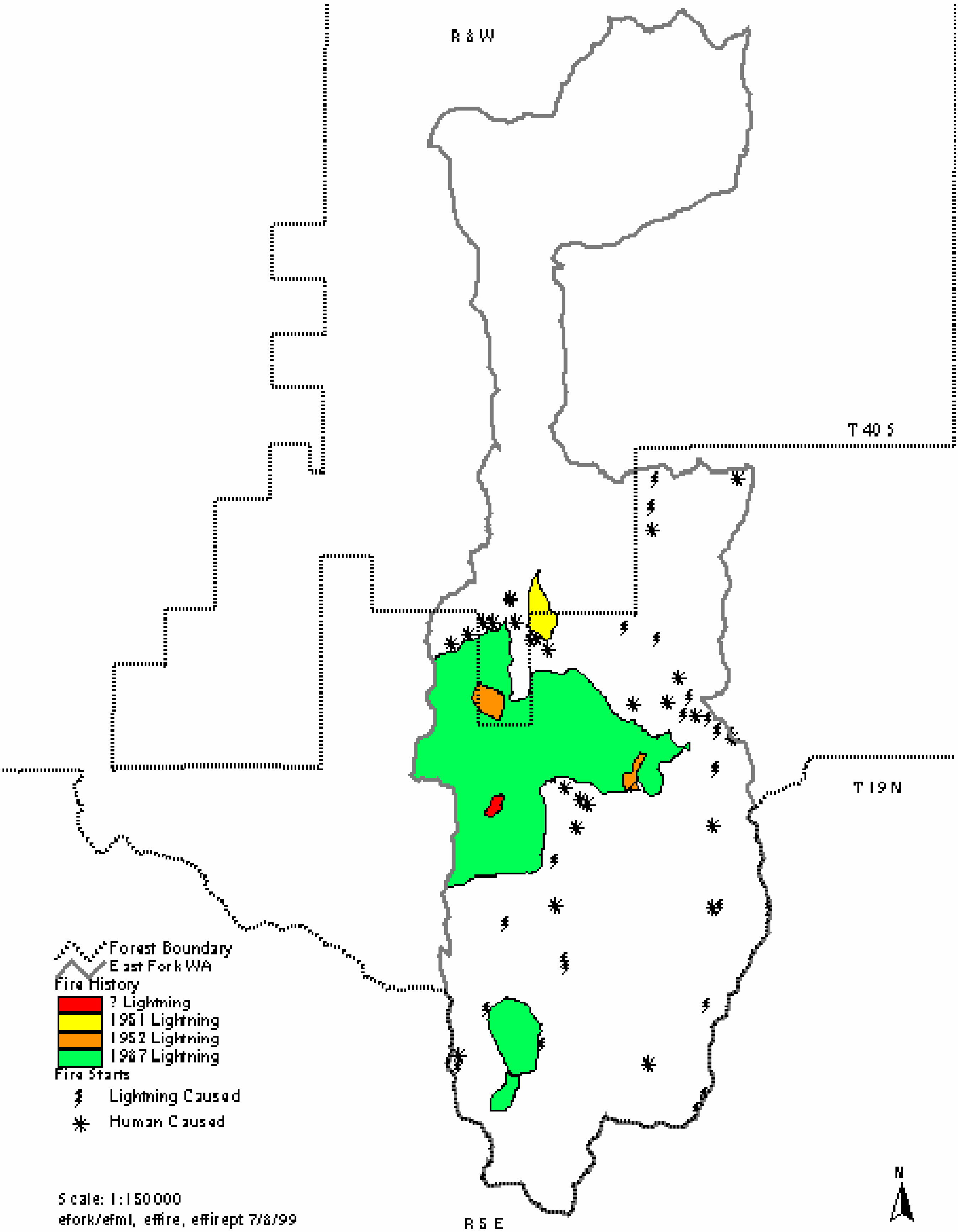
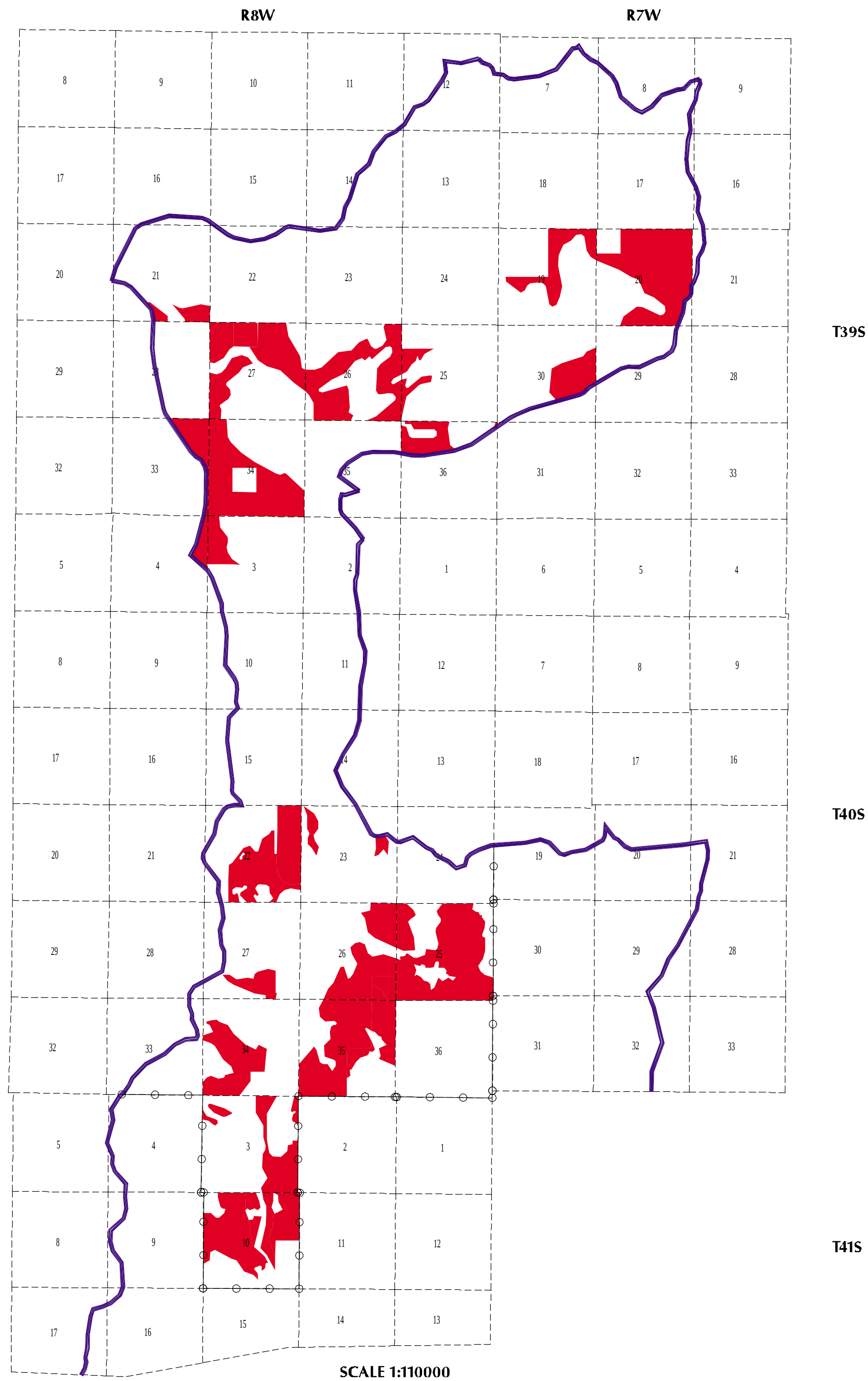
East Fork Watershed Analysis
Fire History





SCALE 1:110000

POTENTIAL HIGH PRIORITY HAZARD REDUCTION TREATMENT AREAS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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LEGEND

Areas With High Ratings

WATERSHED BOUNDARY

USFS BOUNDARY

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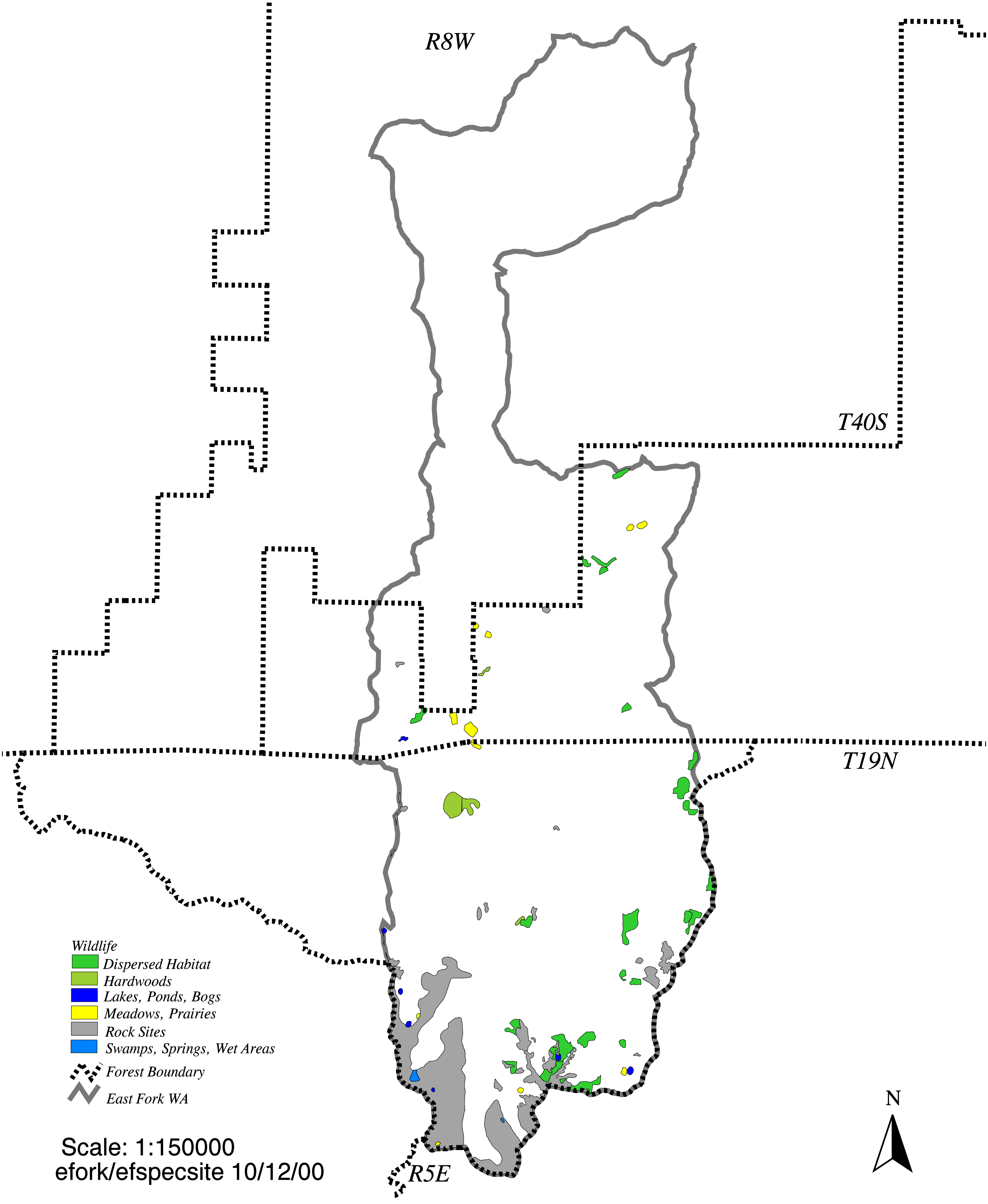
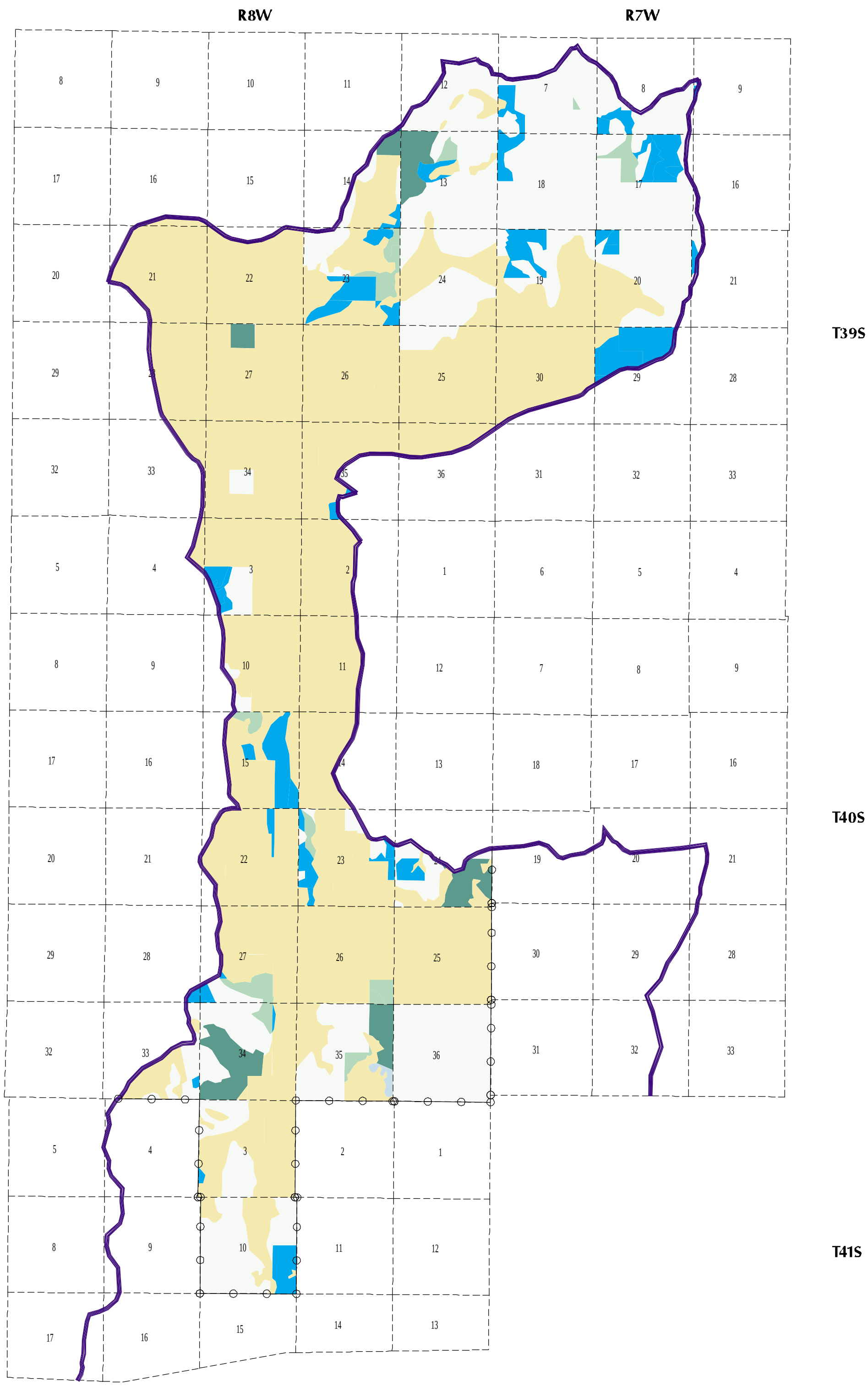
East Fork Watershed Analysis
Special Wildlife Areas





SCALE 1:110000

SPOTTED OWL HABITAT RATING ON LANDS OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

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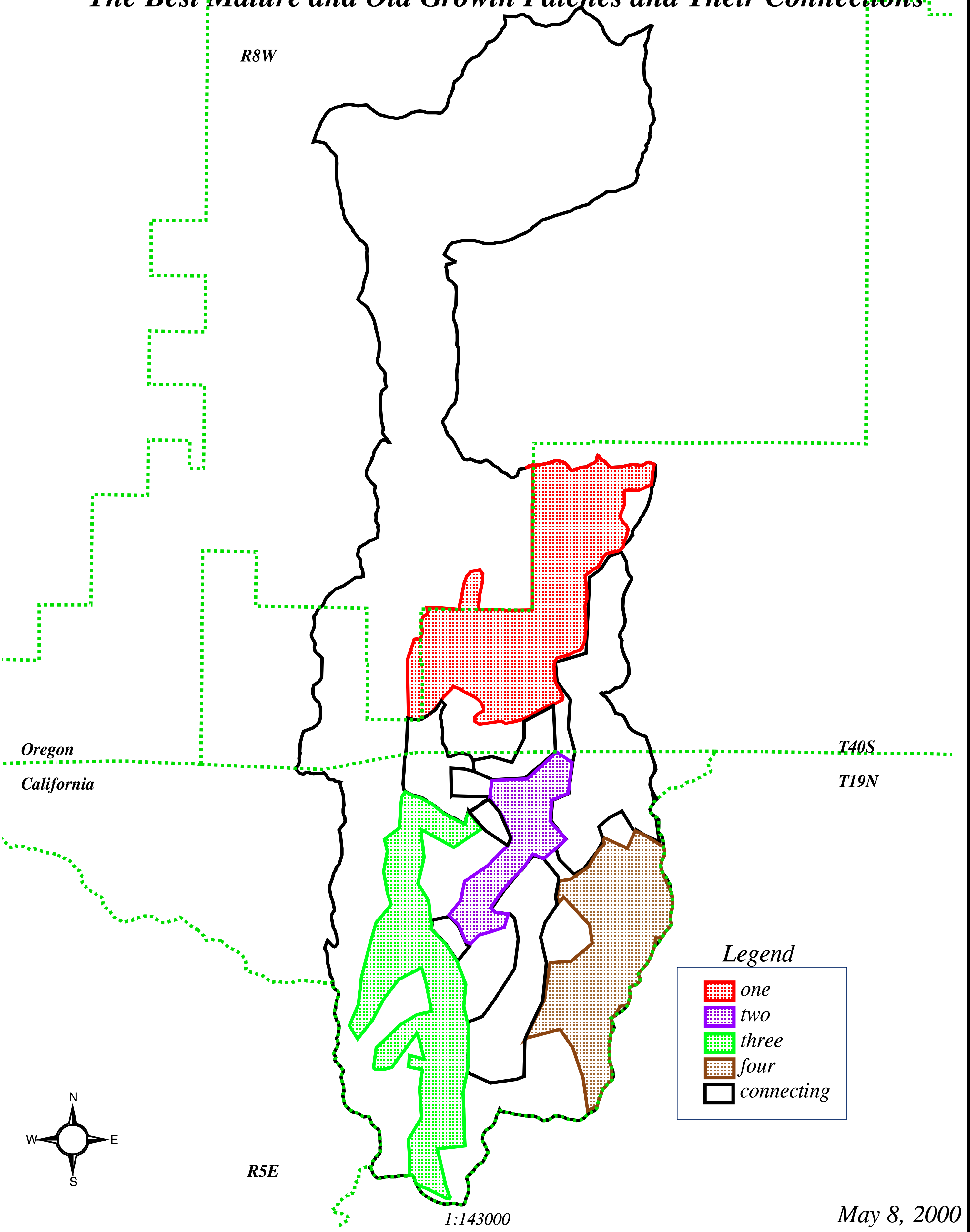
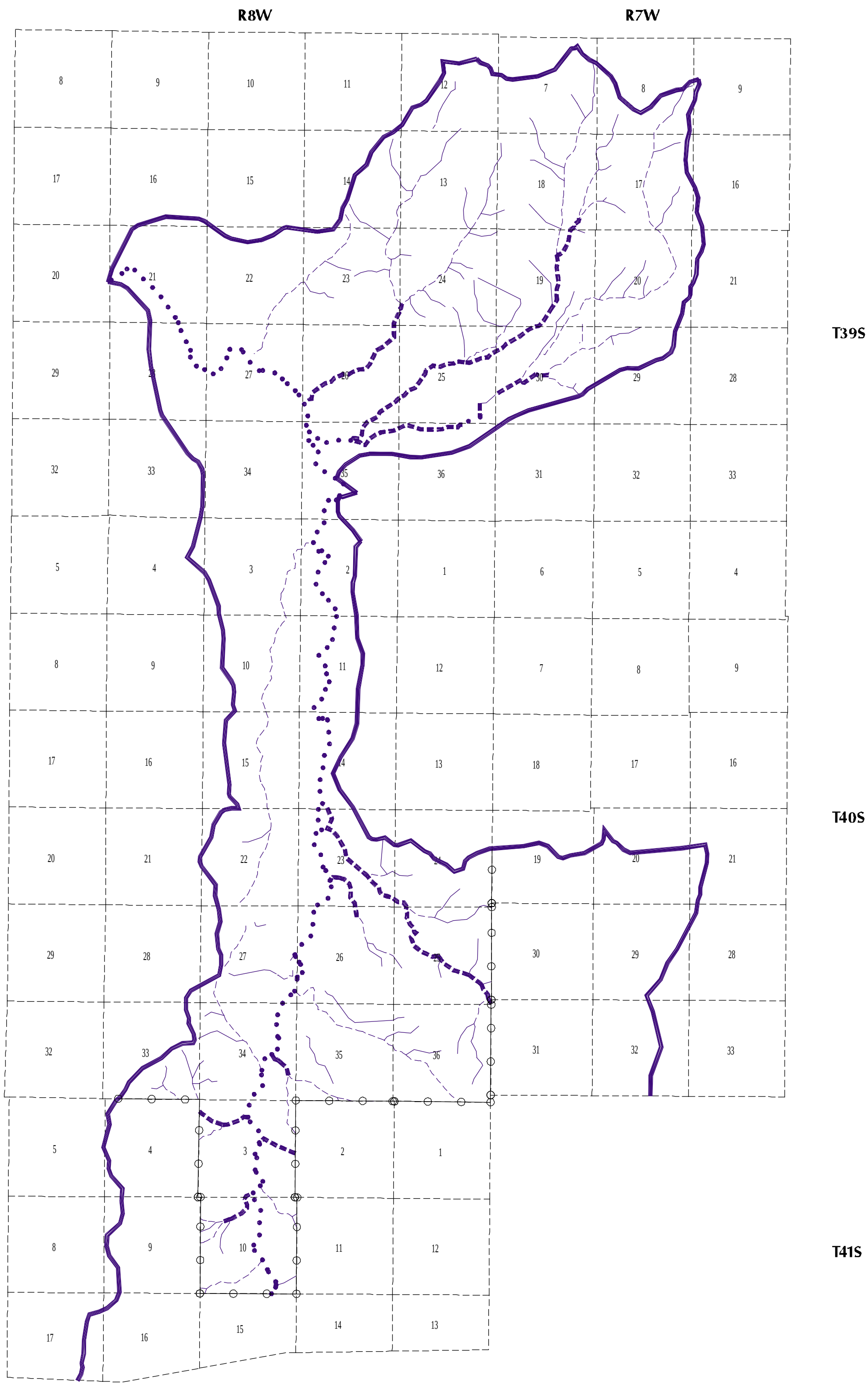
LEGEND

- NONVEG (Not Rated)
- (1) OPTIMAL
- (2) MEETS FORAGING, DISPERSAL, ROOSTING
- (3) MEETS NO REQUIREMENTS; HAS POTENTIAL TO BECOME 1 OR 2
- (4) MEETS NO REQUIREMENTS; NOT LIKELY TO BECOME 1 OR 2
- (5) DISPERSAL ONLY; HAS POTENTIAL TO BECOME 1 OR 2
- (6) DISPERSAL ONLY; NOT LIKELY TO BECOME 1 OR 2
- WATERSHED BOUNDARY
- USFS BOUNDARY

N

East Fork Illinois Watershed
The Best Mature and Old Growth Patches and Their Connections





SCALE 1:110000

STREAM ORDERS (> 1) OUTSIDE THE USFS BOUNDARY IN THE EAST ILLINOIS WATERSHED

LEGEND

- ORDER 2
- ORDER 3
- ORDER 4
- ORDER 5 to 7
- WATERSHED BOUNDARY
- USFS BOUNDARY

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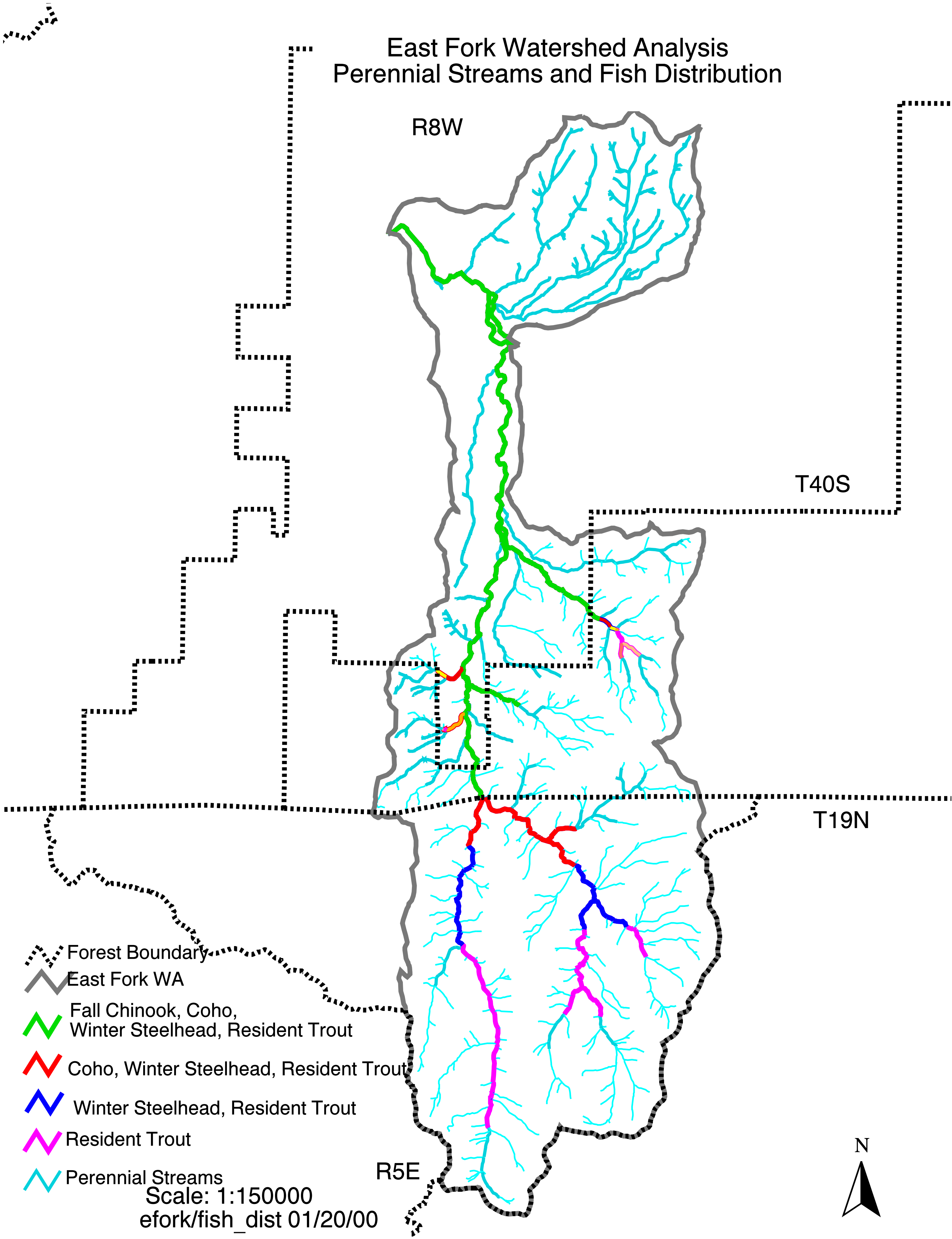
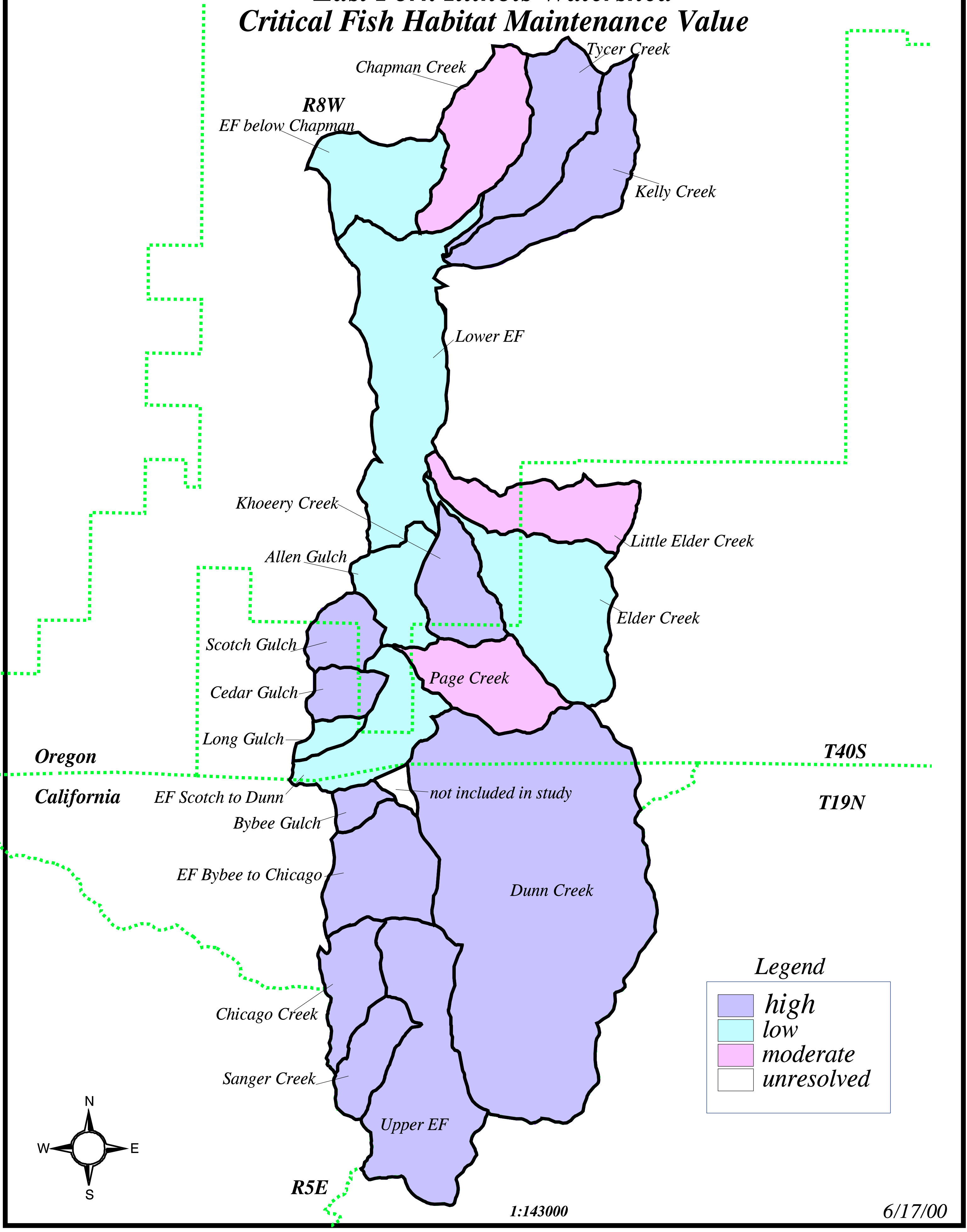
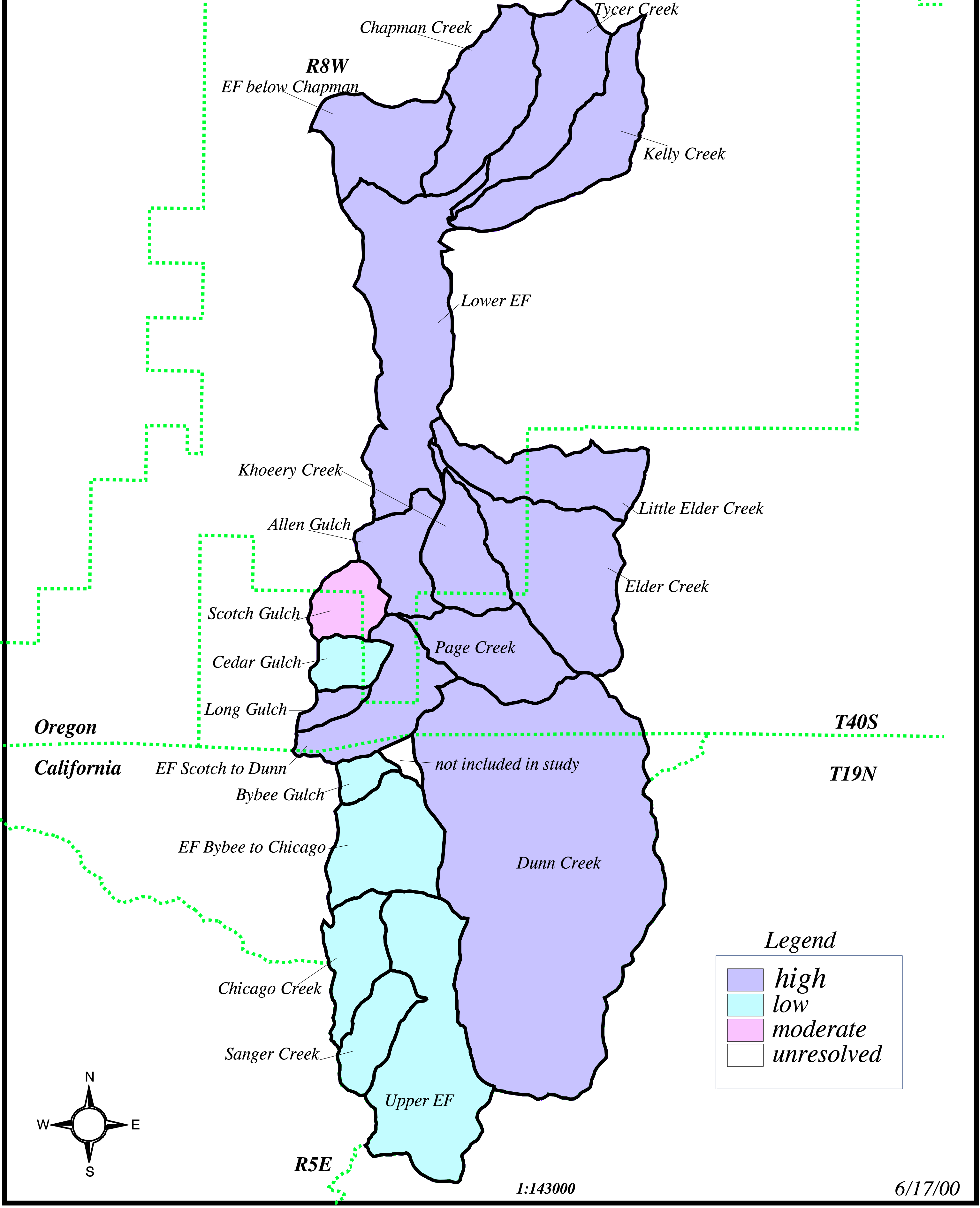

East Fork Watershed Analysis
Perennial Streams and Fish Distribution
R8W
T40S
T19N
R5E
Forest Boundary
East Fork WA
Fall Chinook, Coho,
Winter Steelhead, Resident Trout
Coho, Winter Steelhead, Resident Trout
Winter Steelhead, Resident Trout
Resident Trout
Perennial Streams
Scale: 1:150000
efork/fish_dist 01/20/00
N

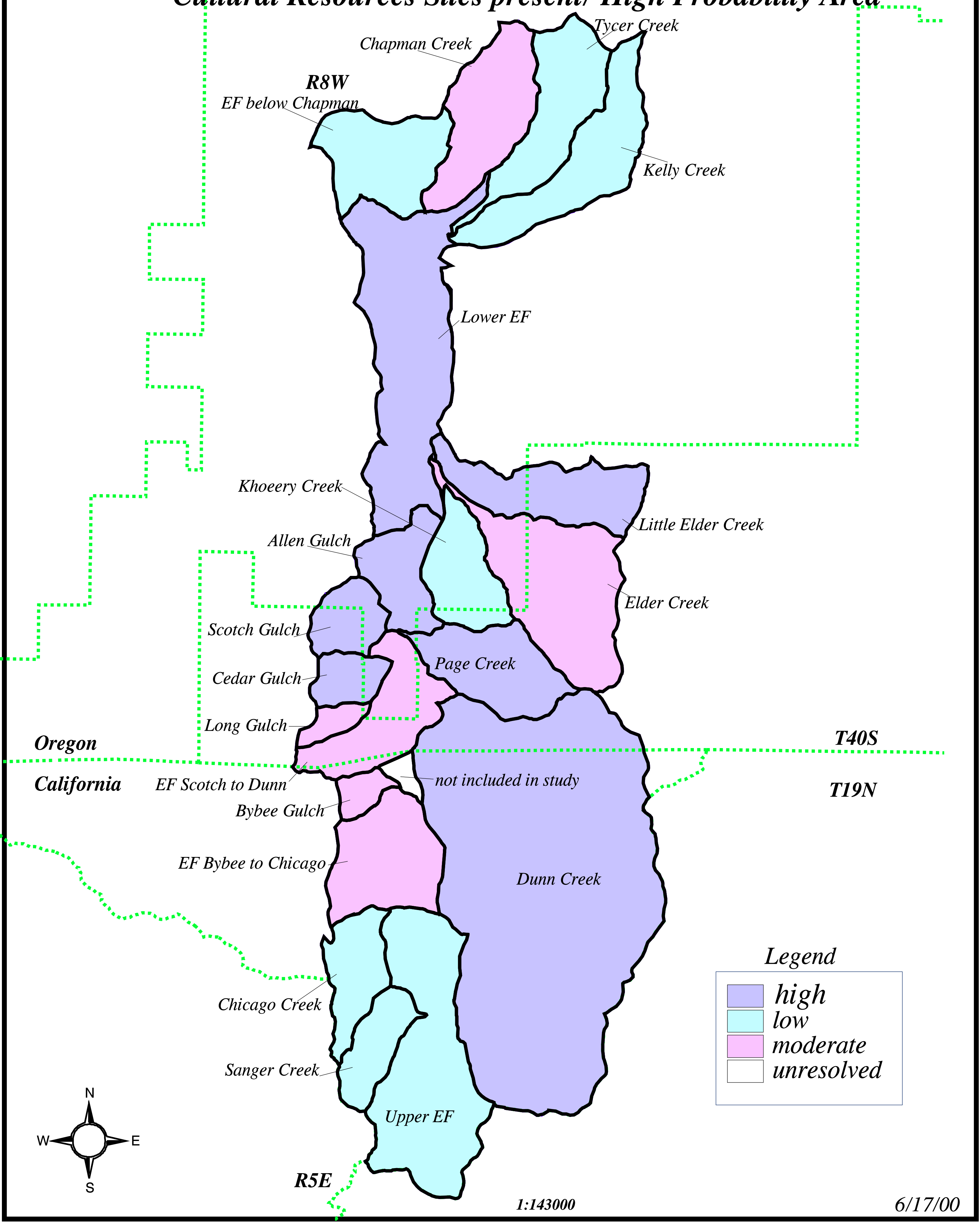
East Fork Illinois Watershed
Critical Fish Habitat Maintenance Value



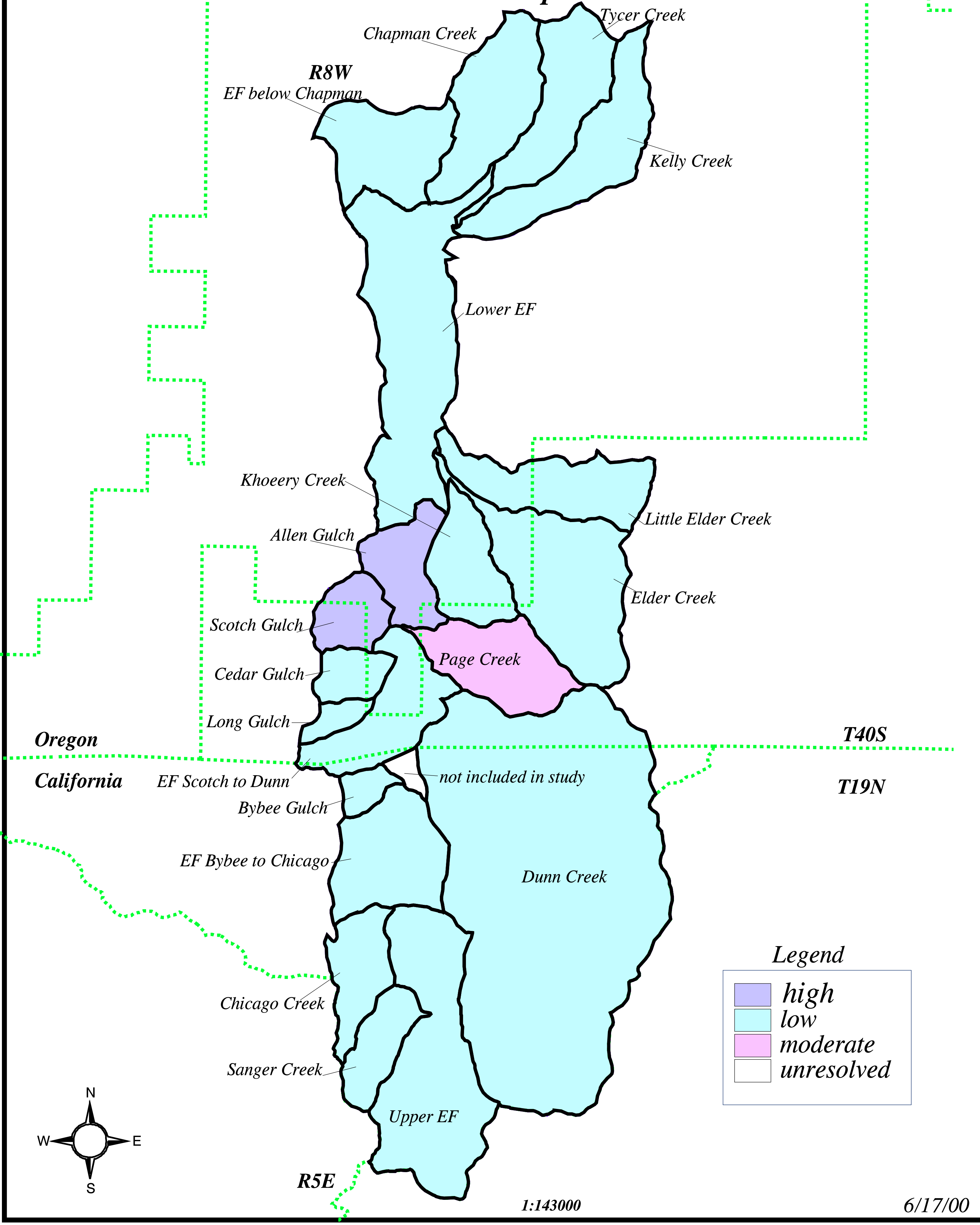
East Fork Illinois Watershed
Critical Fish Habitat Restoration Value



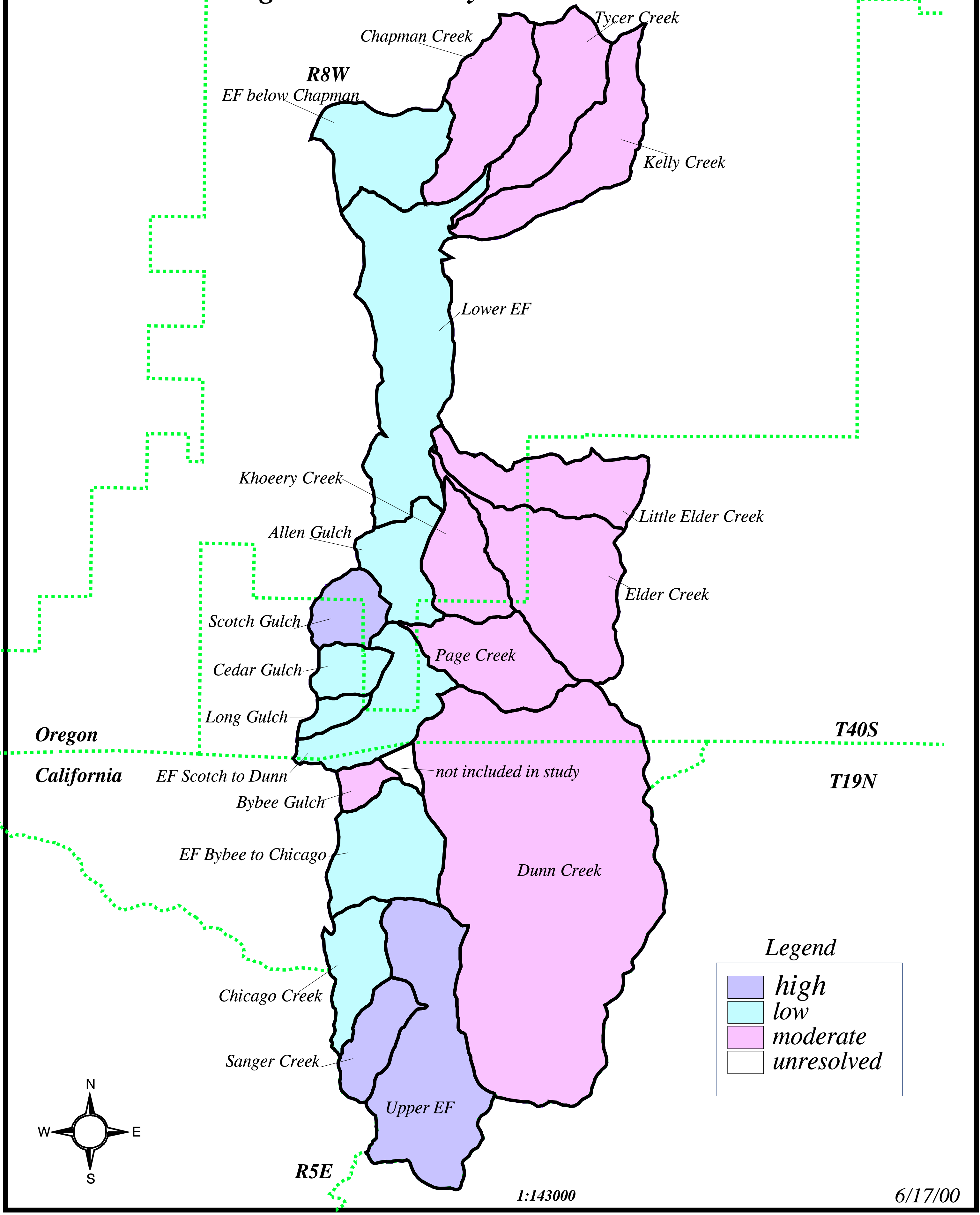
East Fork Illinois Watershed
Cultural Resources Sites present/ High Probability Area



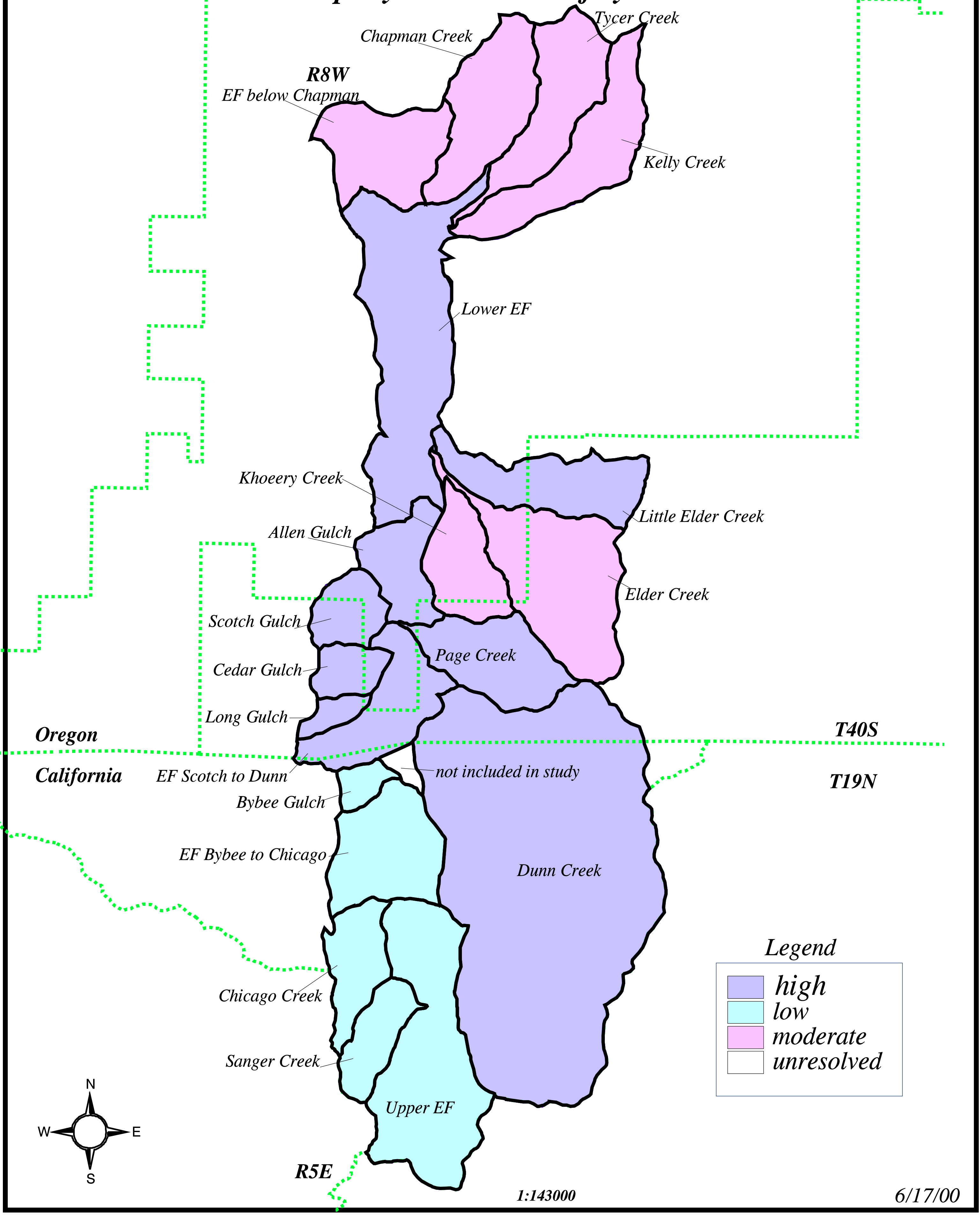
East Fork Illinois Watershed
Cultural Resources Interpretation Value



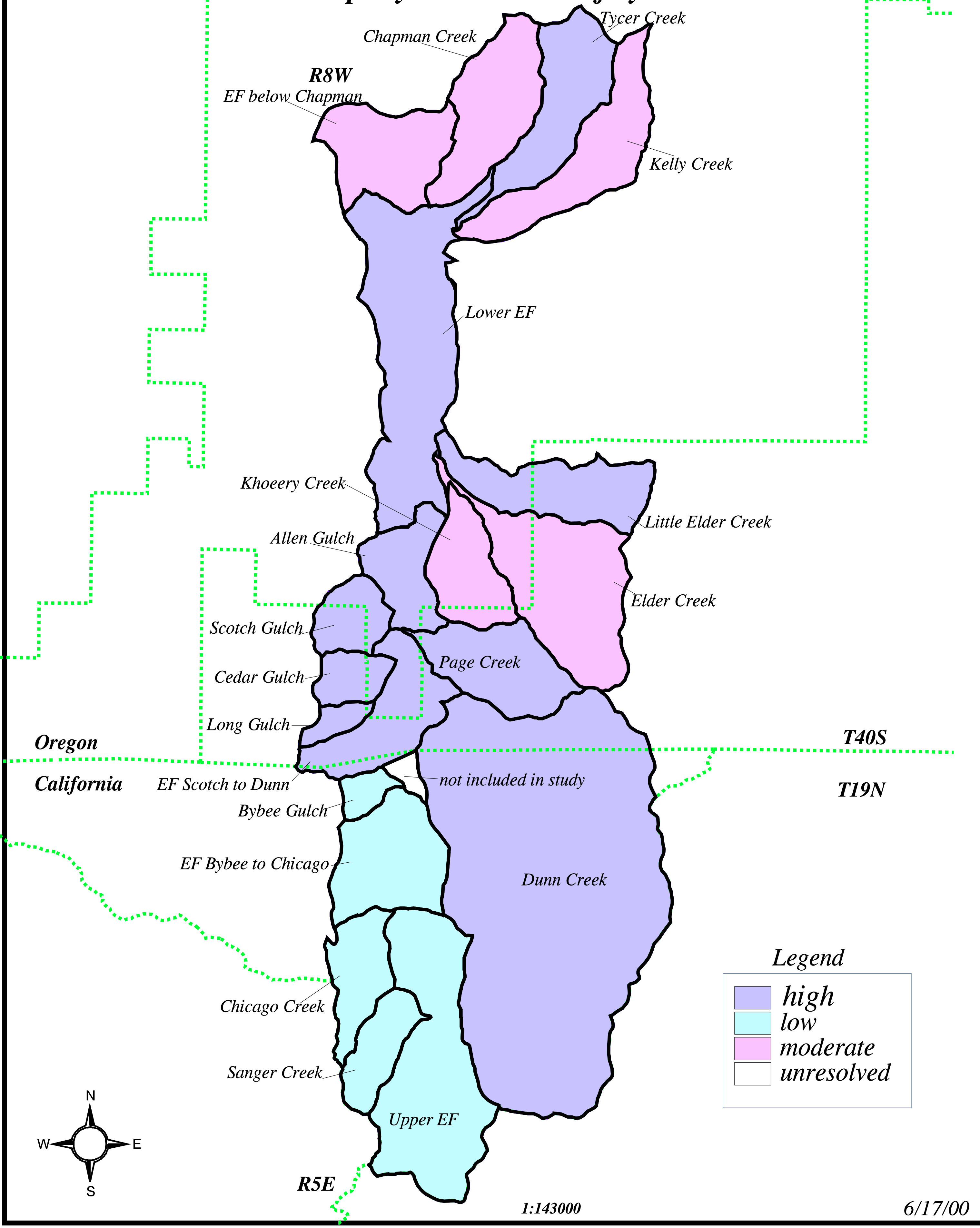
East Fork Illinois Watershed
Large Wood Delivery Potential Maintenance Value

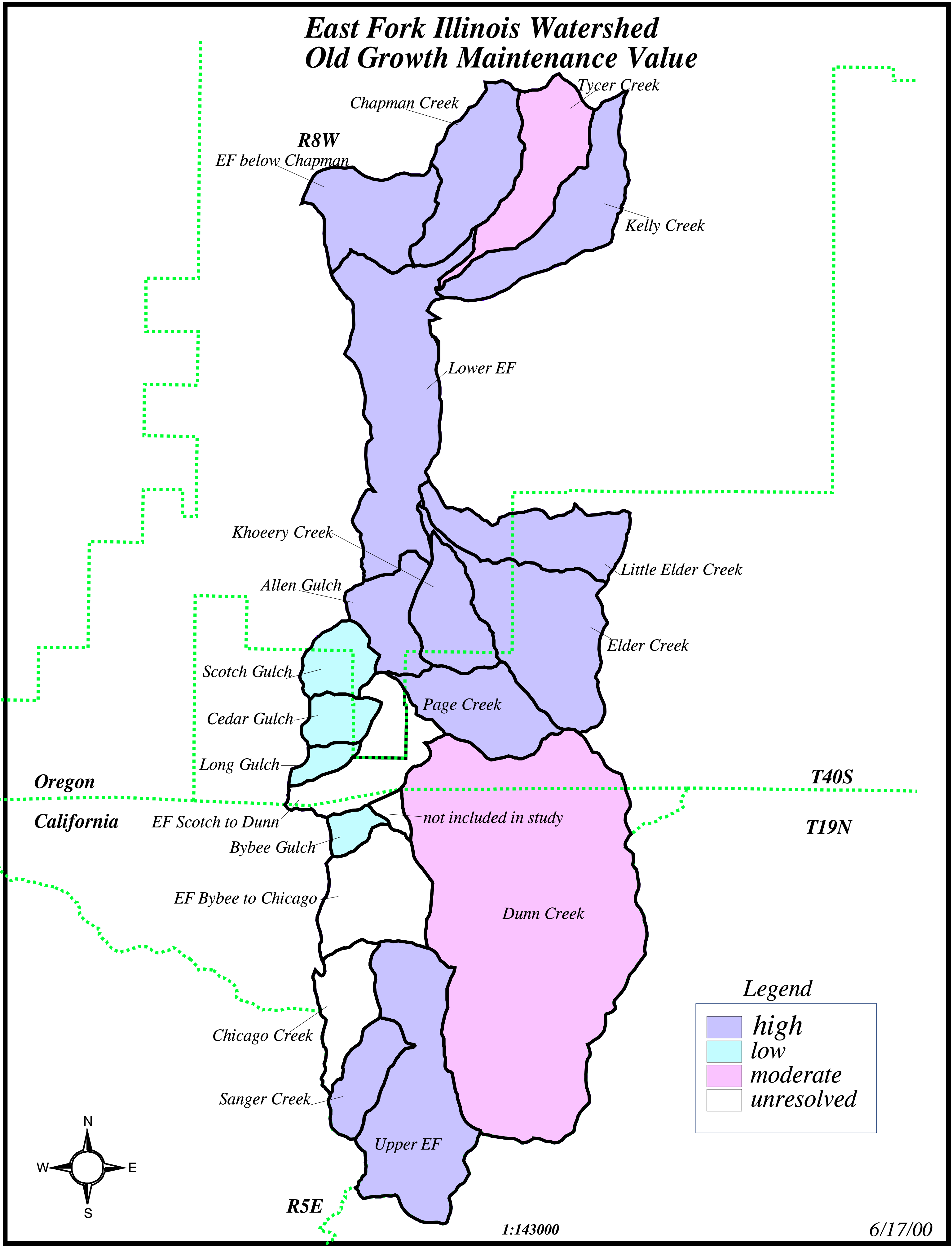


East Fork Illinois Watershed
Private Property and Public Safety Maintenance Value

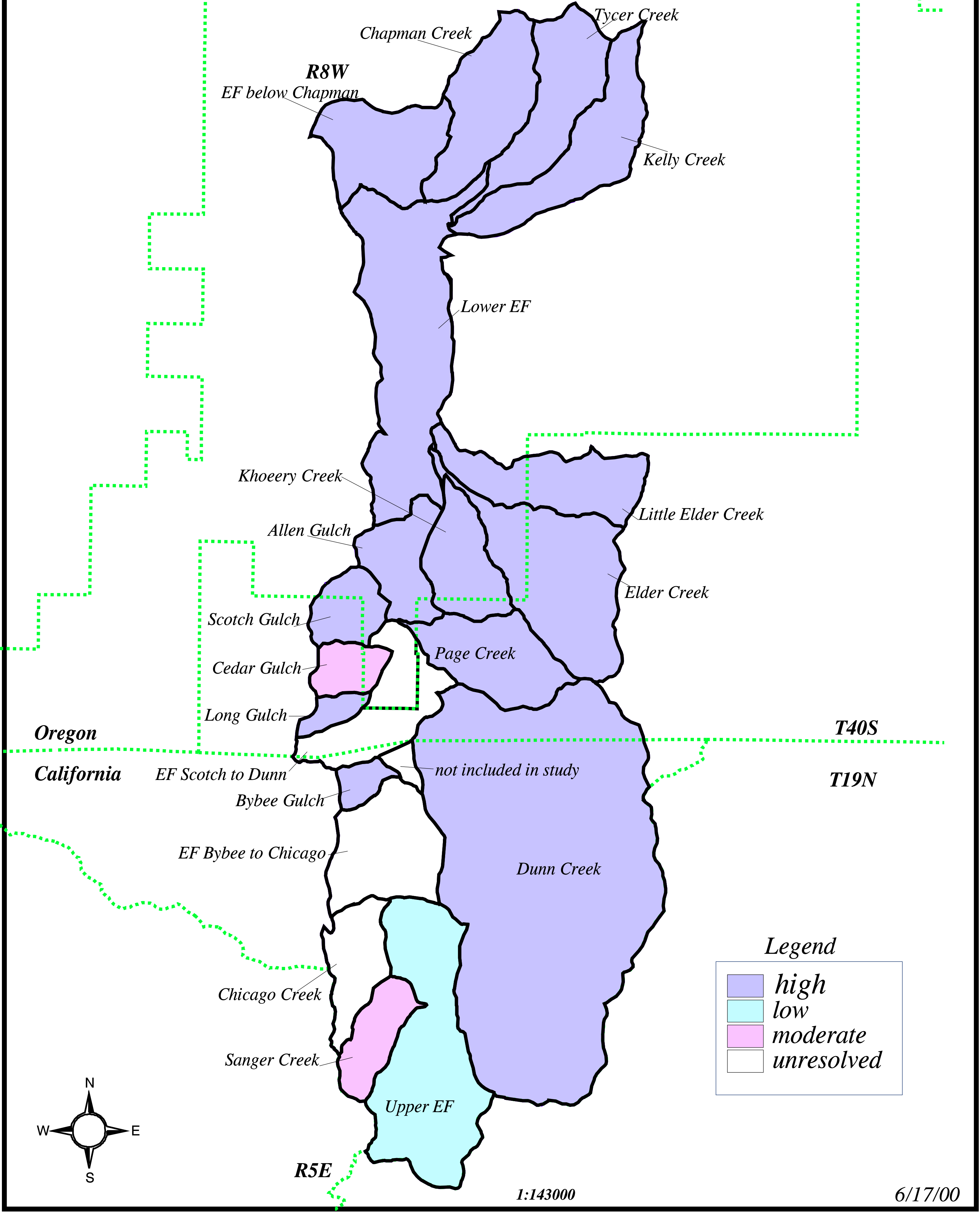


East Fork Illinois Watershed
Private Property and Public Safety Restoration Value

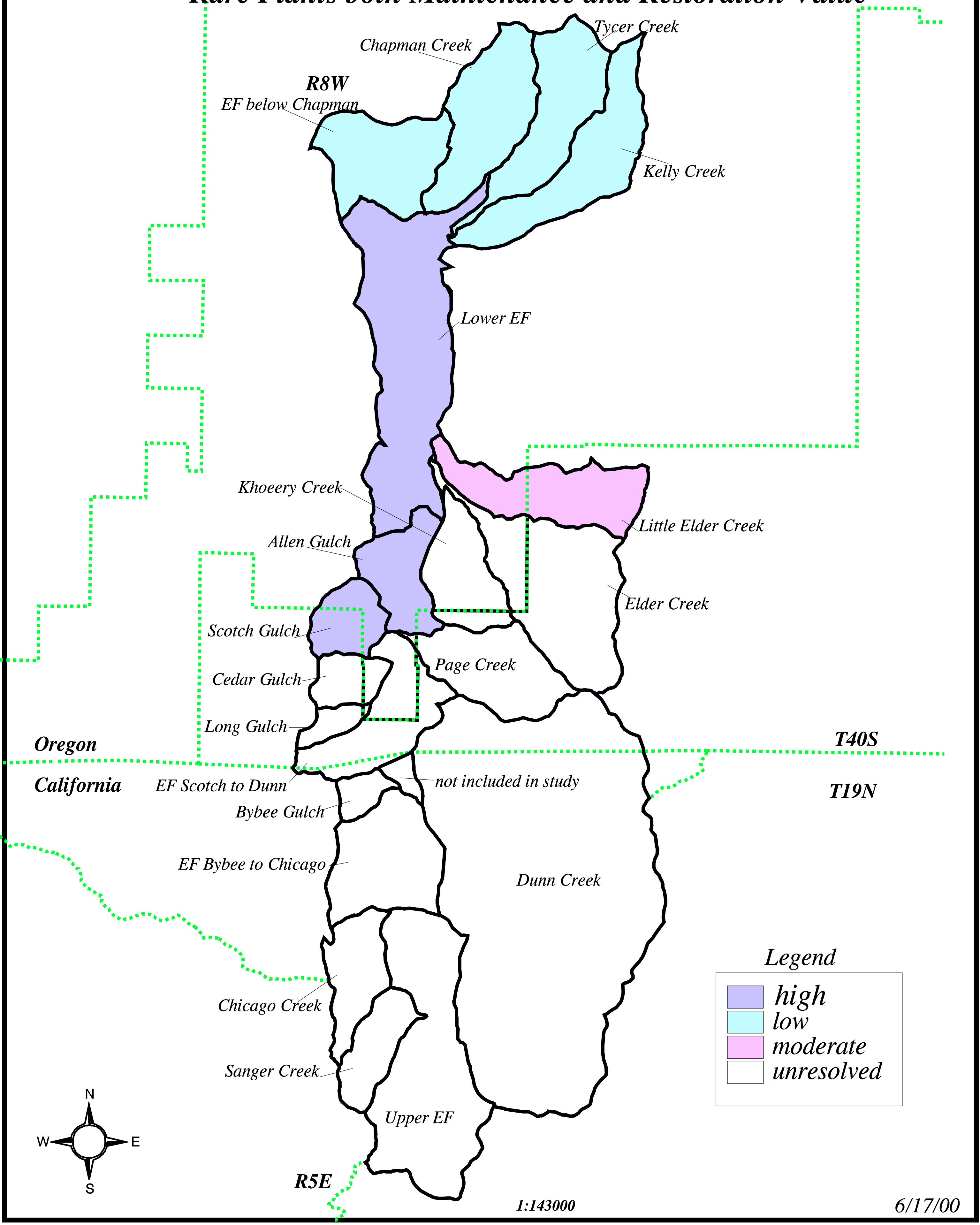



East Fork Illinois Watershed
Old Growth Maintenance Value
Tycer Creek
Chapman Creek
R8W
EF below Chapman
Kelly Creek
Lower EF
Khoeery Creek
Little Elder Creek
Allen Gulch
Elder Creek
Scotch Gulch
Page Creek
Cedar Gulch
Long Gulch
Oregon
T40S
California
EF Scotch to Dunn
not included in study
T19N
Bybee Gulch
EF Bybee to Chicago
Dunn Creek
Legend
high
low
moderate
unresolved
Chicago Creek
Sanger Creek
N
W
E
S
Upper EF
R5E
1:143000
6/17/00

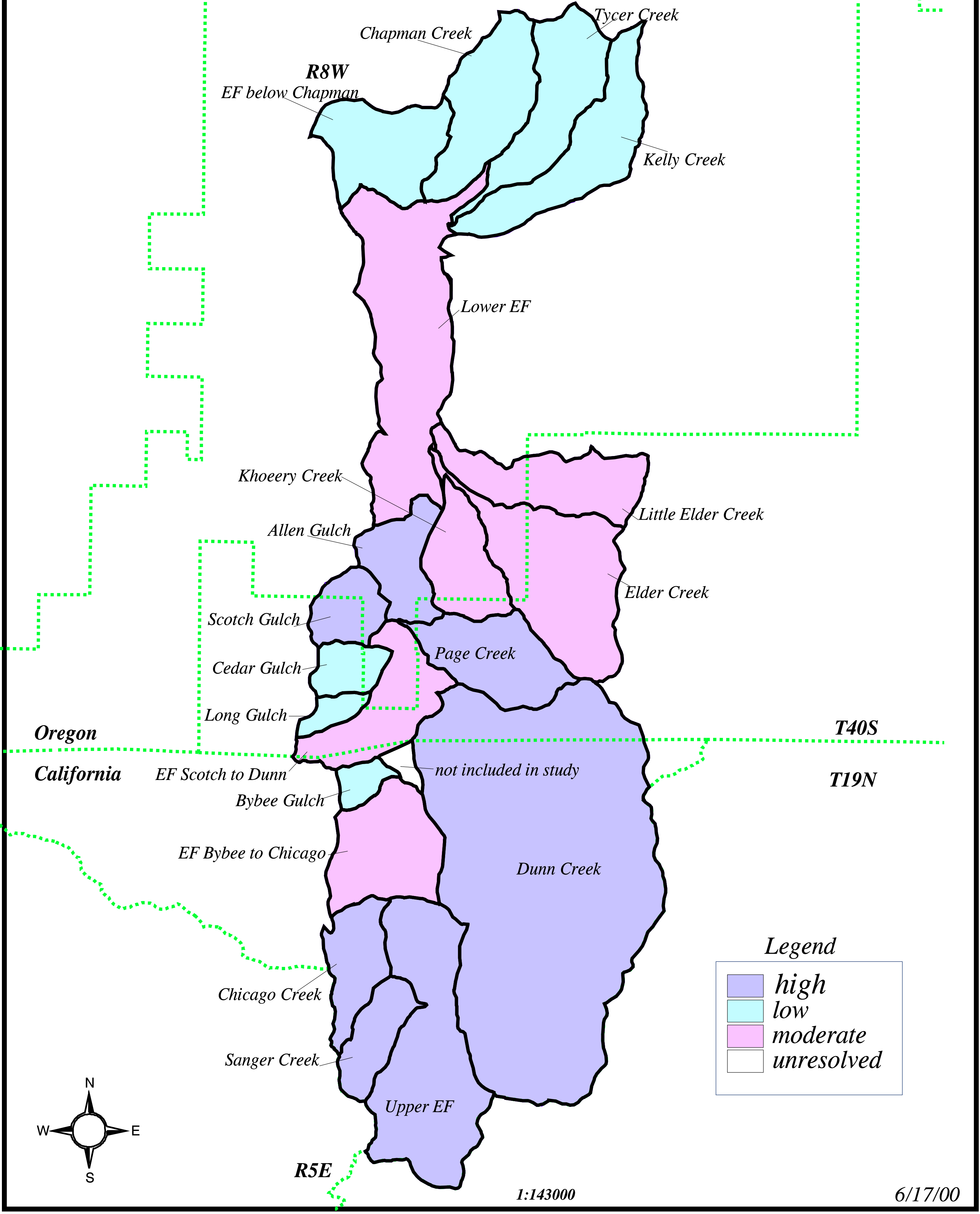
East Fork Illinois Watershed
Old Growth Restoration Value

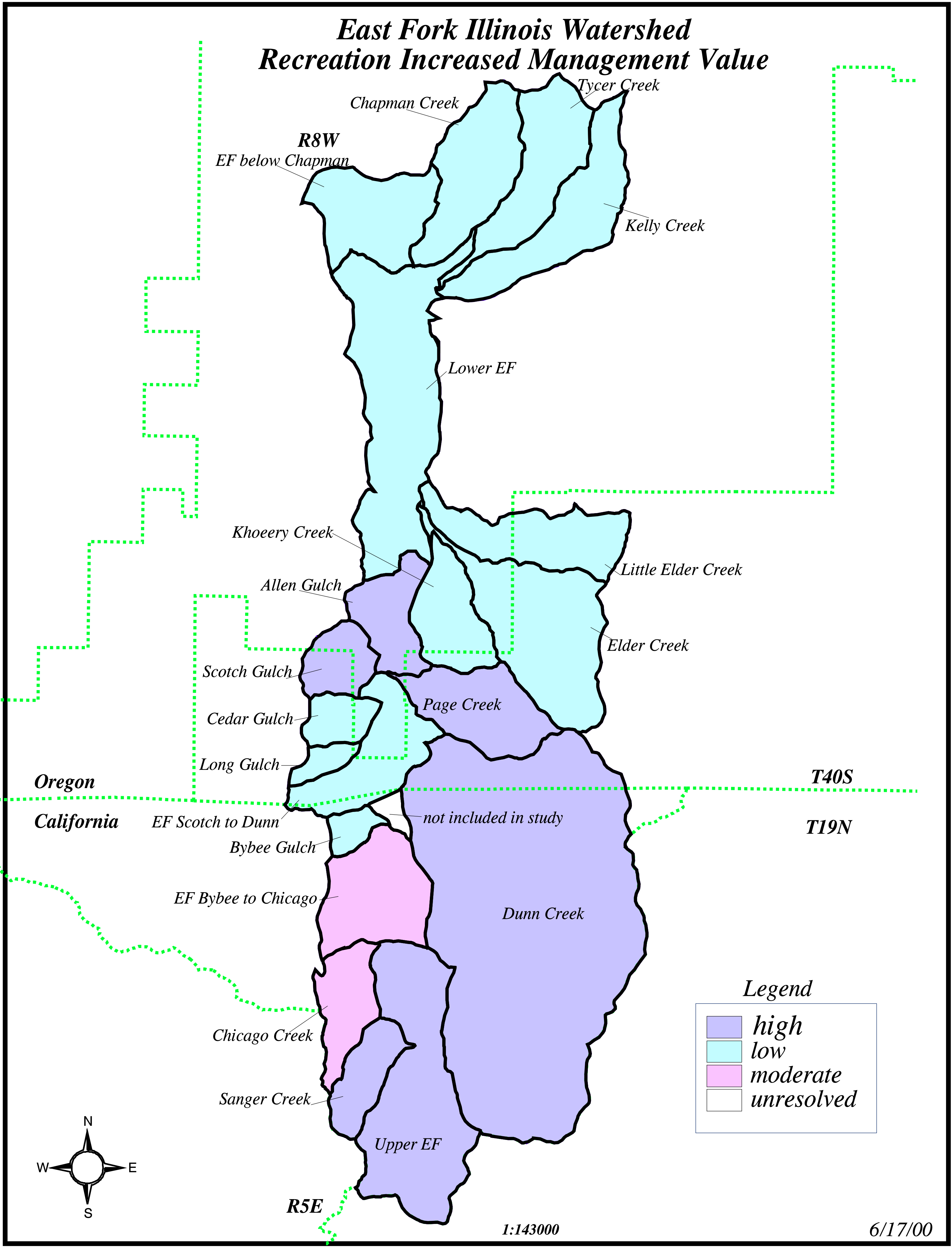


East Fork Illinois Watershed
Rare Plants both Maintenance and Restoration Value

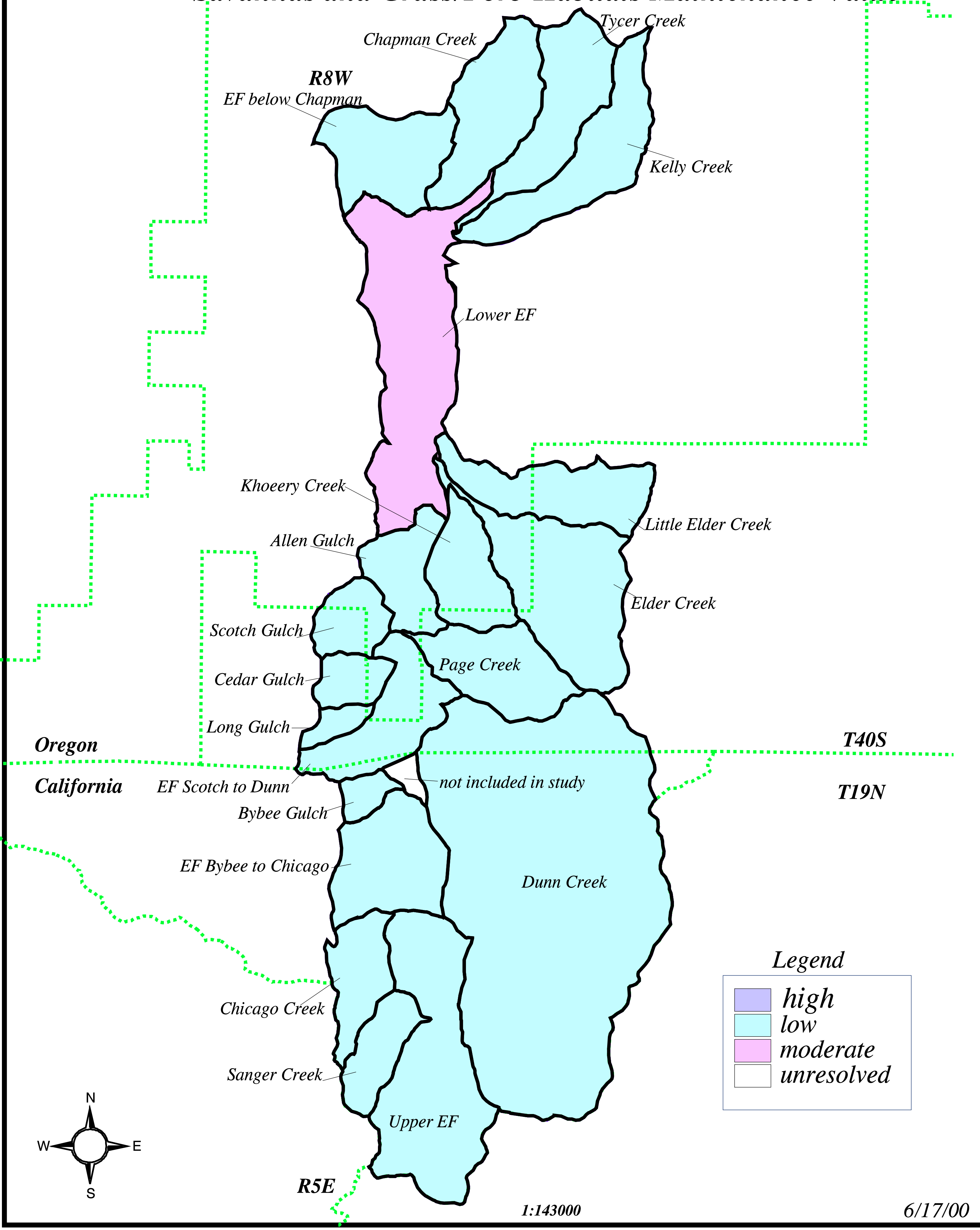


East Fork Illinois Watershed
Recreation Use Value

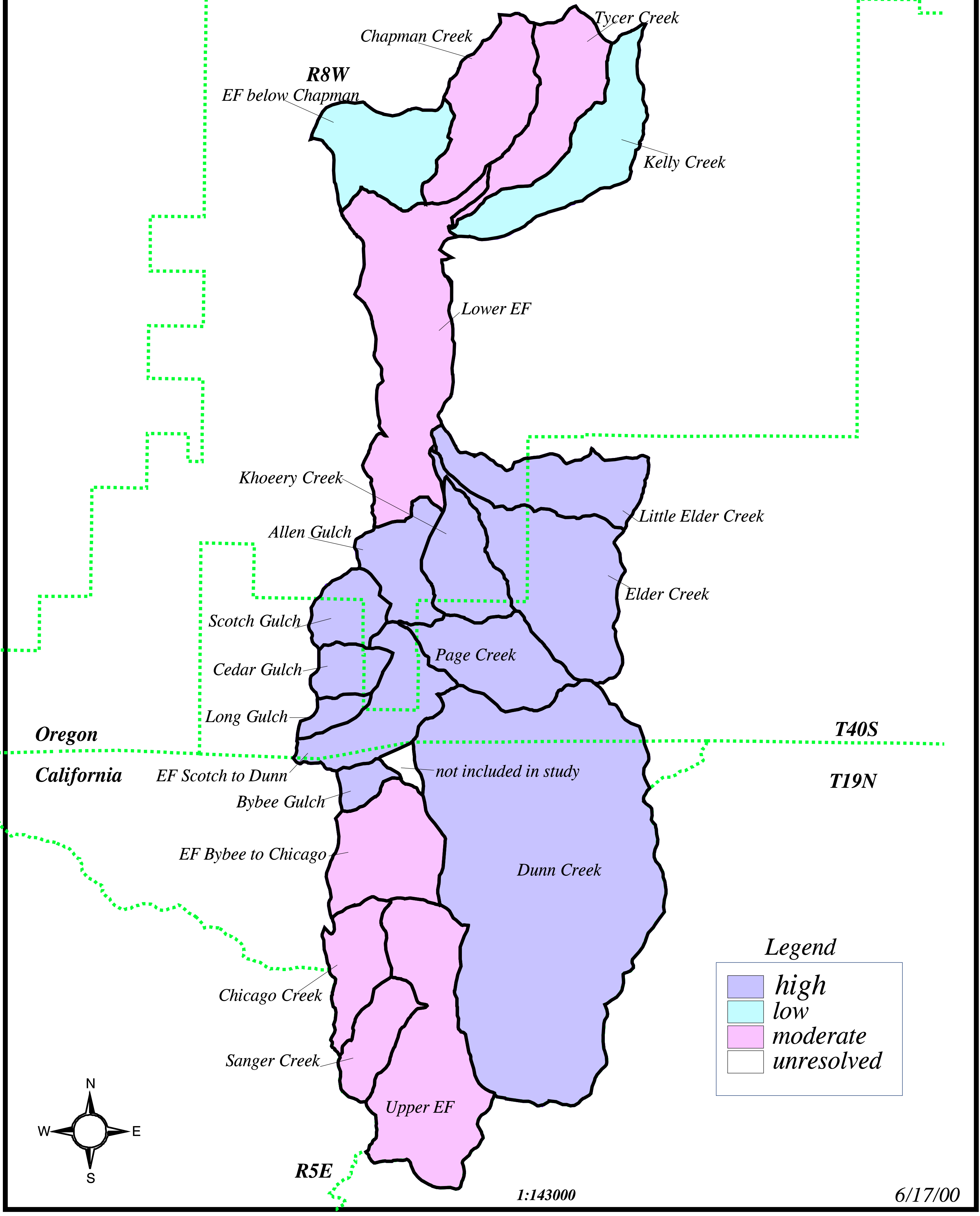



East Fork Illinois Watershed
Recreation Increased Management Value
Tycer Creek
Chapman Creek
R8W
EF below Chapman
Kelly Creek
Lower EF
Khoeery Creek
Little Elder Creek
Allen Gulch
Elder Creek
Scotch Gulch
Page Creek
Cedar Gulch
Long Gulch
Oregon
T40S
California
EF Scotch to Dunn
not included in study
T19N
Bybee Gulch
EF Bybee to Chicago
Dunn Creek
Legend
high
low
moderate
unresolved
Chicago Creek
Sanger Creek
N
W
E
S
Upper EF
R5E
1:143000
6/17/00

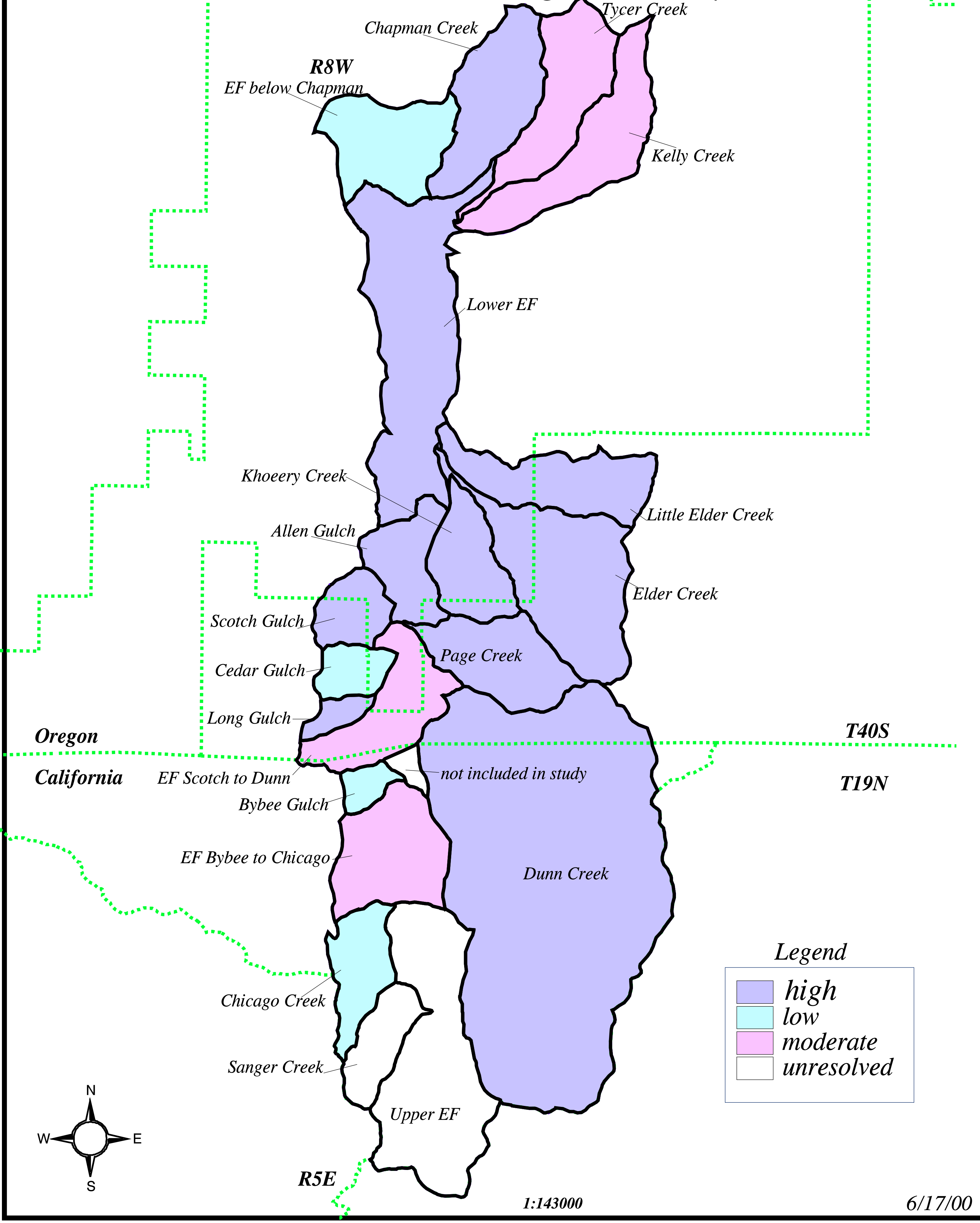
East Fork Illinois Watershed
Savannas and Grass/Forb Habitats Maintenance Value



East Fork Illinois Watershed
Savannas and Grass/Forb Habitats Restoration Value



East Fork Illinois Watershed Analysis
Resource Value Ratings BLM-FS Synthesis



6/17/00