

The Underlying Causes and Impacts of Fires in South-east Asia

Fire and Landscape in Sanggau, West Kalimantan, Indonesia



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Table of Contents

Page No.

1. INTRODUCTION.....	1
2. SITE AND REGIONAL CONTEXT (SOCIAL ASPECTS IMPORTANT TO LANDSCAPE).....	5
3. METHODS – RESEARCH APPROACH.....	20
3.1 GENERAL BACKGROUND FOR THE SANGGAU STUDY SITE.....	20
3.2 ASSUMPTIONS	21
3.3 RESEARCH STEPS	23
4. FINDINGS AND THEIR SIGNIFICANCE.....	29
4.1 GENERAL SUMMARY	29
4.2 LIMITATIONS OF FINDINGS AND COMBINING RESEARCH APPROACHES	30
4.3 TYPES OF FIRES DOCUMENTED	34
4.4 EXAMPLES OF FIRE TYPES FROM THE SANGGAU SITE.....	36
4.4.1 <i>Routine burning of swidden fields by members of village households, as part of “traditional” smallholder shifting cultivation/ agroforestry cycles with customary (<u>adat</u>) norms of practice and liability for damage; forest farmers may subsequently plant cleared areas in perennial tree crops (especially rubber): NOT generally cause for <u>local</u> concern</i>	<i>37</i>
4.4.2 <i>Fires deliberately set by village smallholders for shifting cultivation, but which escape their intended limits; escaped swidden fires considered accidental, arising despite actions that local community members consider responsible fire use; customary fines and repair of damages indicated under <u>adat</u> judgements are not necessarily enforced on the fire setter, even where damage to agroforestry property occurred.....</i>	<i>40</i>
4.4.3 <i>Escaped swidden fires due to <u>irresponsible</u> burning by village smallholders (includes fires affecting local community members’ land, plantation lands, degraded grassland or scrubland common property, or remnant natural forests), subject to customary sanctions against the fire setter in the case of local community lands; in principle subject to civil liability for damages to plantation trees</i>	<i>43</i>
4.4.4 <i>Fires set for hunting, with repeated burning causing long-term land degradation and formation of grasslands, fern mats, and slow-succession scrub forests; cause for longstanding disputes between adjacent communities.....</i>	<i>48</i>
4.4.5 <i>Extensive wildfires that burn grasslands that had been historically formed by repeated wildfires; specific causes of recent fires are unknown, but local people recognize high fire risks in these fire-prone areas of their community landscapes. (Some of these recent fires are complicated by contested rights with timber plantations, leaving a lack of effective responsibility for protection against fires in recently disputed areas).....</i>	<i>50</i>
4.4.6 <i>Fires set by plantation developers or outside contract labor to clear land, with burning contained within relatively uncontested boundaries (since 1995 such burning was illegal).....</i>	<i>58</i>
4.4.7 <i>Fires set by plantation developers or outside contract labor to clear land in areas of contested land rights, leading to potential for retaliatory action; subject to sanctions under local customary law; illegal since 1995.....</i>	<i>60</i>
4.4.8 <i>Fires that local people believe were set to intimidate them into ceding their customary land rights or other resources to plantation developers (corporate arson; this research did not substantiate any incident by accounts from plantation staff themselves, or by official investigation).....</i>	<i>61</i>
4.4.9 <i>Fires set by local customary landholders for land clearing prior to ceding their land to a plantation concession (burned using techniques similar to conventional swiddening, but often without traditional fire safety measures).....</i>	<i>66</i>
4.4.10 <i>Fires set by local customary smallholders for routine swidden land clearing, but which escape and burn adjacent commercial plantation trees.....</i>	<i>70</i>

4.4.11	<i>Fires set by local people in reoccupying plantation land previously ceded by customary owners; also fires set by village members and allowed to burn out of control, where community members assume they have no long-term stake in plantation trees once they have ceded their customary land to the plantation</i>	75
4.4.12	<i>Fires set by members of local communities to protest perceived injustice or unresponsiveness by plantation developers (protest arson; openly admitted in some cases, hidden in others)</i>	82
4.4.13	<i>Fires with unknown immediate causes, but located in areas locally understood to be fire prone, especially adjacent to customary borders</i>	83
4.5	COMMUNITY-BASED FIRE MANAGEMENT MEASURES.....	84
4.6	PLANTATION FIRE MEASURES.....	87
5.	UNDERLYING CAUSES AND IMMEDIATE CAUSES	90
6.	POLICY IMPLICATIONS AND SUGGESTIONS	95
7.	REFERENCES CITED	101
8.	REFERENCES	105
APPENDIX I:		106
APPENDIX II: GLOSSARY		107

FIGURE :

FIGURE 2-1	GENERAL MAP OF THE SANGGAU STUDY SITE	6
FIGURE 2-2	GOVERNMENT DESIGNATED USES AND CONCESSION AREAS, SANGGAU, WEST KALIMANTAN.....	8
FIGURE 2-3	EASTERN JANGKANG/WESTERN BELITANG, LANDSAT TM IMAGE, 16 SEPTEMBER 1991	11
FIGURE 2-4	EASTERN JANGKANG/WESTERN BELITANG, LANDSAT TM IMAGE, 8 MARCH 2000	12
FIGURE 4-1	ESTIMATED LOCATION OF 1991 FIRE IN KERINTIK, TINTING BINDANG, AND BIAWAK (KECAMATAN BELITANG HILIR).....	41
FIGURE 4-2	NORTHEASTERN BELITANG HILIR SUB-DISTRICT AND SOUTHEASTERN JANGKANG SUB-DISTRICT.....	42
FIGURE 4-3	1991 AND 1999 FIRES IN MENTAWAI TEKAM, MENAWAI LINGKAU, AND TAPANG BAROH	45
FIGURE 4-4	INHUTANI III AND P.T. FINNANTARA INTIGA TIMBER PLANTATION AREA IN JANGKANG, AREA ALONG WESTERN BORDER OF BELITANG HILIR.	46
FIGURE 4-5	FIRE AFFECTED AREAS IN RESAK BALAI.....	46
FIGURE 4-6	FIRE AFFECTED AREAS IN BELITANG HILIR SUB-DISTRICT.....	51
FIGURE 4-7	SOUTHEASTERN BELITANG HILIR, LANDSAT TM IMAGE, 16 SEPTEMBER 1991.....	62
FIGURE 4-8	SOUTHEASTERN BELITANG HILIR, LANDSAT TM IMAGE, 8 MARCH 2000	63
FIGURE 4-9	CONCESSION BOUNDARIES AND AREAS PLANTED BY P.T. FINNANTARA INTIGA, JULY 2000.....	73
FIGURE 4-10	FELLING INHUTANI III TIMBER PLANTATION TREES IN PREPARATION FOR PLANTING SWIDDEN FIELD ON THIS SITE; REOCCUPATION OF TIMBER PLANTATION LAND BY PEOPLE OF SUNGEI OMANG AND SEBUDA VILLAGE (IN <i>DESA SAPE</i>), JULY 2000.....	76
FIGURE 4-11	HOT-SPOTS 1998 AND 1999.....	78

TABLE:

TABLE 2-1	POPULATION IN WEST KALIMANTAN AND SANGGAU	13
TABLE 2-2	RECENT SANGGAU POPULATION ESTIMATES	13

1. INTRODUCTION

The research on fire and landscape reported here was undertaken to improve understanding of underlying causes of “fire”, and of impacts of fire, interpreted in a context of landscape transformation in the long term. This research interprets fire events, and especially concentrations of unwanted fires, as particular moments within broader regional landscape history. Fieldwork for this research was conducted in West Kalimantan in the years 1999 and 2000.

The Sanggau study site represents a region of Kalimantan that has experienced a relatively low but significant incidence of uncontrolled fire, compared with this project’s other 7 sites. In one sense, the Sanggau site represents an encouraging “best case” fire scenario, since like other sites where fire has been more devastating, this region has also experienced rapid conversion of much of its land from indigenous agroforestry and primary forests to agroindustrial plantations during the 1980s and 1990s. However, understanding both the underlying and immediate causes of recent fires in Sanggau also warns that relying too heavily on *either* macro-level reforms in land allocation policy *or* on local and regional fire management initiatives would not effectively solve the complex combination of fire problems in this area.

Fire has long been very much a part of the landscape in this region, however, and has played major roles in landscape formation. The major source of food staples in the region’s rural indigenous communities remains shifting cultivation, and most indigenous households burn at least one field each year. Yet, customary and village-based incentives and social institutions to control fires used in shifting cultivation remain relatively intact in many areas, and sanctions against negligent burning continue to be recognized, even where they are not strictly enforced (where perpetrators of the worst uncontrolled fires may not actually pay all customary fines or compensate for all damage the fires cause). Several communities in the study area have embarked on efforts to update, reinforce, and codify customary rules and practical norms aimed at preventing the spread of wildfire. Also, the largest plantation in the region, an international joint venture pulpwood plantation, has attempted to maintain a “no burn” policy for land clearing since its inception in 1994. Overall, in this site the extreme drought of 1997 appears not to have been associated with the worst fires of the 1990s.

Instead, drought years 1991 and 1994, as well as politically and economically chaotic 1999 appear to have been worse fire years in this area. Landscape within this site has been profoundly transformed by changing land and resource uses during the 1990s, with fire an integral part of much of this transformation.

Contemporary landscapes in the Sanggau region of West Kalimantan have been formed in part by uses of fire and by fire accidents over centuries of human habitation. Yet over the past generation, and particularly during the 1990s, uses and abuses of fire have attracted particular attention from both inside and beyond the region. As debates about causes and results of landscape transformation in Kalimantan have become increasingly contentious, focused on deforestation and conversion of indigenous agroforestry uses to agroindustrial plantations fire is the most recent focus in continuing debates about appropriate uses of, and access to, land and resources. In West Kalimantan during the 1960s through the early 1980s, these debates focused on relative damages to the environment posed by logging versus those posed by shifting cultivation. By the late 1980s, large-scale plantation development and associated officially-sponsored transmigration (the state-sponsored population resettlement program) were added to the list of phenomena which proponents considered developmental boons to Kalimantan, but critics saw as social and ecological disasters – or disasters-in-the-making. These debates have colored analysis of both causes and consequences of fires in the 1990s, problematizing the increasing risks posed by uses and abuses of fire in contexts of rapidly changing ecological and political landscapes. Debates have become particularly explosive as they propose alternative approaches to reducing fire risks, and affecting the distribution of fire impacts, all with profound social and political consequences as well as ecological effects.

Most of Sanggau's indigenous Dayak populations have long taken for granted the need to burn their swidden fields as essential to their traditional agroforestry systems. Broadly-practiced safeguards against both escaped wildfire and land degradation due to overcultivation have long been integral parts of these systems. Indigenous communities and nongovernmental land rights advocacy organizations opposed the appropriation of customary rights lands for the establishment of commodity plantations, and resented the risks posed to their remaining customary property by large-scale burning as the cheapest means of landclearing for the rapidly expanding plantations.

Uses of fire that have long been fundamental to many of Kalimantan's "traditional" indigenous shifting cultivation and agroforestry systems have come under attack by developmentalist land managers in forestry, agricultural, and regional government bureaucracies. Many of these criticisms have tended to conflate all types of shifting cultivation and long rotation agroforestry into a single stereotype, assumed inevitably to result in felling of primary forests, and rapid degradation of land in shifting cultivation cycles. Recently, government administrators in Kalimantan have added disastrous wildfires to the long list of threats posed by to shifting cultivation, and the burning it entails, defining swiddening as backward and wasteful, practiced by "left behind" Dayak populations, and resulting in "wasted" timber, failure to maximize the land's production of commodities and revenue, and a degraded land base in need of "rehabilitation".

Only toward the end of the New Order (mid-1998) did introspection begin to alter these official positions, at the height of the "haze" caused by fires in Kalimantan and Sumatra, during late 1997 and early 1998. Indonesia's Ministry of Forestry and Estate Crops grudgingly accepted the hotspot/overlay analysis developed by BAPEDAL, within the Ministry of Environment, which suggested that most of the fires causing the smoke were located within timber, oil palm, and other plantation or land development concessions, and were assumed to be due to burning as part of large-scale land clearing operations.

Prompted by criticism from increasingly vocal Indonesian and international civil societies, and by international demands from neighboring Southeast Asian nations for Indonesia to end transborder pollution from smoke, several Indonesian and international bodies became adept at tracking the appearance of "hotspots" in remote sensing images, and overlaying locations of these hotspots on administrative maps and concession maps. While it became convenient to assume that any "hotspot" appearing within the borders of a plantation or timber concession indicated a fire set for commercial land clearing, reports from the field, and attempts to "ground truth" reports of fire events derived from "hot spot" location data quickly indicated that preventing and controlling fires in the future would require better understanding of underlying causes of these fires, as well as the more obvious immediate causes of their ignition and spread. In many cases, including those in Sanggau, causes and impacts are more complex than those indicated by a simple hotspot overlay. This investigation of fires over the past decade within part of Sanggau *Kabupaten* (District), West Kalimantan, aims to show

some of the complexity of these fire “stories”, and suggest that even in this small region, no single, uniform approach to fire management can be effectively applied to reduce risks of fires.

2. SITE AND REGIONAL CONTEXT (SOCIAL ASPECTS IMPORTANT TO LANDSCAPE)

The Sanggau study site represents a region of Kalimantan that experienced a significant incidence of uncontrolled fire during the 1990s, although fires were less destructive than in other areas during the 1997-98 period of concern. It appears that relatively fewer fires have spread out of control due to commercial plantation clearing, compared with the project's other 7 sites. Fires of concern have tended to be extensive than in other areas.

The Sanggau study site is located mainly to the north of the Kapuas River in West Kalimantan, in the southeast portion of *Kabupaten Sanggau* (Sanggau District). The entire "site" considered in this research is some 2234 square kilometers (see General Map of the Sanggau Study Site in **Figure 2-1**), and includes all of *Kecamatan Belitang Hilir* (Lower Belitang Subdistrict), the eastern portion of *Kecamatan Jangkang*, and northern *Kecamatan Mukok*. The delineation of this site permits study of a historically fire-prone swathe of land that spans the western border of Belitang, the eastern border of Jangkang, and northeastern Mukok. Running from north to south in the northern part of the site, between the Belitang and the Mengkiang watersheds (both tributaries to the Kapuas), is the cultural and historical political border between Mualang and Jangkang ethnic/language groups (*suku*, in Indonesian). The Sanggau study site represents a frontier of indigenous settlement and intensifying agroforestry land uses in the north, and a rapidly developing peri-urban area in the south.

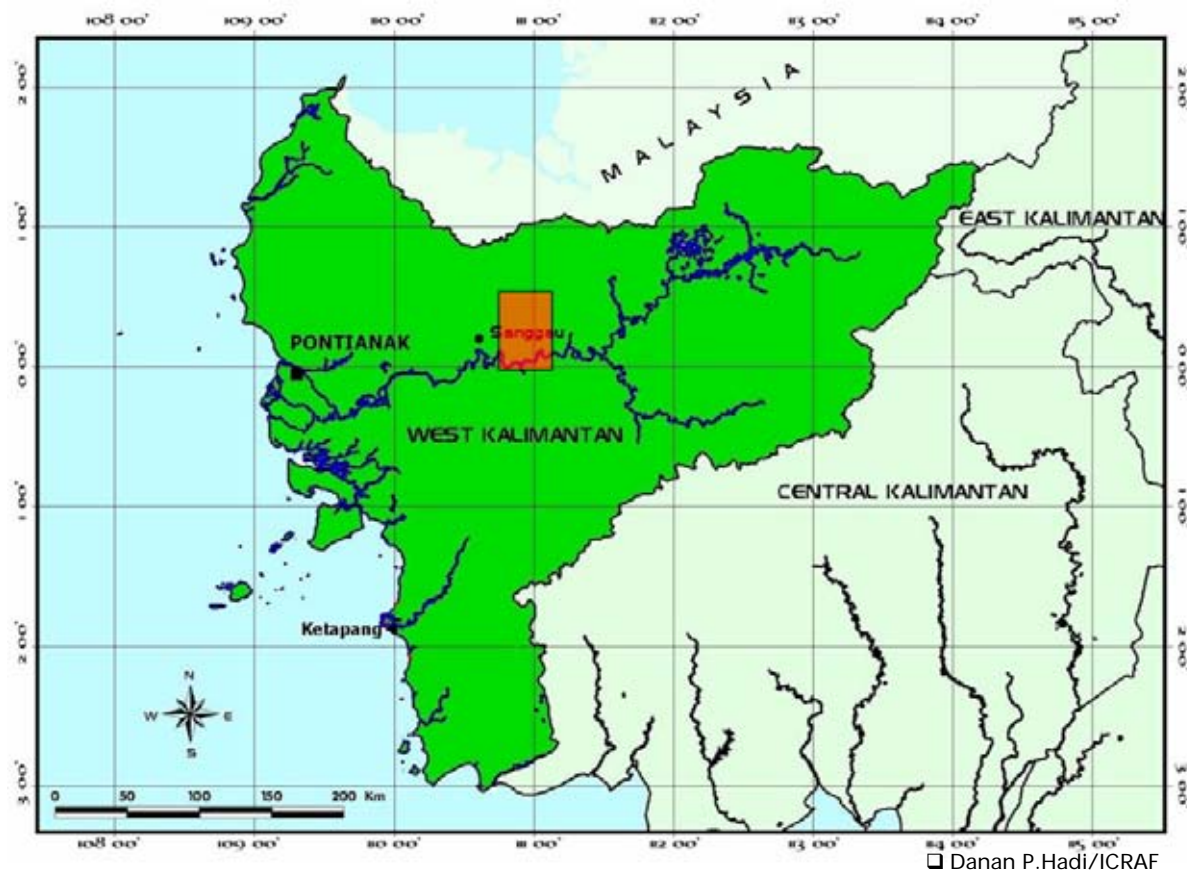


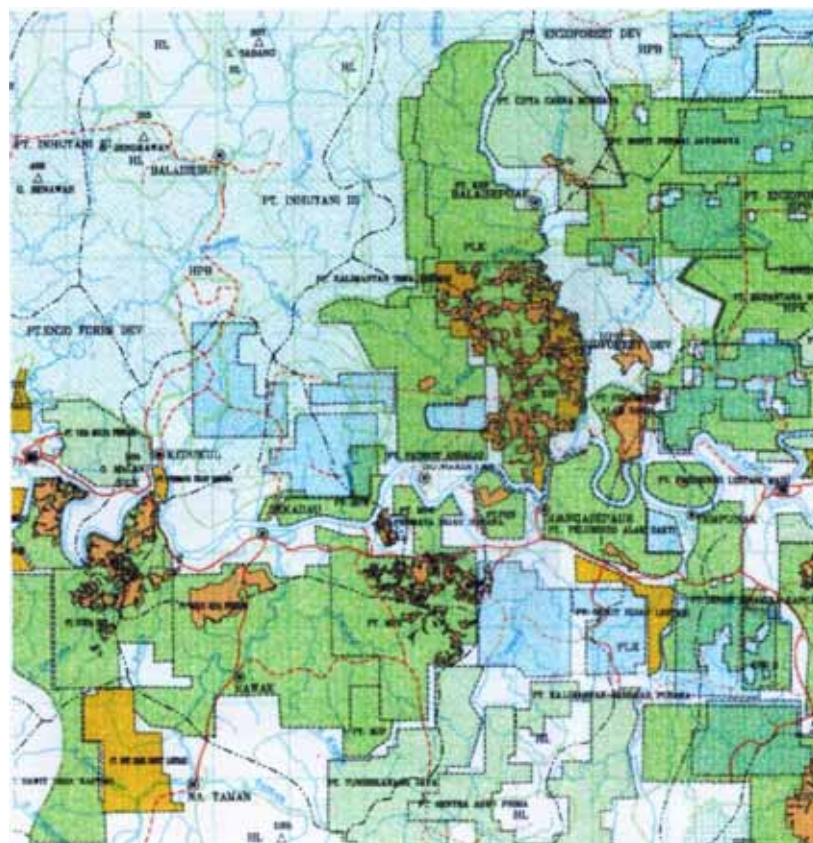
Figure 2-1 General Map of the Sanggau Study Site

Two areas within the Sanggau site were selected for more detailed study. One subsite for detailed research within the Sanggau study site encompasses *Kecamatan* (subdistrict) Belitang Hilir (which includes the former Ayak River Subdistrict) especially *Desa* (administrative villages) Menawai Tekam and Merbang, together covering some 206 square kilometers at the western side of the *Kecamatan*, and with a population of 3450 people in year 2000 (for a mean population density of 17 people per square kilometer, considerably below the Sanggau overall mean of 27 per square kilometer, which includes urban areas. (Spatial data were developed in cooperation with PPSDAK-Pancur Kasih in an area that lies between coordinates 110.82° East to 111.17° East, or UTM 49N480000 Meters East to UTM 49N520000 Meters East, and just north of the Equator at 0.009048° North to 0.30010° North, or UTM 1000 Meters North to UTM 42000 Meters North). The second subsite for detailed research within the Sanggau study site encompasses areas east of the Mengkiang River in *Kecamatan* Jangkang, focusing on *Kampung* Ensibau (*Desa* Semirau), and *Kampung* Sungei Omang and Sebuda (*Desa* Sape). Considerable information has also been obtained about the

timber plantation areas developed by P.T. Finnantara Intiga, and by P.T. Inhutani III, especially areas located between these two study subsites. Other areas that are part of the Sanggau site, but outside of either of these research subsites are addressed in a more general way.

The two *Desa* in the Belitang subsite that were subject to the most in-depth research in terms of underlying causes of fire from social and institutional perspectives are *Desa* (administrative village) Menawai Tekam, and *Desa* Merbang. Both of these Belitang *desa* had worked with research partner PPSDAK – Pancur Kasih, a regional nongovernmental organization, to develop community resource maps, and record village oral histories and other information about village resources. Organizations associated with Pancur Kasih have also been involved in other information-intensive work in this area, and have made much of this information available as background for the present research. The Jangkang subsite focuses on several *kampung* within two *desa* (Semirau and Sape), as well as the timber plantations, and includes areas that have been previously studied by Judith Mayer [Mayer 1996]. P.T. Inhutani III and P.T. Finnantara Intiga also provided extensive information about their operations for various research projects.

The *Kecamatan* Belitang Hilir study sub-site is comprised of 8 *Desa*, and 33 *Dusun*, based on current administrative designations, although this represents 51 “customary” villages, plus transmigration communities today [Suratmoko 2000]. The subsites of note in *Kecamatan* Jangkang include one *Dusun* each in *Desa* Semirau, and two in *Desa* Sape. Observations were also made in *Kecamatan* Mukok *Desa* Layak Omang, although no detailed village studies were conducted. All of these subsites border on areas that were developed as timber plantation during the 1990s by P.T. Inhutani III, and later by P.T. Finnantara Intiga. Each of these *Kecamatan* also includes Transmigration settlements, established mainly during the late 1980s, which have only recently been granted normal administrative status as permanent villages (rather than new transmigration settlements) relative to regional government matters. (See map of Government Designated Land Uses and Concession Areas, Sanggau, **Figure 2-2**.)



□ BPN Land Use Map for West Kalimantan, 1999

Figure 2-2 Government Designated Uses and Concession Areas, Sanggau, West Kalimantan

Elevations within the study site range from 10 meters to 75 meters above sea level. Rolling hills alternate with broad alluvial valleys running mainly from east to west within much of the Sanggau site. Hill soils are largely red-yellow podsolic, and organosols. They include soil complexes locally known as *Lawanguwang* on a base of shale, mudstone, and sandstone in hilly areas, and *Teweh* on a base of sandstone, shale, mudstone, and marl in sedimentary plains [RepProt 1987; Suratmoko 2000]. Many of the valleys include “*kerangas*” heath soils. *Kerangas* soils are characterized by a thin humus layer which indigenous shifting cultivators find cannot produce a satisfactory rice crop (and so is used for shifting cultivation only in extreme circumstances), and which leaves white quartz sand if repeatedly burned [see McKinnon et al 1996: 240-261]. In many of these areas within the study site, an underlying clay pan limits water percolation and creates seasonal wetlands that include peat soils in some low-lying sections. In rainy years, these wetlands drain to blackwater streams. In drought years, these areas become extremely vulnerable to fire.

Rainfall in this area varies from year to year, and this research found that local residents perceive that these variations are becoming more extreme. Rains usually begin in September, with the heart of the rainy season from November to February, and a dry season with little to no rain in July and August. While the nearest reliable meteorological station (in Sintang) measured some 3320 mm of rain and a total of 219 days with rain in 1996 [BPS 1997: 42-43], considered a “normal” wet year, during drought year 1997, from July to December no month had more than 6 days with any rain, and most of these rains produced negligible precipitation [Dinas Tanaman Pangan 1998]. (Reliable weather statistics have not been published for the research region from the period of meteorological and political chaos in 1997.)

The landscape within this site is comprised of mosaics of indigenous settlement and land management, now interspersed with recent agroindustrial plantation sites. In the early 1980s, beyond the Sanggau urban fringe north of the Kapuas River, the landscape matrix was a patchwork of smallholder shifting cultivation/ agroforestry land uses, with significant islands of remnant “primary” forests, especially in swamp and *kerangas* areas. During the late 1980s, several transmigration projects (in the southern portions of all three *kecamatan* in the site) were established. The transmigration sites were joined by additional development schemes during the 1990s, including a new timber plantation (legally two enterprises), as well as a new nationally-licensed oil palm plantation.

Southeastern Sanggau agroforestry land uses, as practiced by both Jangkang and Mualang ethnic groups during the 1980s and 1990s, are notable for the speed with which land that might formerly have been “recycled” into rapid-cycle padi-dominated shifting cultivation has instead been planted in perennial tree crops, especially mixed-species forest gardens (*kebun*) dominated by rubber (*Hevea brasiliensis*) [Mayer 1996a; Suratmoko 2000]. Ethnic Melayu areas within the study site appear to share this characteristic, although the intensively studied research subsites do not include Melayu communities. Both Jangkang and Mualang areas are notable for their *tembawang*, mixed-species forest gardens in which indigenous management focuses on economically valuable fruit and nut trees, managed in complex systems of property rights, including several varieties of common and private property.

Only a few islands of primary forest remain, with most of the largest ones located in the northern areas of the site, and very few larger than one hectare in the south. Many of the

remnant primary forests of the 1980s had been felled by the late 1990s, and many of those remaining had been degraded by selective logging, initially mainly for local household use small-scale marketing, and later by large timber concessionaires. New areas have been opened to shifting cultivation at the expense of old or primary forests to some extent, though according to oral histories most of this “frontier” expansion took place prior to the mid-1980s, before the focus period for this study. Forest remnants have also been “nibbled away” by shifting cultivation and rubber garden planting over the past two decades, leading to a very significant overall loss in native forest cover. These major changes in land cover and land use are visible in remote sensing imagery. Fire has been used as a major tool in landscape transformation.

Since the mid-1990s, commercial logging at concessions north of the study site, near the Sarawak border, have relied on a north-south corridor road built through the middle of this site in 1995, to move logs to landings of P.T. Anuraga, and P.T. Inhutani III in Kedukul, on the north shore of the Kapuas River. (P.T. Anuraga has a logging concession of some 41,600 hectares that includes extensive areas of primary forest to the north of the study site for this research.) Since the early 1980s, a road network has developed rapidly within the site, first focusing on linking settlements with market and administrative centers, later on providing infrastructure for transmigration settlements, and finally adding company roads within plantation and logging concessions. The road system has had a profound effect on land uses (and on related agricultural burning), as even smallholder cultivation has increasingly focused on the road, and as road networks have opened previously remote primary forests to commercial logging. While some communities have acted collectively to protect community primary forests, and old forest islands within their village areas, they have rarely succeeded. One result is a sequence of fragmentation of the region’s remaining old forests, opening the way for intensifying extractive and agricultural/ agroforestry uses, and for fire. For example, , construction of rough log bridges for this logging corridor road, and possibly for the outside market, consumed many trees from remnant primary forests in the study area, notably and contentiously from the *kampung* of Ensibau (the focus of this study’s Jangkang subsite). This included trees from the village’s common property protected forest (*rimba adat kampung*), and a large forest “island” to the northeast of the village center (*Pulau Rintong*). Resulting fragmentation can be seen by comparing 1991 and 2000 satellite imagery [see Eastern

Jangkang Western Belitang, Landsat TM Images in **Figure 2-3** (16 September 1991) and **Figure 2-4** (8 March 2000)]. The extensive burn scars of late 1991, shown in **Figure 4-2**, show some of the consequences of wildfire in areas of relatively degraded secondary forest and grassland during the very serious drought of 1991. Note that the most extensive burning during the 1991 drought was concentrated in “frontier” areas along the border between the Mualang and the Jangkang customary territories, and between current *Kecamatan* Belitang Hilir and *Kecamatan* Jangkang.

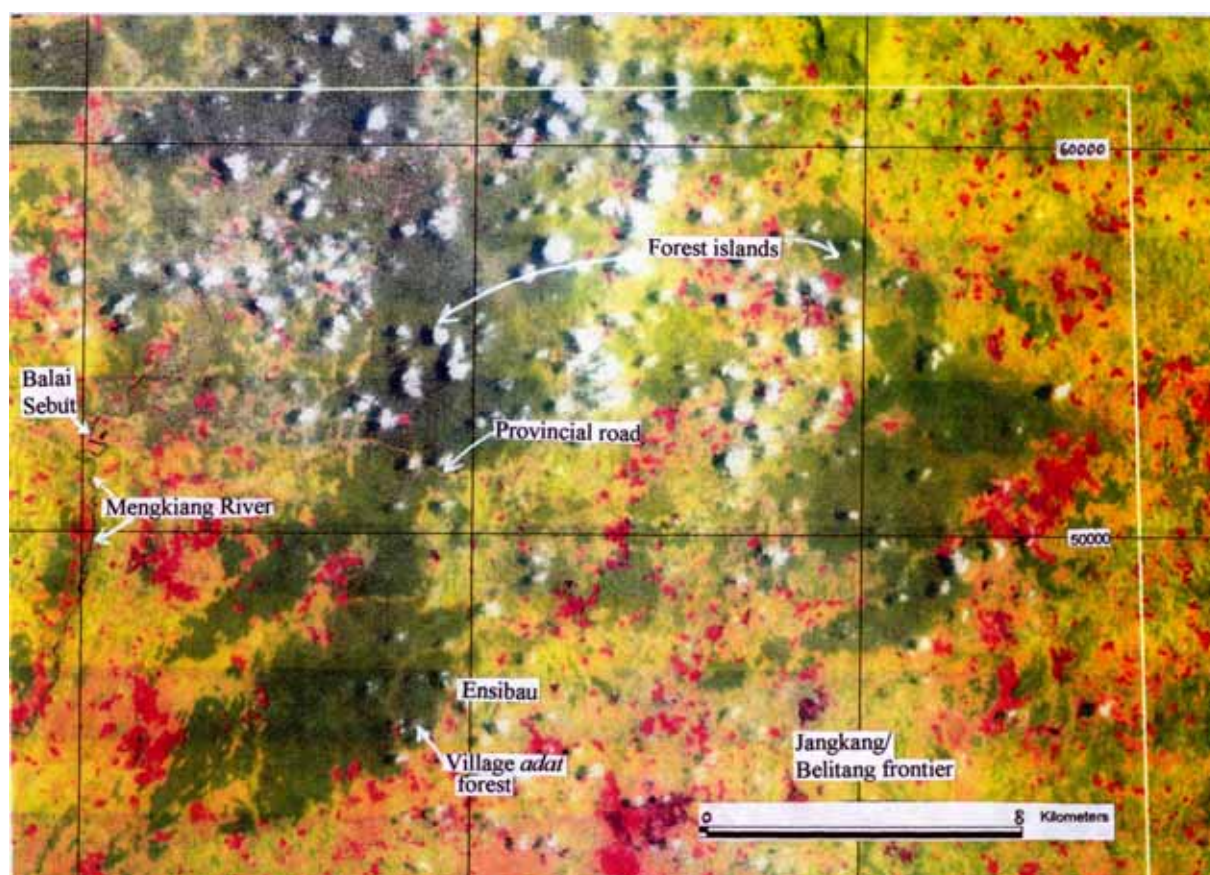


Figure 2-3 Eastern Jangkang/Western Belitang, Landsat TM Image, 16 September 1991

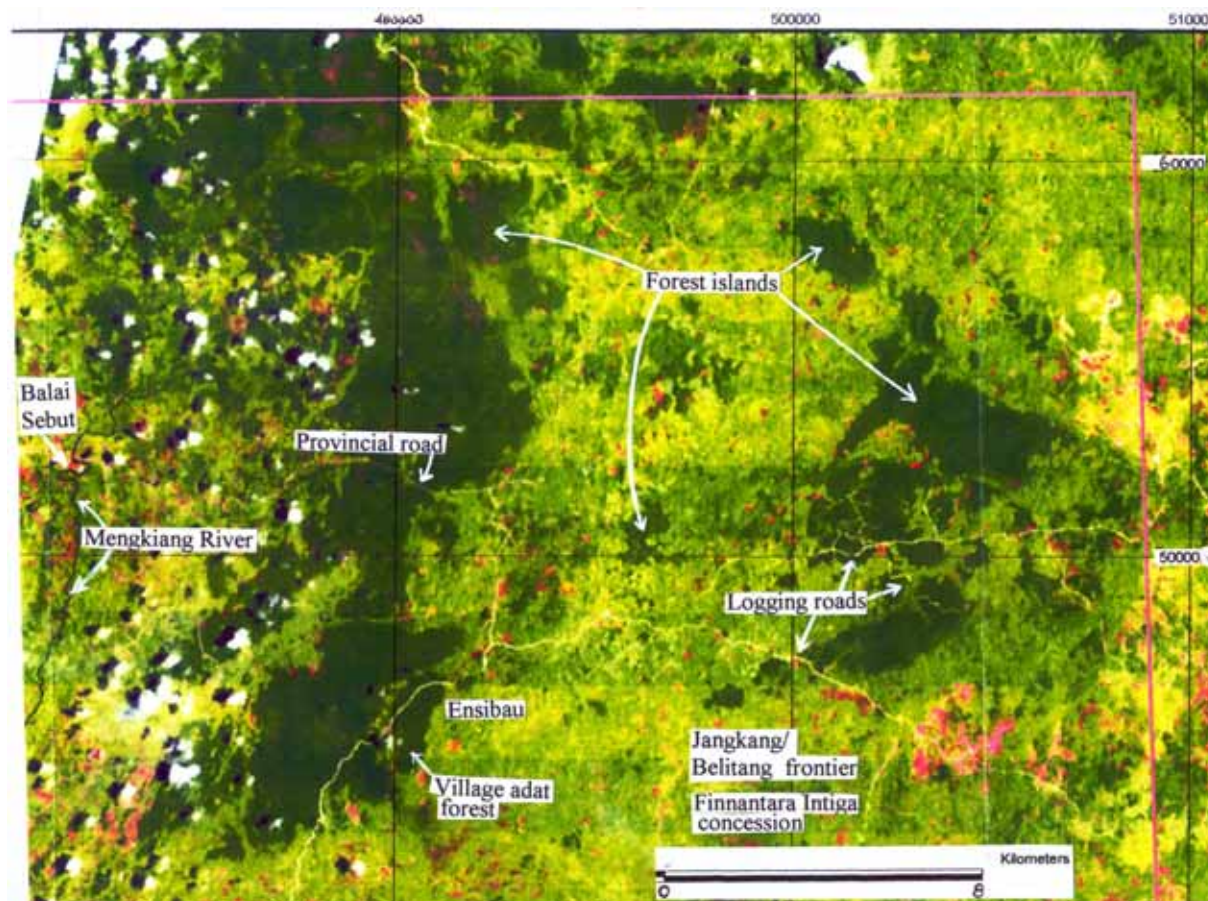


Figure 2-4 Eastern Jangkang/Western Belitang, Landsat TM Image, 8 March 2000

Demographic characteristics, including population growth and loss, varied widely across the study region during the late 1990s, and from year to year during the period of focus for this research. Overall, population growth has been rapid, due to both natural increase in existing population, and migration from other parts of Indonesia. From the 1971 to 1990 population census, Sanggau's overall population increased by 52%, which is somewhat less rapidly than the 60% increase in overall population for West Kalimantan as a whole, where population grew faster in urban and coastal regions. From 1980 to 1990, however, Sanggau population grew somewhat faster than that of the Province (32% for Sanggau; 30% for West Kalimantan). Table 2-1 shows population growth figures for West Kalimantan and Sanggau:

	1971 pop.	1980 pop.	Change 1971-1980	1990 pop.	change 1980-1990	change 1971-1990
West Kalimantan	2,019,924	2,484,891	+23%	3,228,073	+30%	+60%
Kabupaten Sanggau	281,029	323,499	+15%	428,295	+32%	+58%

Source: Adapted from BPS Kalimantan Barat, 1995, p. 96 (from Census of Population)

Table 2-1 Population in West Kalimantan and Sanggau

Within Sanggau, population figures for the late 1990s for the areas covered by the Sanggau site include those below. These changes represent a sharp departure from the more rapid population growth in the area during the previous few years, reflecting specific employment opportunities and projects, as well as “pushes” and “pulls” in the aftermath of ethnic riots in the surrounding region, including the riots of February 1997 and March 1999. They also represent a significant departure from the Sanggau-wide estimates and projections used to plan specific projects. Significant population figures based on official estimates for these areas of Sanggau include the following (unfortunately, results of the Year 2000 population census for this region are not yet available at the time of this writing):

Place	1998	% change 1994-95	% change 1995-96	% change 1996-97	% change 1997-98	Mean annual change 1994-98
Kabupaten Sanggau	499,318	1.87	2.54	1.00	1.02	1.61 %
Kecamatan Belitang Hilir	19,749	0.50	5.17	1.03	0.96	1.92 %
Kecamatan Jangkang	22,950	1.07	-0.89	0.43	-5.47	-1.22 %
Kecamatan Mukok	15,977	5.63	2.70	0.38	10.04	4.69 %

Source: BPS Kabupaten Sanggau, 2000, p. 32-33.

Table 2-2 Recent Sanggau Population Estimates

Population densities vary greatly across this rural study area. The densest populations are near the Kapuas River in the south, while the northern parts of this site are much more sparsely settled. For example, although the *Kecamatan* Belitang Hilir subsite had a mean population of 27 people per square kilometer, the two *desa* of detailed study for this research has a population density of only 17 people per square kilometer. *Kecamatan* Jangkang mean

population densities are similar, while population densities in Mukok are considerably higher, especially in the peri-urban southern portion, on the fringe of the city of Sanggau on the Kapuas. Populations of villages in the area of most intensive research for this study, in Kecamatan Belitang Hilir, are shown in **Appendix I**.

Neither contemporary oral histories developed for this research nor available written chronicles mention any permanent settlements along the current Jangkang/ Belitang border before the 1890s [Veth 1856; Enthoven 1903; PPSDAK and villages 1999]. Oral histories among both Mualang and Jangkang people indicate that most of this frontier was still old forest during the youths of the current generation of elders; yet grasslands had already begun to develop along this frontier in some of these areas by the 1950s.

Ethnicity, or language group identity (*suku*), is an important aspect of this study, since land and resource use and management techniques, as well as the norms and customary rules that control uses of fire within them, vary according to ethnicity and community history, even within this relatively small study site. The Mualang are the dominant ethnic group in *Kecamatan* Belitang Hilir, while the Jangkang occupy *Kecamatan* Jangkang, and northern *Kecamatan* Mukok. Ethnic Melayu communities occupy riverside areas in the southern parts of Belitang Hilir and Mukok. Some Ketungau communities, including some which predate Mualang settlement, remain in Belitang, as well as some which lost their previous community territories through various means, and have since been “borrowing” land of other communities. Ethnically mixed communities have developed in *Kecamatan* centers, and in the area’s 15-year-old transmigration sites. The Mualang are linguistically and culturally related to the Iban, Borneo’s most numerous Dayak ethnic group. The broad cultural, legal, and land use divides between the Ibanic peoples including the Mualang, and the “Bidoih” or “Bidayuh” peoples including the Jangkang, are significant for this study. [For broad ethnographic descriptions of major language and cultural groups, see King 1993.] While both Mualang and Jangkang historically have relatively egalitarian social structures, compared with aristocratic groups like the Kayan and Kenyah, their different histories in West Kalimantan have led to some significant distinctions in land and resource use practices. Somewhat different customary laws (*adat*) between the Mualang and the Jangkang, and different norms of land and forest use, have important implications for fire management. These variations reflect differing community histories of land use, migration, and settlement,

as well as different decision-making norms and inheritance rules among descent groups within extended families.

A swathe of grassland and slow-succession scrub forest bisects the study site from north to south, along the border between the major watersheds, between the Mengkiang and the Ayak and Belitang River systems. These grasslands also mark the historic frontier between Mualang and Jangkang Dayak peoples [see Veth 1854 and 1856; Enthoven 1903]. This grassland and scrub area, considered degraded land by both indigenous and official concepts of land capability, has grown gradually over the past 50-some years. Local people as well as government officials understand its expansion to be a result of repeated fire, including both frequent accidental burning and some deliberate burning. These types of *Imperata*-dominated grasslands, scrub forest, and bracken ferns are all recognized locally as hallmarks of a dangerously fire-prone landscape.

The Mualang in eastern Sanggau migrated to the area from the northeast during the late 1800s, eventually coming up against an ambiguous forest border with the Jangkang, to the west. Both groups gathered forest products, hunted, and fished in the “open access” old forest in the frontier between each groups’ more established territories during the late 1800s and early 1900s. Mualang forebears of the current residents of *Desa Merbang* and *Desa Menawai Tekam* settled within these villages’ present territories in the 1920s and 1930s, some of which had been previously occupied, intermittently, by ethnic Ketungau people, whose descendents still occupy small pockets interspersed with the more numerous Mualang. These Mualang settlers made small moves to their current residential village centers in subsequent years, until the land was “filled” in the 1970s.

Senior members of both Mualang and Jangkang communities can recount precise settlement and migration histories and geneologies, which include the identities of people first felling or “opening” primary forest, and people planting landmark groves of trees (*tembawang* in Malay), which also serve as the communities’ property and territorial markers (*temawa’n* in Jangkang; *temawang* in Mualang), and are crucial for customary recognition of village territory and descent group property rights. Recent research, community mapping, and land rights advocacy efforts have recorded some of these histories in this area [For histories of migration and settlement along this frontier, as well as associated customary laws of Mualang

in Belitang Hilir and Jangkang peoples relative to land and settlement, data were obtained from oral history interviews for this research. See also sources including Tim Merbang 1997; Paternus 2000, Lame and Andismin 1951; van Hulten 1992; Mayer 1996a; Enthoven 1903; Topographisch Bureau Batavia. 1912].

In *Kecamatan* Jangkang, the dominant ethnic group is the Jangkang Dayaks (with six customary subgroups), related to the broad “*Bidoih*” identity (their own name for this larger ethnic identity, also known as Bidayuh in Sarawak, and named Land Dayaks by early English and Dutch ethnographers, to distinguish them from the Iban “Sea Dayaks”; see King 1993). At the beginning of the 20th Century, while the Mualang were rapidly establishing new settlements within the watersheds of the Belitang and Ayak Rivers to the southwest of their forebears’ former homes, the Jangkang, who originated from west of the Mengkiang River, were gradually extending footholds to the east of the Mengkiang, and increasingly encountered the Mualang in the forested plain to the east. Forebears of the current residents of Jangkang *kampung* Ensibau, one of the subsites for this research, established a permanent village community within their present territory in 1915, after moving there mainly from a single village in the more heavily populated Jangkang core region to the east. The 1915 village re-occupied sites that previously served as temporary settlements and seasonal forest resource collection expedition camps for another Jangkang community during the 1890s. Villages to the south of Ensibau, in *Desa* Sape, recount similar histories, although their forebears originated from different Jangkang subgroups and villages, and settled in their current territories around the same time. During the late 1900s, the Menjoungka people, another distinct linguistic group, also occupied southern parts of what have become Jangkang areas [Veth 1856; Enthoven 1903]. The Menjoungka were apparently absorbed by the more numerous Jangkang, and have ceased to have any distinct territorial identity in current Jangkang areas.

Local customary law controlling land and resource tenure, and inheritance, strongly influence household and community decisions about land and resource uses, including decisions about agricultural burning. In general, among both Mualang and Jangkang ethnic groups, a household (or person) who first fells “primary” forest as part of swidden cultivation retains rights to re-clear and re-cultivate that land, and to plant perennial crops on it. Customary owners of a tree generally have exclusive rights to harvest products from that tree, or to fell it.

These rights are generally inherited bilaterally and undivided, meaning that all descendants of the original clearers and/or planters inherit shared rights over those resources. In Jangkang *adat*, one descendent will generally prevail in management decisions among the inheriting descendants; in Mualang, all descendants ideally have equal say in management [Lawe and Aken 1951; Paternus 2000]. Under bilateral and undivided inheritance from a tree's original planters, and from the original "openers" of primary forest, *tembawang* groves eventually become the common property of a large descent group, or an entire village, after a few generations. Thus, the *tembawang* physically embodies a community's history of settlement, land use, and kinship relations [see Peluso 1994]. In addition to serving as oral records of community history, genealogy, resource use, and resource rights, the oral histories of settlement and land use associated with named *tembawang* and other landscape features with customary importance become resources for research on landscape history and fire history. As shorter-lived perennial cash crops like rubber gardens have become increasingly important economically, and as a portion of the community landscape, property rights are gradually being privatized. Parents normally bequeath a rubber garden to only one descendent, rather than leaving it as common property to all of their progeny [see Mayer 1994]. This ongoing change in tenure practice within the region's *adat* communities (indigenous communities still internally governed by local *adat*, or customary law), has important implications for land use decisions, and thus for agricultural burning.

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In the southern part of the Sanggau study site, including the southern parts of *Kecamatan* Belitang Hilir, Jangkang, and *Kecamatan* Mukok, older Dayak and Melayu communities grudgingly accepted the development of several government-sponsored transmigration projects within their communities' customary territories, beginning in 1986. Members of these communities were offered opportunities to join the transmigration schemes, and in exchange for rights over some of their customary property, many received a rough-built project house, and a standard Transmigration "package", which included rights to eventual legal title opportunities to receive legal title to 2.25 hectares within the project site. Such rights gradually developed into the core of a small formal land market open in this rural region.

The largest settlements in the study site are the *Kecamatan* centers, with less concentrated population at the transmigration settlements in the south. Village communities form small nodes of residential settlement anchoring the agroforestry land uses covering much of the site, and connected by a growing network of government and company-owned roads (particularly visible in the Year 2000 Landsat TM image) and local footpaths. Prior to the 1980s, settlements were linked mainly by The first roads passable by 4-wheel vehicles were built to this area reached this area in the early 1980s, although a network of foot trails and river routes had been maintained since the 1930s. Prior to the 1980s, settlements were linked

mainly by footpaths and a few navigable streams. The road network was extended and improved in the 1990s, as transmigration settlements matured, and *kecamatan* centers became foci for rapidly developing regional infrastructure. During mid-1990s, a network of plantation roads and a logging corridor road opened easier access to areas previously reachable only by several hours walking, or in some cases by motorcycle.

Government policies have greatly influenced changing settlement and land uses within the site, especially during the 1990s, when the central government granted timber plantation and oil palm plantation concessions covering an enormous portion of the site. (See map of Government Designated Land Uses and Concession Areas, **Figure 2-2**) From a fire perspective, locations of these concession areas and boundaries are notable since virtually all of these concessions overlap existing communities' customary boundaries. Thus, all of these concession boundaries may be considered "contested" to some extent, requiring companies to negotiate with customary communities and individual and family customary owners to release (*menyerah*) these areas of their customary territory and property to the plantation for clearing and planting with the company's industrial crops, even after the official boundaries and plantation management plans have been officially approved.

3. METHODS – RESEARCH APPROACH

3.1 *General background for the Sanggau study site*

Analysis of fire at the Sanggau “site” was undertaken as part of a multi-site study intended to characterize underlying causes and consequences of fire in Kalimantan and Sumatra, where serious vegetation fires affected extensive areas during the 1990s. Although much of West Kalimantan experienced its most serious fire years during *El Niño* induced drought of 1997-98, in the Sanggau study site the most serious fire years were during the droughts of 1991 and 1994, and during the period of political and economic upheaval during 1998 and 1999. The study includes a range of landscape-scale “sites” with varying characteristics, selected to enable the broader study to characterize the variety of fire causes and impacts in ways that can inform future policy.

In the social research at the Sanggau site, narrative accounts, information from interviews with knowledgeable informants, meetings in villages, with timber plantation managers and staff, and with government officials, as well as written records provided specific information at various levels of detail about almost 100 “unwanted” fire events (*kebakaran*) during the 1990s, especially the late 1990s. Although these fires do not represent all unwanted fires in the study subsites during that period, let alone all burning, and although they do not form a statistically representative sample of all fires within the broader Sanggau study site, they do represent a very large portion of “fires of concern” (see below) in research subsite areas. The accounts of these fires represent major types of fires of local concern, and present useful examples of the lines of causality for these fires (and in many cases, detailed sequences of fires and landscape change over time for particular locations), of consequences of these fires, and of actions taken locally to reduce risks of unwanted fires in the future.

Together, the cross-section of the types of situations we believe are representative of fires in this region of Sanggau in the 1990s include types of circumstances that should be addressed by future policies and programs to improve fire management, to prevent illegal burning and arson, and to prevent and respond to accidental fires and wildfires. They also represent types of fires for which underlying causes and risk factors are associated with particular land and resource use policies, corporate practices, and local cultures of land and resource use. All of these could become targets for future interventions aimed at reducing risks associated with fires and burning.

3.2 Assumptions

Fires of concern:

The identification and definition of “fires” considered significant for this research has been problematic, in a context where indigenous shifting cultivators have long burned forest as part of “traditional” swidden/ agroforestry systems. However, large-scale commercial plantation development schemes in the 1990s have also burned extensive areas to clear land for industrial tree crop planting due to the extremely low direct cost to them (regardless of broader social costs or liabilities), and the familiarity of the fire technology. In a Bornean context of contested rights and access to land and resources, identifying “undesirable” fires, or even distinguishing between arson and “normal” agricultural practice, can be problematic. Distinct and often conflicting interests are represented by multiple parties involved, fluidly aligned (or opposed) to one another. Customary land and forest owners, commercial plantation and land development companies, and various components of the Indonesian state each represent distinct sets of interests and concerns. In such situations, one party’s “business as usual” may appear to be vicious negligence to another, or even arson. For the purpose of this case study, “fire” of particular concern refers first to accidental fires (*kebakaran*, in Indonesian, as distinct from *pembakaran*, intentional burning), either entirely unintended, or fires which had been purposely set, but which had spread beyond control and burned areas which the fire setters had not originally intended to burn. Fires of concern also include fires resulting from burning of contested legitimacy. This includes any fire set to clear land for commercial plantation development after the commercial burn prohibitions of 1995, fires burning in communities’ territories without customary land owners’ consent

(either accidental or deliberately set), and fires burning plantation crops (accidental or deliberately set). Obviously, based on these ideas, many of the very large number of “hot-spots” detected in the study area by remote sensing in the 1990s are not fires that evoke strong local concern, or pointed concern for this research, especially the thousands of well-controlled, routine swidden fires by indigenous small-holders.

In order to “capture” stories of other types of fires considered significant and problematic in a local context, “fire” documented in this research also refers to burning which some party considers to be inadequately controlled (through negligence, lack of concern, malice, or revenge) or otherwise illegitimate or illegal. Thus, fires deliberately set to burn an area to clear land for a contested development, plantation, or other land use are also noted in this study, since they are problematic in the local context. These problematic fires are analyzed against a background of “traditional” burning for indigenous styles of shifting cultivation and associated agroforestry. Distinguishing between these types of fires is difficult, and demands an understanding of the intentions of people clearing land and burning vegetation, which can only be discerned through grounded research, with hope of unambiguous responses to researchers’ questions. The distinction between swidden burning for home provisioning and large-scale burning for plantation development in this region, unlike in other areas including Ketapang and parts of Sumatra, is difficult to be sure of based on remote sensing analysis alone. The distinction between various types of burning, motivated by different intentions, became doubly difficult in many areas of Kalimantan during the late 1990s, after commercial burning was prohibited. In part to avoid the explicit prohibition on commercial burning, plantation developers entered into informal contracts with customary land owners to “prepare” their own land for planting (using techniques familiar from “traditional” shifting cultivation) before releasing it to the plantation company. In some cases, customary owners were even allowed to plant and harvest a final rice crop before the land was turned over to the plantation, a variation of well-known Javanese *tumpang sari* systems.

Varying detail of data for subsites:

The Sanggau site is extensive, and grounded social research has not been carried out with a consistent level of effort throughout the site. This study did not obtain a consistent “density” of data for the entire site. Several “core” subsites were selected for development of more

detailed information. In general, these subsites were areas where previous data development efforts had taken place, by regional NGOs, academic researchers, community members themselves, and timber plantation companies. We are confident that the accounts of fires in this area represent a reasonably full range of the types of fires that have affected this site. However, because of varying levels of detail for different areas within the Sanggau site, it is inappropriate to apply statistical analyses to this sample from “core” subsites to the entire Sanggau site. Information on specific “unwanted” fire events from 1990 to 1999 was collected in fine detail in some twenty *kampung* (customary villages), located within 3 *desa* (administrative villages) in Belitang Hilir and Jangkang, and for planted areas of the Sanggau section of the Finnantara Intiga timber plantation. Relatively detailed data were collected in twelve of these *kampung*, including GPS points for fires of concern. The most detailed map data were developed based on work undertaken by communities with assistance from PPSDAK-Pancur Kasih, in *Desa Menawai Tekam* and *Desa Merbang*, in *Kecamatan Belitang Hilir*, including *Kampung* (customary village) or *Dusun* (administrative village hamlet) Menawai Takam, Menawai Lingkau, Menawai Ulu, Kerintak, Ucong, and Sungai Biawak. Other key information was collected from parts of *Desa Semirau* and *Desa Sape* in *Kecamatan Jangkang* (during studies by Judith Mayer beginning in 1993), with other information from timber plantation areas located within Layak Omang (Mukok) as well as *Desa Sape* (Jangkang), including fire and planting information provided by P.T. Finnantara Intiga, and P.T. Inhutani III. More general contextual information was obtained for broad areas around and near these highlighted locations.

3.3 Research Steps

Research steps undertaken at the Sanggau site include the following:

Select and delimit study site and subsites to include representative fire conditions and landscape histories, based on existing data developed by researchers, NGOs, regional government agencies, etc.:

The Sanggau site was roughly delimited to “capture stories” of fire and its implications for the historic development of the landscape of this region, and the area’s future prospects regarding fire in light of emerging patterns of landscape transformation. The Sanggau site was defined

to represent an area where the incidence of fire has been relatively light in the 1990s compared to other sites in the larger fire study, and where land clearing for commercial plantation development was not obviously the major underlying cause of fires that did occur during the late 1990s. The area delineated for this site-specific research is shown in **Figure 2-1**. For study of the Sanggau site, background information on land use and settlement history, and on the uses of fire in indigenous land management systems, had been developed in previous research undertaken for scholarly, agroforestry development, and land rights advocacy purposes. [For example, see Tim Merbang 1997; Getrude and Martalena 1998; Mayer 1996; Potess and Mikkilä 1995]. Community resource maps were also available for some parts of the site as results of some of this previous work, along with continuing access to knowledgeable and articulate local residents and leaders willing to cooperate with this research. Members of some communities and the major commercial enterprise in this area (a pulpwood plantation) were interested in investigating and documenting the extent to which their own efforts to prevent serious fires had been effective, or could be improved. The nongovernmental organization cooperating in this research, PPSDAK – Pancur Kasih (Program Pembinaan Pendelolan Sumber Daya Alam dan Kemasyarakatan, from Pontianak-based Yayasan Pancur Kasih) has also maintained a presence in the area, especially in two desa in Belitang Hilir. The decision to expand the study site beyond Belitang Hilir was aimed at addressing implications of timber plantation, transmigration, and oil palm plantation development in adjacent areas. The study site was also designed to cross an historic ethnic boundary which appeared to have been heavily affected by wildfires in the past.

Subsites for more intensive study within the Sanggau site include:

1. *Desa* Menawai Tekam and *Desa* Merbang, in *Kecamatan* Belitang Hilir, with particular attention to a few kampung within these *Desa* (and particularly strong attention to *Kecamatan* Belitang Hilir overall within the Sanggau site);
2. *Kampung* Ensibau in *Desa* Semirau, *Kecamatan* Jangkang; and overlapping areas of *Desa* Sape and the P.T. Finnantara Intiga industrial timber plantation in *Kecamatan* Jangkang, within a context of mixed developments including timber plantations and transmigration in northern *Kecamatan* Mukok (home to both an Industrial Timber Plantation and several Transmigration sites), and southern *Kecamatan* Jangkang.

The Sanggau site was delineated to span this swathe of frequently-burned grassland and scrub forest on the border between Belitang and Jangkang. Parts of this area had become the focus of “regreening” and transmigration projects during the 1970s and 1980s, when parts of it were also designated for development of transmigration projects. In the early 1990s, the Ministry of Forestry and the regional government designated much of this area for Industrial Timber Plantation (*Hutan Tanaman Industri*, or HTI) development, as it had been classified as “degraded” national forest land, indicating that it would yield less than 20 cubic meters of commercial timber per hectare. Planning for a timber plantation in this area of central Sanggau began in 1989, with state forestry corporation P.T. Inhutani III beginning planting in 1991/92. Inhutani’s original plantation concession was incorporated within a much larger concession when Inhutani III joined in a joint venture (described below) to develop a pulp plantation. Staff of resulting timber plantation company P.T. Finnantara Intiga provided some data on fires and fire management for this study; P.T. Inhutani III provided detailed information for a previous study on plantation development. Due to limited time and difficult contacts, oil palm company P.T. Patriot Andalas, with a concession in Kecamatan Belitang Hilir but outside of the detailed study subsite, did not provide information for this study. The availability of relatively current and reliable data, including village-level resource maps developed by recent community mapping efforts, and plantation development maps and fire records, contributed to a decision to focus this project’s site-level work where fire research could build on such existing basic data.

- (a) Visit promising areas for research to interview members of local communities, staff of plantation enterprises, and government officials about their experiences of fire in the 1990s: Field work in Sanggau was conducted by a CIFOR consultant (Judith Mayer), CIFOR’s NGO collaborators (PPSDAK – Pancur Kasih, coordinated by Bagus Suratmoko), and an ICRAF staff member between May 1999 and July 2000. Names of field research staff and dates of village visits are listed in Appendix 1
- (b) Identify locations of significant “fires” of concern (kebakaran, indicating unwanted burning) with local people: Add locations of these locally significant fires to previously-produced community map, through a sketch-mapping exercise with village members. This was done either in large general meetings or in select groups of knowledgeable and articulate village leaders and residents. (General meetings were held in Resak Balai,

Merbang, Menawai Tekam, and Ensibau. Small group discussions were held in Resak Balai, Tapang Pulau, Semadu, Menawai Tekam, Tabai, Menawai Lingkau, Ensibau, and Sebuda.) Field researchers found that although it was important to hold general community meetings to inform community members of the purposes and methods of the fire research, and to get a general picture of fire concerns in each community, detailed information on fire events was best obtained in discussions with the smaller groups of knowledgeable people. In some cases, participants were hesitant to provide precise information about fire events and causes in larger meetings due to conflicts with other village residents sparked by or aggravated by blame for past fires. In smaller meetings, however, multiple sides of fire stories emerged, and could be "triangulated" to identify the most likely sequences of events, and rationales for actions. During these large and small discussions, information was also obtained about communities' actual current practices as well as customary rules and practices of fire use and fire management, with special attention to recent efforts aiming to reduce risks of fires.

- (c) *Record fire locations in the field, along with detailed narratives of fire events:* In the field, visit locations of these locally significant fires, which had already been drawn onto fire location sketch maps, and record their locations using data from GPS receivers. Document detailed narratives of each fire event by people who remember it, including information about their understandings of the causes and consequences of each fire. Include information on what (if anything) was done to prevent the spread of each fire, as well as on any penalties or sanctions applied to parties deemed to have been responsible for starting fires of concern. Most data are from the 1990s, however some precisely identified fire locations date to the 1980s and before, especially for those areas that have repeatedly burned.
- (d) *Add these more precise fire locations based on GPS data to previously developed community maps:* In places where maps have been digitized for GIS use, add the locations of the fire events as an a new "layer" to existing digital maps. In places where maps are not available in detailed digital form, add fire locations to a new version of a map to scale. For the information collected in Kecamatan Belitang Hilir with cooperation by PPSDAK-Pancur Kasih, fire map data were added to kampung maps printed at 1:25,000 and 1:35,000 scales during sketch mapping sessions and for field visits to fix

sites more precisely in village territories. For other areas of the site, existing maps at various scales were used as available.

- (e) *Government information on fires:* Contact regional government agency staff, and staff of land development and plantation companies to help develop data about fire incidence, fire response, and fire prevention for land under their responsibility within the study area. Cooperate with timber plantation companies to locate fire events on their working maps, and obtain information from them about fire events in as much detail as possible.
- (f) Integrate information on recent fires from plantation enterprises with data on fire locations and events from members of local communities: Obtain information about fire events from as many sources as possible, especially in cases where fire spread across a boundary between communities' lands and adjacent plantation lands. Attempt to construct a more complete story to explain what actually happened, and long-term consequences of each fire. At the Sanggau site, P.T. Finnantara Intiga contributed detailed information for 1999, and more general information for 1997 and 1998.
- (g) Integrate data from "grounded" research with analysis of remote sensing imagery: Combine information about fires collected in "the field" with information from a variety of other sources. Overlay maps with fire information on administrative maps showing various kinds of jurisdictions, and official land use designations for all areas of the site. Satellite imagery of this area was not available to take to the field to locate "hot spots", landmarks and burn scars associated with fires of local concern. However, researchers attempted to locate evidence of fires of local concern with month-by-month maps using satellite imagery of "hotspots" for most of the 1990s, and thematic mapping based on landsat imagery to deepen understanding of landscape changes in the area during the 1990s, as well as burn scars indicating locations of fires of particular local and regional concern. While small, short-lived fires of concern are unlikely "register" in these remote sensing images, many of these were located in areas where landscape-based risk factors could be identified through remote sensing, and where evidence of fires were likely to have been concentrated over the years. Where fires were extensive enough or long-lived enough so that signs of them appear in available remote sensing imagery, comparing this evidence to evidence collected "on the ground" permits us to improve understanding of

how best to “capture” the information that allows us to reconstruct both the roles of fire in landscape history, and both immediate and underlying causes of particular fire events. Disparities between results of multiple lines of evidence allows us both to “triangulate” to achieve better understanding than any one approach would allow, and through critiques of one line of evidence based on others, to improve means of identifying and analyzing fires and other landscape-forming phenomena that can be perceived through multiple means.

- (h) *Identify fire patterns indicating roles of underlying causes of fire, and their implications for future fire management:* Characterize the range of fire events documented in this research in terms of their underlying causes, and in terms of their impacts with implications for future planning and management.

4. FINDINGS AND THEIR SIGNIFICANCE

4.1 General summary

The Sanggau site represents a “best case” scenario in terms of responses to pervasive fire risks posed by a volatile combination of social and physical factors for unwanted and uncontrolled fires during the 1990s, and particularly during 1991, 1994 and 1999, disastrous fire periods in Sanggau during years that were considered less problematic in other areas of the Province. Yet, even with relatively few very large fires, the landscape within the Sanggau site changed enormously during the 1990s. Fire played a part in most of these changes, for better or worse, including both well-controlled purposeful burning, and wildfire. Under pressure from new state-sponsored demands for land, most often taken from local customary rights territory, and from growing rural population, swidden (shifting cultivation) cycles in appear to have shortened, so that forest farmers are recultivating forest fallows of decreasing age. The areas covered by grassland, scrub forest, and fern mats expanded to the detriment of overall land capabilities to support swidden production in subsequent cycles. A significant portion of the region’s remnant primary forests were felled to expand indigenous agroforestry production, with a final swidden rice crop as the first step in such land conversions. Selective timber felling by local people further degraded many remaining primary forest patches (for self-provisioning of building materials, or for local markets). Since the 1930s, and increasingly in the 1950s and after, indigenous households converted many locations they had already cultivated for several swidden cycles into mixed-species forest gardens (usually dominated by rubber), rather than continuing a cycle of land degradation with rapid swidden rotations [see Mayer 1996]. During the late 1980s and 1990s, extensive areas of land designated for transmigration projects and commodity plantations were rapidly developed in the site, especially in the area in the center that had been repeatedly burned during previous decades.

It is unclear whether recent patterns of landscape change would have occurred the way they have with different uses and abuses of fire, or with different fire use or fire management practices. In this site, social factors posing and exacerbating fire risks, in many cases becoming underlying causes of unwanted fire, include:

- burgeoning populations (of growing indigenous communities and recent officially sponsored migrants);
- contested designation of lands open for “development” by various arms of the Indonesian state, and appropriation of these lands previously held by indigenous communities under local customary rights, for agroindustrial commodity plantations (pulpwood, oil palm);
- competition for land and resources among long-time inhabitants as well as between local communities and new “outside” land development schemes including plantations;
- indigenous agroforestry systems that continue to rely on swidden burning (shifting cultivation), simultaneously with factors that undermine customary norms, practices, and sanctions which had served to reduce risks of wildfire;
- a general policy climate that allocates access rights to land, resources, and capital to large-scale agroindustrial companies’ development schemes over protection of resource access for indigenous peoples’ agroforestry systems and land management under customary tenure.

Combined with physical risk factors that include erratic and increasingly unpredictable rainfall and increasingly severe droughts, and formation of increasingly fire-prone landscapes due to changing vegetation cover and concomitant changes in broader ecological conditions (hydrology, soils, microclimate), these social factors have contributed to both immediate and underlying causes of undesirable fires in the Sanggau study site during the 1990s.

4.2 Limitations of findings and combining research approaches

This research relies on case study methods that are neither statistically representative of the universe of “fire possibilities” within the study site delineated for this research, nor does the Sanggau study area represent a generally applicable set of conditions for all of West Kalimantan, let alone Borneo or Indonesia as a whole. As a study of limited scope, conducted within serious constraints of available time and personnel, it has not been possible to assemble data sufficient to claim to be able to portray the “full picture” even within this limited region. However, the examples provided here do represent a significant portion of the range of

underlying causes and impacts of fire in this region. An extensive compendium of basic background information about the case study areas is also not included here, but is available from other sources. (Note that during 1997 and 1998, due to political, economic, and environmental disturbances in this region, many government statistics were not even reliably collected.)

Four serious limitations could be overcome with additional research in the future. First, the study focuses attention on conditions in indigenous Dayak villages of only two ethnic groups. In part, this is due to the availability of a body of existing information in those areas; in part, it may also represent biases of the researchers. The Belitang villages which were the focus of this study are generally those which have participated in other community organizing and documentation efforts conducted by PPSDAK and other branches of Yayasan Pancur Kasih (including participatory community resource mapping). They represent villages with unusual levels of social cohesion and political conscientization on natural resource issues. The communities studied in Jangkang were previously studied by Judith Mayer for other purposes. They represent, if anything, opposite conditions in terms of community capabilities.

Second, the extent to which uses of fire by land development corporations (mainly in establishing oil palm plantations) have continued into the late 1990s is also not well substantiated here, nor are precise details of fire events affecting P.T. Inhutani's and P.T. Finnantara Intiga's timber plantations in earlier years. It may be possible to reassemble some fire records from earlier years of Finnantara and Inhutani activities with additional effort, but at this point, developing a history of those events through narrative analysis of company staff accounts without detailed records would be very difficult. Most non-local staff of both Inhutani and Finnantara from the period of 1998 and before have now moved out of the area to other positions (including almost all staff of either company who believe they have authority to provide information to researchers on a contentious subject). No detailed information about company fire and burning practices (or alternative land preparation) was collected directly from staff of two oil palm companies very recently active in the area, and possibly continuing to rely on burning for land preparation, including P.T. Patriot Andalas and CNIS (Citra Nusa Inti Sawit). The activities of these companies may be responsible for the recent (1999/ 2000) appearance of hotspots and burn scars in parts of the Sanggau study site beyond the subsites selected for detailed study. CNIS has been active in the Jangkang

area south of Balai Sebut; Patriot Andalas' concession in *Desa* Tapang Pulau (including *Kampung* Pakit Engkuning) is remarkable in that one of the most extensive primary and old secondary forest islands near the north shore of the Kapuas River existed very near a major transmigration settlement. That forest was targeted for oil palm plantation development, and was the site of an extensive fire in *Kampung* Engkuning in 1998, documented for this research, and based on both general stories and on burn scar analysis in Landsat TM images from March 2000, extensive fires took place there in 1999 as well. Further research should focus on the activities of these companies. Note that detailed information on company burning for land clearing purposes in the late 1990s would be information on clearly illegal activities. Creating a more complete and accurate picture of those activities from multiple perspectives, including the companies', would add another repertoire of sleuthing methods to those on which this study relies for the most part.

Third, little attention has been paid to fire conditions and fire use practices specifically associated with transmigration settlements, although these are noted in passing. For example, this research has obtained no information about the extent to which people who do practice shifting cultivation or burning for smallholder agroforestry in transmigration communities also practice particular fire use precautions, or what kinds of incentives or sanctions would encourage fire safety among this population.

The findings explained in this report represent part of a larger research process focused on the Sanggau site that also includes analysis of remote sensing data. These include analysis of the distribution of fire-indicating "hot-spots" over space and time, and analysis of vegetation types and "burn scars" based on Landsat TM satellite imagery of the site from years 1991 and 2000. Along with the "grounded" social research reported here, "triangulation" among these methods should provide a means to develop better understanding of the "big picture" of underlying causes of fires than any of these three approaches could alone. One of the most important contributions of this larger research project is to demonstrate the usefulness of such a combination of methods. Together, these methods provide a powerful set of tools to improve understanding of underlying fire causes.

Based on this research experience, several observations on the process of combining research

approaches are worth mentioning briefly here. A major set of decisions in research of this type centers on choosing subsites for detailed analysis. In this case, those decisions were made largely on the social and “micropolitical” issues to be addressed, and these decisions were made before the year 2000 Landsat TM image was available to our research team. If that image had been available, we might have devoted considerably more attention to documenting fire data from two plantation areas which had extremely prominent and extensive burn scars in the Year 2000 image. Exhibiting both Year 1991 and 2000 Landsat images to raise questions in some interviews and meetings in the region could also have added some very useful information. Another problematic aspect of using Landsat images from periods 9 years apart is that many of the “events”, significant from a fire perspective, which would have appeared in images from intervening years, could not be analyzed. For example, it would be extremely useful to note immediate effects of major road construction and timber plantation landclearing when these activities were at their peak in this research site, during the mid-1990s.

However, developing a “picture” of fire issues as they appear to multiple actors in the study region without using high-tech remote sensing images or detailed data was also extremely useful, since this also allows us to compare how causes and effects of fire appear to a variety of people “on the ground”, without coloring these discussions with remote sensing data not currently available locally other than through this research. Discrepancies are instructive, between understandings of fire situations based on interviews and discussions in Sanggau, and those gained through analysis of hotspots and burn scars overlain by official land classification maps, etc.

It is interesting that many of the hot-spot concentrations and burn scars that are prominent in remote sensing imagery do not necessarily correspond with specific fire events that local residents, plantation staff, or government officials recall as important. Likewise, several fire events that local people consider extremely significant do not necessarily show up as prominent hot-spot concentrations, or particularly remarkable burn scars. In several cases, areas that have burned extensively have done so in relatively small areas over extended periods of time, in which case remote sensing may indicate locations of these fires through burn scars, but they may never appear as hot-spots. Likewise, several concentrations of hot-spots, especially those appearing during conventional burning periods for indigenous shifting

cultivation, do not indicate fires of particular local concern. Instead, they may have been caused by several village households burning the year's rice fields together, in a cautious and well-controlled manner.

However, hot-spot analysis is extremely useful in helping to locate fires that are widely considered problematic, especially "rogue" burning for commercial crops, especially hot-spots that occur far outside the normal season for "traditional" shifting cultivation burns. Thus, hot-spot and burn scar analysis can be very useful starting points for discussion of fires of concern, but at a very local scale should not be interpreted alone.

Analyzing spatial patterns of burn scars may provide the best indicators of areas where it makes sense to monitor for significant landscape changes over extended periods to identify long-term effects of fire, which may, in turn, help to identify underlying causes of subsequent fires in the same or nearby locations. Caution should be exercised in attempting to impute intentions of people setting fires, attempting to control them, or allowing them to spread out of control, based on analysis of remote sensing data without additional information from the people themselves, if possible, and their social contexts.

4.3 Types of fires documented

This section summarizes findings on fires in the Belitang and Jangkang research subsites, with some additions from other areas within the Sanggau site. Field research documented numerous types of burning, and several types of fires of local concern in the study area, mainly during the 1990s. In summary, they included the following (listed in order of explanations in subsequent sections of this report, not necessarily in order of importance, in terms of damages or in terms of total area burned):

- (a) Routine burning of swidden fields by members of village households, as part of "traditional" smallholder shifting cultivation/ agroforestry cycles with customary (adat) norms of practice and liability for damage; forest farmers may subsequently plant cleared areas in perennial tree crops (especially rubber); NOT generally cause for local concern [see 4.4.1]

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- (b) Fires deliberately set by village smallholders for shifting cultivation, but which escape their intended limits; escaped swidden fires considered accidental, arising despite actions that local community members consider responsible fire use; customary fines and repair of damages indicated under *adat* judgements are not necessarily enforced on the fire setter, even where damage to agroforestry property occurred [see 4.4.2]
 - (c) Escaped swidden fires due to irresponsible burning by village smallholders (includes fires affecting local community members' land, plantation lands, degraded grassland or scrubland common property, or remnant natural forests), subject to customary sanctions against the fire setter in the case of local community lands; in principle subject to civil liability for damages to plantation trees [see 4.4.3]
 - (d) Fires set for hunting, with repeated burning causing long-term land degradation and formation of grasslands, fern mats, and slow-succession scrub forests; cause for longstanding disputes between adjacent communities [see 4.4.4]
 - (e) Extensive wildfires that burn grasslands that had been historically formed by repeated wildfires; specific causes of recent fires are unknown, but local people recognize high fire risks in these fire-prone areas of their community landscapes (some recent fires are complicated by contested rights with timber plantations, leaving a lack of effective responsibility for protection against fires in recently disputed areas) [see 4.4.5]
 - (f) Fires set by plantation developers or outside contract labor to clear land, with burning contained within relatively uncontested boundaries; (since 1995 such burning has been illegal)[see 4.4.6]
 - (g) Fires set by plantation developers or outside contract labor to clear land in areas of contested land rights, leading to potential for retaliatory action; subject to sanctions under local customary law; illegal since 1995 [see 4.4.7]
 - (h) Fires that local people believe were set to intimidate them into ceding their customary land rights or other resources to plantation developers (corporate arson; this research did not substantiate any incident by accounts from plantation staff themselves, or by official investigation) [see 4.4.8]

- (i) Fires set by local customary landholders for land clearing prior to ceding their land to a plantation concession (burned using techniques similar to conventional swiddening, but often without traditional fire safety measures); used by plantation developers to avoid legal prohibition on burning [see 4.4.9]
- (j) Fires set by local customary smallholders for routine swidden land clearing, but which escape and burn adjacent commercial plantation trees [see 4.4.10]
- (k) Fires set by local people in reoccupying plantation land previously ceded by customary owners; also fires set by village members and allowed to burn out of control, where community members assume they have no long-term stake in plantation trees once they have ceded their customary land to the plantation [see 4.4.11]
- (l) Fires set by members of local communities to protest perceived injustice or unresponsiveness by plantation developers (protest arson; openly admitted in some cases, hidden in others) [see 4.4.12]
- (m) Fires with unknown immediate causes, but located in areas locally understood to be fire prone, especially adjacent to customary borders [see 4.4.13].

4.4 Examples of fire types from the Sanggau site

This section presents examples of each of these types of fires, and explains their contexts, to provide a general picture of underlying causes for fires of concern, and of consequences that might be important for policy or planning purposes. Together, these accounts present a skeleton of recent landscape history of the Sanggau study site, focusing on incidence of fires of concern. These examples are chosen to represent the range of fires of concern at this study site, rather than simply a subsite-by-subsite account, to avoid repetition. Basic information is presented about routine smallholder agricultural burning by Mualang and Jangkang peoples, and their versions of “traditional” shifting cultivation / agroforestry. An appended summary table shows basic information for all of the individual fire “events” of concern documented in this research. (This does not include acceptably controlled routine swidden fires, or

uncontested burning for plantation land clearing before 1995.) The roles of routine smallholder burning in local shifting cultivation systems, and rules or norms associated with these fires, are explained below.

4.4.1 Routine burning of swidden fields by members of village households, as part of “traditional” smallholder shifting cultivation/ agroforestry cycles with customary (*adat*) norms of practice and liability for damage; forest farmers may subsequently plant cleared areas in perennial tree crops (especially rubber): NOT generally cause for local concern

The most extensive total sum of areas burned each year in the study area are the small swidden plots cleared by almost all households in indigenous villages of all ethnicities within the study site. However, these “traditional” swidden fires do not call forth much local concern if fires are managed with care, since this burning continues to be intended mainly for basic household provisioning, and fires are typically small, well-controlled, and do not damage neighbors’ agroforestry property. Dayak communities in this area, as in much of Borneo, manage their land in a cycle of clearing *ladang* from forests (dry crop fields, called *uma* in the Mualang language; *muh* in Jangkang), cultivating short-term crops focusing on annual rice and vegetables, then managing the field’s successional vegetation for a return to healthy forest able to support a repeated swidden cycle without significant long-term land degradation after the initial clearing of old forest. The length of time a former rice field (*bawas* in Indonesian/Malay; *babas* in Mualang; *jami* in Jangkang) is left fallow before recultivation depends on numerous factors, but most directly on the alternative choices available to farmers through their family’s or individual customary land rights. Both Mualang and Jangkang recognize that nine or ten years fallow are necessary to avoid rapid land degradation on dry land sites. The Jangkang have found that seasonally swampy sites (called *paya*’ in many areas of West Kalimantan) can be recultivated every two to three years without significant damage. The Jangkang have begun to build bunds in some of these areas for water control, hoping eventually to learn skills for wet-rice cultivation (*sawah*), in which fields could be recultivated each year.

In the past, the Mualang and the Jangkang both felled and burned primary forest for swidden fields, as they expanded their territories into frontier areas. However, at least since the late 1970s, almost all swidden plots are cleared from managed secondary forest successions at various stages of regrowth. A local “rule of thumb” used to estimate the extent of land needed per year per household for swiddening using familiar technologies, where trees are felled and other vegetation slashed and burned, indicates about one hectare per household per year, assuming a mean household size of 5 people. To estimate the total area (in hectares) that is likely to be deliberately burned for shifting cultivation each year within a village, divide the total population by 5. As new technologies are adopted, and as ecological and market conditions change, these rules of thumb are likely to change. [See Mayer 1996; for similar calculations for this and immediately surrounding regions, see Mayer 1996; Momberg 1992; Drake 1982]. This figure assumes that households are producing food mainly for their own consumption (still a valid assumption in this area’s indigenous villages), but also have access to income from perennial cash crop gardens (especially rubber) and fruit gardens, as well as access to wild and semi-cultivated foods (vegetables and fruit gathered from nearby forests), and both domesticated livestock and wild fish and game animals. (Domesticated livestock includes chickens and pigs for consumption and ritual purposes, as well as for cash in some cases. Fish include a variety of local species; the most significant game animals for food are deer and wild pigs.) Some households in the indigenous villages in the Sanggau subsite do clear and cultivate as much as 3 hectares of swidden land per year. To minimize risks of crop failure, such an extensive total area would normally be distributed in small fields across different types of land (e.g., dry uplands and wet lowlands).

The contiguous extents of swidden land burned at one time also vary among communities. Some households in some villages tend to locate their fields alone, and burn only their own field. In other cases, groups of households make each year’s fields adjacent to each other, and burn all of the fields at the same time, or consecutively. This improve the likelihood of achieving a hot and complete burn. Even though fires across such a multi-field area may burn hotter and higher than single-field swidden fires (depending on type of debris burned), many village people believe that such collective burning with mutual assistance among field owners actually improves fire safety. In addition to ensuring that there will be enough people supervising the burning to extinguish escaped fires immediately, such group burning also

applies peer pressure to fell and pile vegetation to improve fire safety, and to cut adequate firebreaks around the areas to be burned. According to local anecdotes, many transmigrants from outside Kalimantan now also have begun to practice shifting cultivation variants, but details about their adaptations, especially their uses of fire and fire precautions, have not been developed for this research.

In the 1990s, routine agricultural burning in these Sanggau swidden/ agroforestry systems took place in a context of rapid transformation of the regional landscape, including village land uses under “traditional” management governed by customary law and norms (*adat*). Large-scale plantation development has transformed the regional landscape in ways clearly visible even from outer space in satellite imagery (compare the Landsat TM images of Eastern Jangkang and Western Belitang in **Figure 3** from September 1991 with **Figure 4** from March 2000). Indigenous village agroforestry landscapes have changed rapidly as well, though in ways that may be less obvious to outsiders. Within village-managed territories subject to customary tenure rules, many post-harvest swidden fields are not allowed simply to succeed back into secondary forest awaiting the next swidden clearing cycle. Instead, in both a very large portion of the areas that would otherwise be swidden “fallows” (*babas*; *jamih*) are instead planted with rubber and fruit saplings, to become forest gardens (*kebun*) after the initial harvest of rice, vegetables, maize, cassava, and other short term crops. In some areas of Jangkang during the 1980s and early 1990s, up to half of the swidden fields used for annual crops each year were converted to mixed forest gardens (*kebun*), either immediately or within a few years after rice was harvested from them [Mayer 1996]. These gardens are dominated by rubber, but also contain many fruit trees and useful herbs) and subsequently managed as *kebun*. In several areas of the Belitang subsites, so much of some villages’ land has been converted to forest gardens that they mention having a difficult time finding land appropriate for growing rice under familiar conditions [PPSDAK field research, 2000]. In some Jangkang areas, dryland swidden sites have been replanted in rubber so fast that siblings and other members of co-inheriting descent groups compete with each other to plant such perennials, pre-empting sites aht others may also claim.

This produces several possible results: (a) speed-up of swidden rotations on remaining available sites, with concomitant land degradation; (b) investment in improved food growing technology such as better water control for wet rice and swamp rice fields on

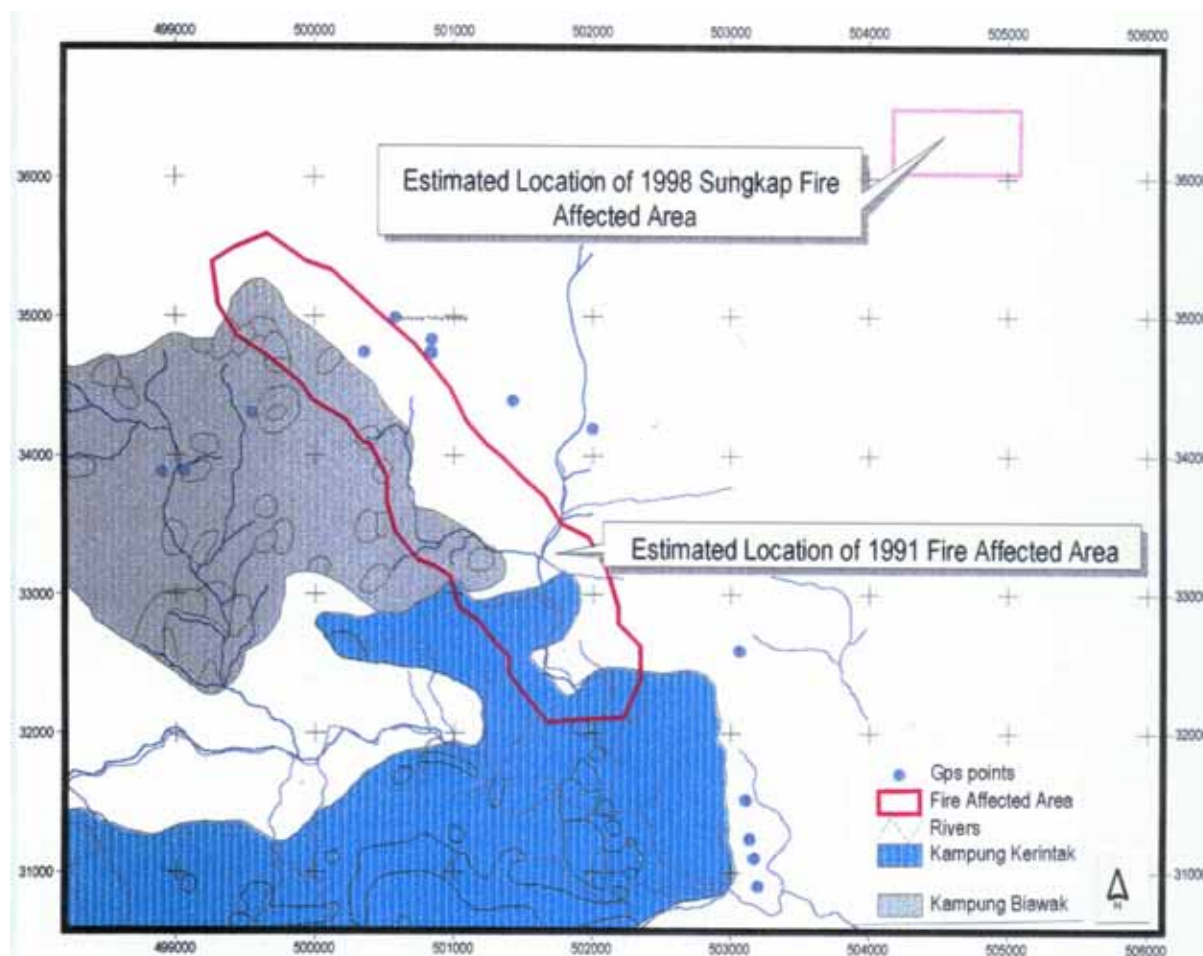
appropriate sites, which may avert land degradation; or (c) increased reliance on purchased food (using cash earned from rubber tapping, etc), rather than continuing self-provisioning at previous levels.

Mualang and Jangkang systems of land and vegetation classification are well developed, but they differ somewhat from one another [see PPSDAK documentation, Mayer 1996; Drake 1982]. A significant difference between the two systems lays in the Jangkang's somewhat finer differentiation of stages of swidden fallow recovery and secondary forest succession than those used by the adjacent Mualang. This may indicate the Jangkang's more highly developed understanding of risk factors for land degradation due to over-cultivation through sped-up swidden cycles, or fields located in areas sure to be degraded to fire-tolerant grass and scrublands if cleared too soon, thus helping Jangkang people to locate each year's fields on more appropriate sites, if households have access rights to them.

4.4.2 Fires deliberately set by village smallholders for shifting cultivation, but which escape their intended limits; escaped swidden fires considered accidental, arising despite actions that local community members consider responsible fire use; customary fines and repair of damages indicated under adat judgements are not necessarily enforced on the fire setter, even where damage to agroforestry property occurred

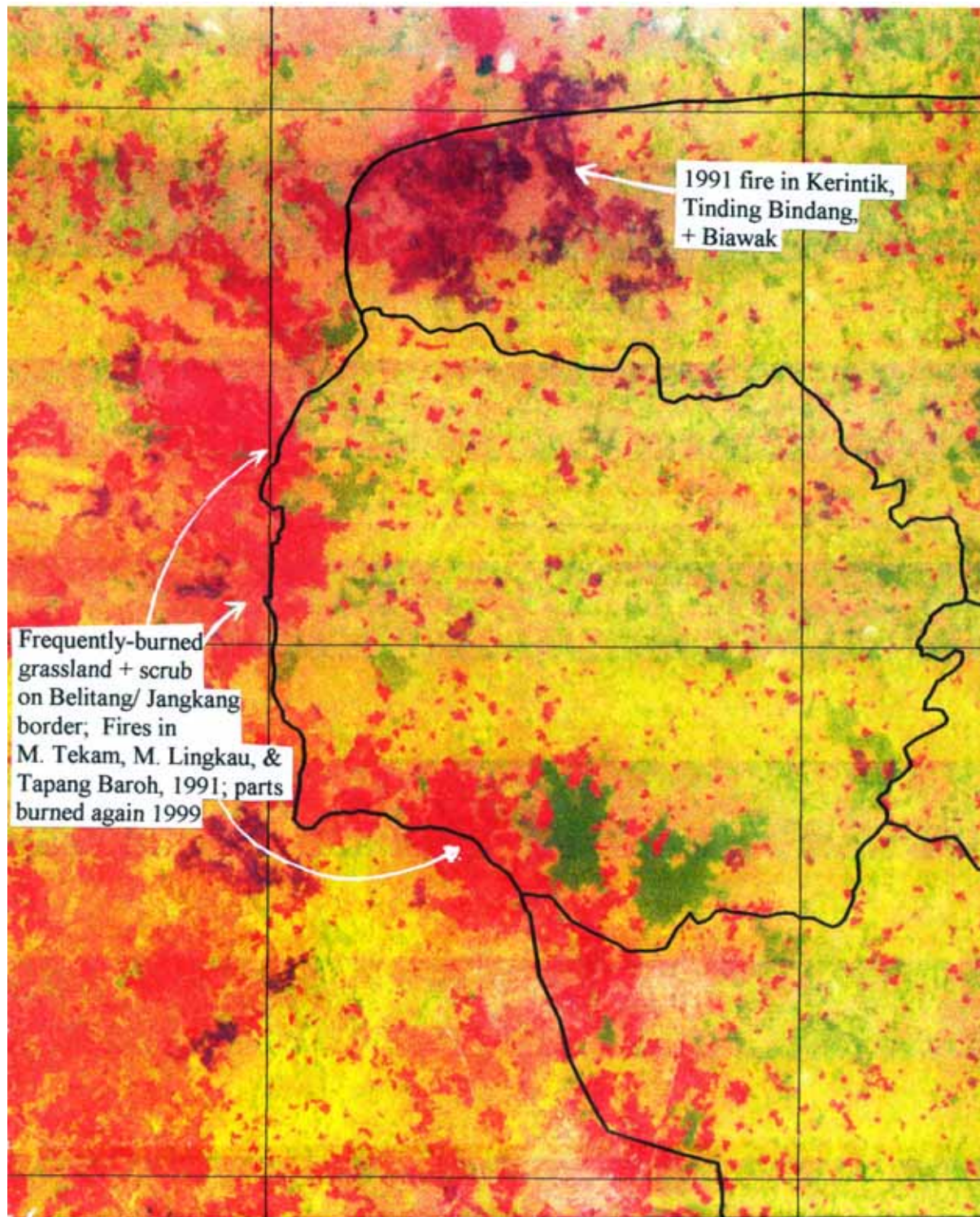
A “classic” case of a wildfire originating in swidden burning conducted according to customary norms that would normally be considered sufficient safeguards burned a significant area in the Belitang *kampung* of Tinting Bindang in 1991, but originated with swidden burning by a farmer whose identity is clear in the neighboring *kampung* of Kerintak (See **Figure 4-1**, showing the estimated location of 1991 fire in Kerintak, Tinting Bindang, and Biawak). During the long drought of 1991, this Kerintak farmer burned his swidden field in the normal way, and made sure that ground fires had been extinguished before leaving the site. According to accounts by people in Tinting Bindang, however, he did not notice that embers continued to smolder within a dead tree near the burned field. Eventually, wind scattered fanned-up fire from the top of the dead tree, and set bushes and rubber trees below it on fire. This fire spread rapidly, and burned areas in the villages (*kampung*) of Kerintak, Biawak, and Tinting Bindang, although the intensity of the burn varied across the affected area. (See Estimated Location of 1991 Fire in Kerintak, Tinting Bindang, and Biawak, and 1998 Sungkap Fire in, and satellite image showing that burn area, of Northwestern Kecamatan

Belintang Hilir, and Southeastern Kecamatan Jangkang in **Figure 4-2**).



□ Bagus Suratmoko, PPSDAK-Pancur Kasih staff, and Tinging Bindang resident

Figure 4-1 Estimated Location of 1991 Fire in Kerintik, Tinting Bindang, and Biawak (Kecamatan Belintang Hilir)



□ Landsat TM 16 Sept. 1991, Bands 5,4,3

Figure 4-2 Northeastern Belitang Hilir Sub-district and Southeastern Jangkang Sub-district

Local assessments indicate that more than 10,000 rubber trees were destroyed in this fire, in addition to swidden fallows (*babas*) without perennial crops where no specific compensation was demanded. Assuming that these were mainly mature rubber trees, the customary requirement that the fire setter replace damaged property was very heavy. Assuming 200 to 300 rubber trees per hectare in this low-intensity mixed forest garden, this would have amounted to the demand to replant a total area of up to 50 hectares, which would only be possible for the labor of a single household to do over many years. If cash damages were to be paid even at the relatively low rate of Rp. 5000 per mature tree (used on some other *adat* compensation settlements in the region during the early 1990s), the total owed would have been Rp. 5 million, an enormous sum for a village farmer at that time. Demands for compensation at higher rates (up to Rp. 30,000 per mature tree for economic species) would have made repayment impossible for a village farmer. In this case, because village neighbors believed that the original fire setter had actually taken appropriate precautions, customary owners of the burned rubber gardens did not demand compensation from him. However, his neighbors in Kerintak and Tinting Bindang believe that this fire setter died later in 1991 of distress, thinking of the sum for which he might have been liable to compensate for his neighbors' losses. [Tinting Bindang interviews, 2000].

4.4.3 Escaped swidden fires due to irresponsible burning by village smallholders (includes fires affecting local community members' land, plantation lands, degraded grassland or scrubland common property, or remnant natural forests), subject to customary sanctions against the fire setter in the case of local community lands; in principle subject to civil liability for damages to plantation trees

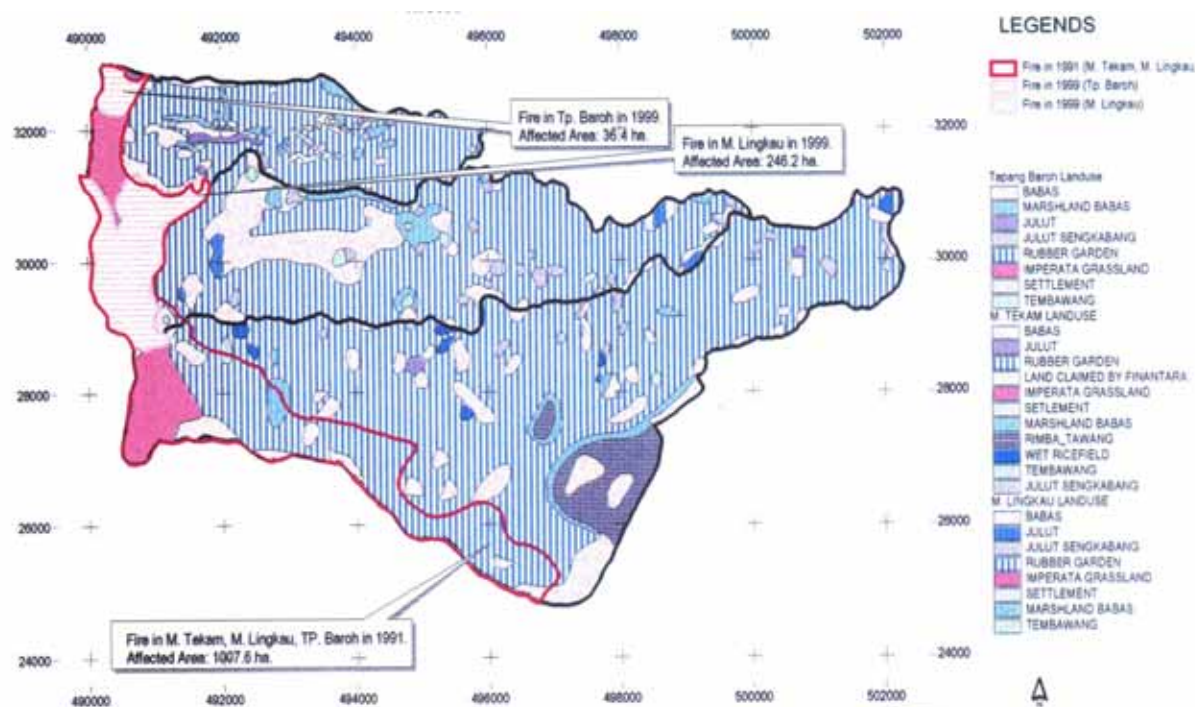
Most of the "fires of concern" recounted in this study were swidden burns that had spread out of control, especially during drought seasons or extremely dry periods such as those that occurred in 1991, 1994, 1997, and 1999. Although local community members attributed part of the blame to extremely dry conditions, they blamed individual carelessness by fire setters failing to take appropriate, familiar precautions. Neighbors' assessments traced the extent and severity of damage caused by these fires to some degree of negligence on the part of fire setters, according to local norms of responsible burning, and according to local customary laws, which invoke customary sanctions for damages due to negligent burning, including fines, and requirements for replacement of burned property.

In some cases where communities realize they have a serious fire problem, whether originating from within their customary territory, or from outside, they have taken action to minimize fire risks in the future. One of these places is the Mualang village of Resak Balai, a *kampung* in *Desa Merbang*, at the southwestern edge of *Kecamatan Belitang Hilir*. (See map of estimated locations in **Figure 4-3**, with detail in **Figure 4-4**). This village has tried to reinforce local rules for burning along a customary law model, along with fostering increased awareness of the consequences of burning under high-risk conditions. (These measures are explained in *Section 4.3* of this report.) From 1964 to 1991 Resak Balai experienced 4 land fires of increasing seriousness in approximately the same locations, during droughts of 1964, 1979, 1983, and 1991. In the 1991 drought, this community's most extensive wildfire in recent memory burned some 200 hectares of swidden fallow (mainly grassland) and rubber trees. Resak Balai residents point to this fire as an indication of increasing fire risks in their area, since this extensive fire burned in the same location as smaller fires in 1964 and 1979, straddling the southwestern village boundary with *Kampung Pinyak*. Much of this area, today mainly *babas*, had been an open-access "no-man's land" until recently. However, since before the forebears of current Resak Balai residents had settled the area in the 1930s, it had been a *gambir* plantation run by a Chinese man. (*Gambir* leaves are ingredients used in betel-nut chewing. *Gambir* may be from several species of climbing plants grown in mixed agroforestry systems, including *Uncaria gambir*, and wild jasmine species.) Political pressure on the Chinese in rural areas during the early 1960s caused him to abandon the plantation, and the former plantation land was then divided between the villages of Pinyak and Resak Balai.

The 1964 accidental fire burned only 4 hectares of *babas* (recovering swidden fallow). The fire was started by a Resak Balai farmer who burned his field carelessly, by everyone's reckoning. The 1979 fire spread out of control through the fire-setter's carelessness as well, due to his failure to cut a fire break around the dry field to be burned. The culprit was the son-in-law of the 1964 fire-starter, but the *babas* that burned was his own, so no fine or sanction was imposed. However, the 1979 fire, accidentally burning over 7 hectares (partly a area being prepared for a new rice field) also destroyed a rubber garden with approximately 2000 rubber trees. The culprit was unable to fully compensate the rubber garden's owner, providing only 500 rubber trees rather than the full 2000. The fire starter of 1979 again neglected a fire in 1983, and burned 1000 rubber trees and 25 highly valued illipe nut trees

(*tengkawang* in Malay; *engkabang* in local Dayak languages), in addition to an unspecified area of other land. He was fined 2 rubber gardens and 2 *tengkawang* gardens (current interviewees have forgotten their extent) as compensation to the owner, and for this repeated negligence. The land that had burned is now a mature rubber garden.

In 1991, fires occurred in 2 locations. The first fire, near the Resak Balai/ Pinyak boundary, was in the same place as the 1964 and 1979 fires. The Resak Balai man who set this fire in 1991 explained in an interview nine years later that he had indeed used proper precautions in burning this field, even pouring water on the embers, and went home believing that the fire had been extinguished. Two weeks later, he returned and saw that the fire had burned 5 hectares, much larger than the area he had intended.



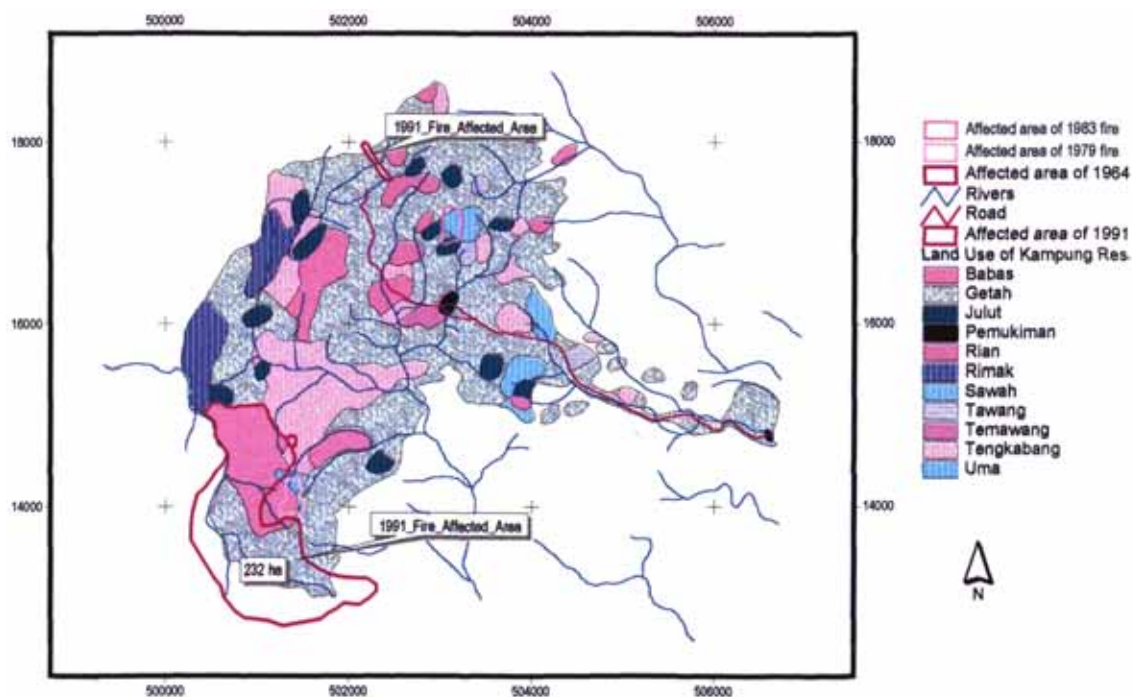
□ Bagus Suratmoko, PPSDAK-Pancur Kasih staff, and Desa Menawai Tekam resident

Figure 4-3 1991 and 1999 Fires in Mentawai Tekam, Menawai Lingkau, and Tapang Baroh



□ Landsat TM. 16 Sept. 2000. Bands 5.4.3

Figure 4-4 Inhutani III and P.T. Finnantara Intiga Timber Plantation Area in Jangkang, Area Along Western Border of Belitang Hilir.



□ Bagus Suratmoko, Staff of PPSDAK-Pancur Kasih, and People of Resak Balai

Figure 4-5 Fire Affected Areas in Resak Balai

Interviews with other people in Resak Balai, however, told a more revealing story. They asserted that this man, from a family habitually careless fire setters, in 1991 was having trouble managing due to the distractions of an extramarital affair. According to these alternative stories, on the afternoon when he burned this field, he ran away from his swidden fire before it had been extinguished, chased by his angry wife. In this version, villagers learned more quickly that the fire had spread, and after the fire-setter left, other members of the community went to help put it out. This was during a long drought, when it had not rained for 6 months, and small streams were almost dry. These village fire fighters used various means to try to extinguish the fires: bamboo water sprayers, hitting grassfires with sticks, and pouring pails of water on ground fires. After two weeks of trying, when the fires continued to spread, the people gave up. Two weeks after that, the fire was finally extinguished by rain, a month after it had started. Resak Balai residents estimate that a 20-hectare area had been burned, including rubber trees, *babas* shrubs, rice fields, and a hut. The fire starter was compelled to give away almost all of his property to compensate village neighbors for their losses. A field survey for this research, guided by Resak Balai residents and using GPS to help locate and measure the area, revealed that the fire-affected area of 1991 was actually over 200 hectares (10 times larger than the area indicated by original village narratives), with almost half of that area located in the territory of the neighboring *kampung* of Pinyak.

The discrepancies between these stories of the same fire are emblematic of many aspects of multiple perspectives on fire events, and blame for fire, on the ground. First, the difference between the fire starter's own version and those of his co-villagers is typical of "classic" community dynamics in which one extended family is singled out as intractible agents of many of the community's ills. As in much of the world, a tendency toward negligent burning (fire-starting, just short of arson) is thought in this village to run in families, and corresponds to these families' other moral deficiencies. Second, the village people's own underestimation of the total area of land burned is also notable, not because of their inability to comprehend standard land measures, but of a tendency to minimize any co-villager's liability relative to an "outside" community, and of a characteristic obliviousness to negative impacts of co-villagers' actions beyond a community's own borders.

This story is also emblematic of the Mualang's expansion along a "Dayak frontier" in other ways. The forebears of the present population of Resak Balai have expanded rapidly along a frontier for the past several generations. The present population of Resak Balai is descendants of people from Pakit Engkuning, now part of *Desa* Tapang Pulau, in the southeast of Belitang Hilir. In the 1930s, some 8 families from Pakit Engkuning set out to find better lands, as their former territory began to fill up. (This story is interesting in that remote sensing images still show one of the most extensive forest islands near the north shore of the Kapuas River in Pakit Engkuning even in 1991. Indications from a fire narrative of 1998 indicate that much of this area may have been peat, and unsuitable for swiddening. Thus, even though Engkuning still had extensive forests, the land may have been ostensibly full from the perspective of swidden-based livelihoods.) The land at the present location of Resak Balai was attractive, but it already belonged to Melayu and Ketungau people. While some of the forebears of the present Resak Balai population bought land from the Melayu and Ketungau owners in open customary transaction, others got it by fooling them. [Suratmoko 2000] Resak Balai people are continuing to expand the territory they control through new means, including purchasing land adjacent to their village territory and nearby from Melayu owners in Menyumbang (south of Resak Balai). Since none of the land in Menyumbang or Resak Balai is formally titled, these transactions have all taken place through informal land markets.

4.4.4 Fires set for hunting, with repeated burning causing long-term land degradation and formation of grasslands, fern mats, and slow-succession scrub forests; cause for longstanding disputes between adjacent communities

Residents of all Mualang villages visited for this research attribute the swathe of *Imperata cylindrica* (*alang-alang*, or *lalang*) grassland and scrub forest along the western boundary of their customary territory with the Jangkang to fires that the Jangkang set in the past for hunting deer and wild pigs. (Two of these border areas are shown in Landsat images in **Figure 2-3** and **Figure 4-2**). During dry weather, Jangkang hunters used advancing grass fires to drive game into the open, where up to several dozen men hunted them with dogs and spears, and more recently with air guns (*senapan*). During the subsequent rains, tender young vegetation sprouting on the recently-burned land, attracted grazing deer and other game into the open for additional easy hunting. Mualang people in Menawai Tekam first became concerned about this expanding fire-prone grassland as early as the 1950s.

Jangkang people interviewed for this research about reasons for the appearance of the *Imperata* grasslands along their eastern frontier with the Mualang admitted freely that hunting with fire had not been unusual in the past. However, they attributed the appearance and expansion of *imperata* grasslands *within* their own borders mainly to other causes. These reasons focused on too-frequent recultivation on sensitive soils, which degraded land to a status they refer to as *jami h doda*'. Jangkang informants also indicated that they believe some of the grassland could be attributed to past Mualang tendencies to extend their fields into areas on what they identified as the Jangkang side of the ambiguous forest border, and overcultivate them until they were seriously degraded because they knew that they would have no permanent land rights in those areas. Jangkang informants claim that is why Mualang failed to plant stabilizing perennial crops along their border with the Jangkang.

In fact, although residents of most of Mualang border communities have been distressed by timber company demands (by Inhutani, later by Finnantara) to cede land to them for development of a new timber plantation, they indicate that their fear that wildfire would spread into their own customary territory from the west (from Jangkang areas) has actually declined since the plantation took over the land in the Jangkang areas just across their border. Plantation staff have effectively discouraged such burning for hunting in areas they control, since hunting fires could easily spread into timber plantings. It is highly unlikely that such hunting practices will be resumed, since prized game species (wild pigs, deer) have largely disappeared from the area due to land conversions and habitat fragmentation by plantation monocultures.

From a research perspective attempting to construct a landscape history highlighting implications of fire in regional landscape formation, attaching credibility to such disparaging accounts by Mualang about Jangkang, and by Jangkang about Mualang, adds complexity to attempts to determine underlying causes of wildfire and undesired fire, and resulting landscape transformations. The antipathy of these rival communities of different ethnicity [see Drake 1994], and their aggressive land and fire use practices in the past, contributed to the formation of the fire-prone landscape along the border between them that we observe today. The existence of that landscape, which both ethnic groups as well as government administrators recognize as seriously degraded, was used as a basis for designating that area for commercial timber plantation development in the early 1990s. Fire risks along this

frontier in the future are likely to be influenced more by timber plantation practices, and the plantation's relations with adjacent communities, than by the longstanding rivalry between Mualang and Jangkang.

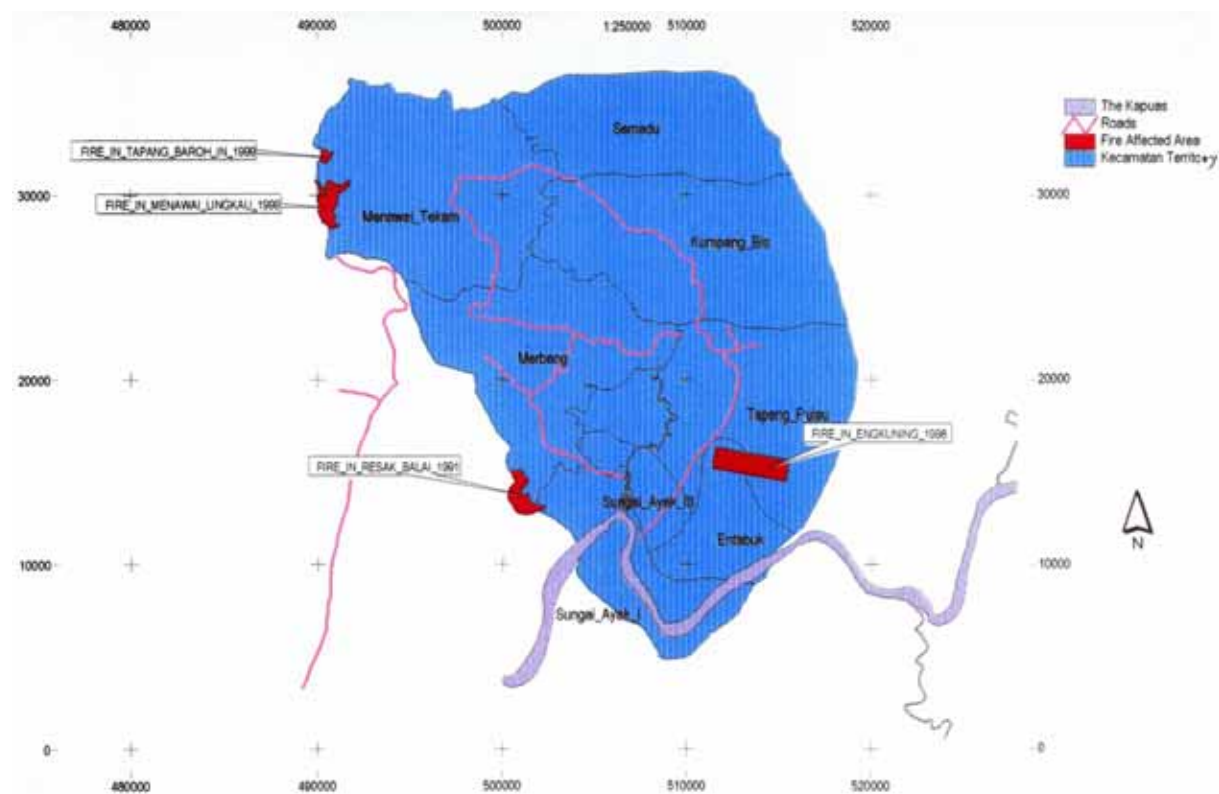
4.4.5 Extensive wildfires that burn grasslands that had been historically formed by repeated wildfires; specific causes of recent fires are unknown, but local people recognize high fire risks in these fire-prone areas of their community landscapes. (Some of these recent fires are complicated by contested rights with timber plantations, leaving a lack of effective responsibility for protection against fires in recently disputed areas)

Example 1: Fires following encroachment on village customary land by timber plantation

This narrative explains Belitang Hilir villagers' understanding of underlying causes for fires along their western border with the concession area of the timber plantation being developed by P.T. Finnantara Intiga. (This area at the western edge of Belitang Hilir, especially the *Desa* of Menawai Tekam, is shown in the Map of 1991 & 1999 Fires in Menawai Tekam, Menawai Lingkau, & Tapang Baroh in **Figure 4-3**, and the March 2000 Landsat TM image of P.T. Inhutani III and P.T. Finnantara Intiga Timber Plantation Area in Jangkang in **Figure 4-4**, as well as in the map of Fire Affected Areas in Resak Balai in **Figure 4-5**, and in the map of Fire Affected Areas in Kecamatan Belitang Hilir in **Figure 4-6**). Residents of Belitang Hilir *Desa* Menawai Tekam and *Desa* Merbang in villages along the western border with Jangkang (e.g., *Kampung* Menawai Tekam, *Kampung* Menawai Lingkau, *Kampung* Tapang Baroh) have long been concerned about frequent fires along the western fringes of their customary territories, where *alang-alang* grasslands have expanded rapidly since the 1950s, and catch fire predictably during drought years. Extensive parts of this area burned in 1999, with smaller fires during 1997 and 1994.

Directed by the Indonesian Ministry of Forestry during the late 1980s, state timber corporation P.T. Inhutani III targeted these areas for timber plantation development. Plans assumed that village people with customary claims to these degraded lands, which are officially designated as National Forest, would willingly release these lands to the company in exchange for token cash compensation, and promises of work on the plantation (see Mayer 1996). In 1993 and 1994, Inhutani III extended their timber plantation to Belitang Hilir, Mukok and Sekadau Hilir, in many cases under highly contentious circumstances. Villagers

interviewed recount that Inhutani representatives approached residents of Menawai Tekam, Menawai Lingkau, and Tapang Baroh in 1993 to persuade them to release these lands at the western ends of their territories to the company (current joint venture concessionaire Finnantara was not yet active in the area). However, all three villages refused the offer, since it offered little advantage to them, when their own income-generating labor was already well-occupied tapping their own extensive small-holder rubber gardens.



□ Bagus Suratmoko, Staff of PPSDAK-Pancur Kasih, and People of Desa menawai Tekam

Figure 4-6 Fire Affected Areas in Belitang Hilir Sub-district

Prior to beginning community mapping of their borders in 1997, with help from PPSDAK-Pancur Kasih, teams of 10 to 15 Menawai Tekam people went out to mark the village's western boundaries. One team went to mark the boundary between Menawai Tekam and Stor Karya, and found that the bamboo that villagers had previously planted to mark the boundary between the two *kampung* had been cut down, and the Menawai Tekam team recognized the stumps. Some of the land within the Menawai Tekam border had already been planted with *Acacia* trees (likely *Acacia mangium*, a species not planted as part of traditional agroforestry systems in this area, but the mainstay of Industrial Timber Plantations in Kalimantan). The Menawai Tekam team reported their news to the rest of the village, and they determined that Finnantara had cleared and planted these *Acacia* within Menawai Tekam's borders without permission from the village. The Menawai Tekam people suspected that a man from the neighboring village of Stor Karya, who was a foreman for Finnantara (which had recently taken over management of this area) was probably behind the idea of removing the village boundary markers, but considered the matter to be between their village and the plantation company, not a personal matter with an overzealous employee from their rival neighboring village. The people of Menawai Tekam complained about the encroachment to Finnantara by letter, and two weeks later met with Finnantara staff and representatives of their neighboring village in *Kampung* Stor Karya, near the area where Menawai Tekam asserted the company's encroachment into their village territory. Menawai Tekam fined the company according to an *adat* procedure, and demanded that Finnantara return control of the land to the village. After a lengthy debate, the Menawai Tekam people saw that the company representatives took responsibility for the encroachment. Finnantara paid a customary (*adat*) fine to the community of Menawai Tekam, in the form of payment for expenses of a customary ceremony. In such a ceremony, pigs or chickens are sacrificed, a "mantra" (with mystical significance) is recited, the world is purged of the wrong-doing in question, and cosmological balance is restored. However, the village did not consider payment for this ceremony as compensation for Finnantara's fault. Compensation was considered the return of some 13 hectares of land to the people of Menawai Tekam, land that the company had already planted with *Acacia* trees.

Following this incident, teams from neighboring villages Menawai Lingkau and Tapang Baroh went to check their own western boundaries, where they encountered similar situations.

Finnantara had already cleared about 100 hectares within Menawai Lingkau's western border without village permission, and 30 hectares in Tapang Baroh, but had not yet planted these areas. The Menawai Lingkau and Tapang Baroh people demanded the return of these lands. Both villages planted these bulldozed lands with rubber trees, presumably to be owned in common by village residents.

In March 1999, the once-disputed lands in Menawai Lingkau caught fire, eventually burning some 246 hectares of young rubber gardens and *Imperata* grasslands (calculated using GPS points with PPSDAK's GIS). Some of the formerly contested land in adjacent Menawai Tekam also caught fire in March 1999. Three months later, in June 1999, the formerly disputed lands in Tapang Baroh burned as well. No concerted effort was made to extinguish these fires, since there was no easy way to reach them, and they were far away from any residential settlement area and the villages' most valuable forest gardens, which are located mainly to the east. No one knew who had set any of these fires, though their seriousness could be attributed, in part, to a vacuum in effective responsibility over lands that had been subjects of contested use and property rights, within a historically fire-prone swathe on a historically ambiguous border. However, people interviewed in all three villages attributed the 1999 fires to the general history of land disputes and contentious tenure on these lands.

Some of the same areas along the old frontier between the Mualang and the Jangkang that burned in 1999 had burned before, especially during the drought of 1991. The 1991 fires, across 3 *kampung*, including the southwestern and western fringe of Menawai Tekam, and the western fringes of Menawai Lingkau and Tapang Baroh. These 1991 fires along the border (previously described) burned for about a month, until they were extinguished by rain, burning an area of some 1007 hectares (by PPSDAK GIS reckoning) of rubber gardens, remnant old forest islands (*julut*, in Mualang), and illipe nut gardens, in the Menawai Tekam *kampung* alone, and considerably more land beyond that *kampung*'s borders, in the area between the Mualang and the Jangkang (prior to the establishment of the timber plantation on parts of this land). Since the mid-1990s, much of this burned area within Belitang Hilir has bordered the new Industrial Timber Plantation that was developed largely on "degraded" land on the Jangkang side.

Example 2: Development of fire-prone landscape on land with history of insecure tenure

According to Mualang accounts, a variation on this theme concerning fire risks of areas of disputed tenure, in a “tragedy of the commons mode”, explains the development of extensive grasslands in the Belitang village of Tabai Timpuk, a community of ethnic Ketungau people. Although this research did not conduct field work in Ketungau villages such as Tabai Timpuk, it appears that considerable expanses of their small land area (now interspersed with land allocated for transmigration projects) burned in 1997 and 1999. The Ketungau people migrated to this particular area after the best land had already been claimed by the Jangkang, Mualang, or Sanggau Melayu people. Therefore, the Ketungau “borrowed” (*num pang*) land from the Jangkang and Mualang for their swidden fields and housing area. (Note that in some other areas, Mualang people originally settled their current territories on land “borrowed” or otherwise obtained from the Ketungau.)

Because the Tabai Timpuk Ketungau village’s land was initially considered to be on loan to them, until the 1960s the Ketungau there did NOT plant trees or other perennial crops on their former swidden fields. The Mualang asserted that this lack of investment in trees (or private land improvements) went along with the Ketungaus’ failure to develop a sense of long-term stake in the land they occupied. They further note that a lack of perennial tree crops in an area, with their stabilizing and privatizing effect on customary land tenure, becomes an underlying cause for the development of a landscape at risk for wildfire and further land degradation, by swiddeners or agroforestry gardeners’ standards.

Because of this lack of private property in land and planted trees in the Tabai village landscape, Tabai people also had little incentive to control fires that would burn only land repeatedly returned to its original owners. Menawai Tekam people assert that this lack of private agroforestry property, and lack of sense of permanent place, also explains why the Ketungau people of Tabai Timpuk were willing to sell much of their land to the plantation company. Now, households with little land of their own depend on wage labor and labor migration, especially unskilled work at gold mines.

Several aspects of the insecure resource tenure for the ethnic Ketungau population of Tabai Timpuk might lead to increased fire risks. In general, with an ambiguous long term stake in “borrowed” land, and few long-term agroforestry assets in the form of planted trees, Tabai farmers would have little incentive to vigilantly monitor the land for signs of the types of land degradation associated with wildfire, and thus less likely to positively respond to those changes. One implication of the practice of NOT planting trees on fallow rice fields is that then ANY descendent of the people who originally “opened” that field from primary forest could claim the right to recultivate it, although normally the most recent cultivator would retain that right. (If trees are planted on the site, only the planters and their descendents have rights to the trees’ produce, or to permit felling the trees). Thus, a prohibition or longstanding practice of NOT planting trees on former rice fields would retain a common property right to recultivate the site which, after generations, would become virtually an open access right for all village members. With no one to ensure that a sustainable fallow period would be maintained before the site could be recultivated by people with limited access to suitable sites, it is likely that these sites would be recultivated at an unsustainable rate, resulting in development of *alang-alang* grasslands. The existence of extensive areas of *alang-alang* commons (effectively open access for a small village population) also has important implications for fire, since such grasslands tend to be fireprone during drought years. Broad expanses of such vegetation, as appear in southwest Belitang Hilir, and in northeast Mukok, provide few vegetative fire or fuel breaks, letting small fires spread out of control.

The area of the old Tabai *kampung* was used partly for a transmigration site in the 1980s, while other parts of it were taken over by timber plantations in the 1990s (Finnantara now; but previously Inhutani). One of the likely reasons that this area had been targeted for land acquisition for both transmigration and the timber plantation was that the land was notably degraded, and with relatively weak agroforestry livelihoods and customary claims largely limited to descent group common property in *bawas* (fallow fields), the Tabai Ketungau people were more willing than others to give up their rights to these projects in return for some sense of opportunity. Non-Ketungau residents of neighboring villages point out that it is this lack of a sense of property (or even of permanent territory) that led the Ketungau of Tabai to be unusually willing to give up their land, first for the transmigration project, and later for

the timber plantation. They also point out that by giving up so much land, even if the Tabai people received some rights within the transmigration site in return, many Tabai people are now compelled to migrate away in search of work, and have found it especially as unskilled gold mine laborers.

Example 3: Sojourners forbidden to plant perennial tree crop gardens

Closely related to the previous example of how the swathe of degraded grass and scrubland was created is another example of how local people believe that insecurity of rights to land by the people usually using that land creates risks of creating fire-prone landscapes, and encourages behavior that increases risks of wildfire, or unwanted fire. To understand this dynamic, it is important to remember that in both Mualang and Jangkang systems, rights to reclear and recultivate land are inherited by all descendents of the people who originally “opened” that site from primary forest. Most often, the people who most recently recultivated a field retain control over that site, but without perennial crops planted on the site. However, once trees are planted on the site (e.g., fruit, *tengkawang*, rubber, or other perennial crops), only the planters and their descendents or designees generally have rights to harvest those crops (or permit others to harvest them) and they retain rights to determine whether or not those trees may be felled to allow the site to be recultivated, or for sale of their wood. In general, customary rights over trees may be held separately from rights over the land on which the trees stand. However, in practical terms, people holding rights over trees gain *de facto* control over the land as well. During a period from the 1940s to 1960s, a fairly large number of Jangkang people from Mukok, lacking access to high quality land in their own areas, came to the Mualang villages of Merbang and Menawai Tekam to “borrow” or rent land to grow annual crops.

The Mualang leaders were apprehensive that these Jangkang sojourners would thus gain a foothold within the relatively porous borders of the time in Mualang customary territory. Therefore, although they were happy to have the Jangkang people farm their land in return for a portion of the crop, or labor, or traditional payments in pigs, chickens, and antique plates, they forbade the Jangkang visitors from planting trees on that land. As it happened, however, those Jangkang visitors stayed for many seasons in succession, and others returned several times. They were generally allocated single-season cultivation rights on land that was already

relatively degraded, and as these rights were repeatedly renewed, land capability of these sites further declined, until they remained “empty fields” (Mualang: *babas puang*; Jangkang: *jamih doda*), where no one was particularly interested any longer in pressing any privatized or descent group customary rights. With few people interested in the long-term capabilities of these areas, these degraded lands then became targets for hunting fires, or at any rate, for relative carelessness in burning adjacent land, since there would likely be no *adat* sanctions for negligent burning. Several men who had originally come to the Mualang area from Jangkang villages pointed out in interviews for this research that when they first arrived, they had been forbidden from planting trees in their “borrowed” swiddenfields. Only when they had married Mualang wives and stayed in their new villages for quite a while, “becoming Mualang”, were they encouraged to plant perennial tree crops on their former swidden fields.

What are the implications of this separation of rights for fire? Men interviewed in Mualang communities believe that planting these agroforestry trees protected their fields against a cycle of overcultivation, and the concomitant development of fire-prone grass and scrub, while building up their stock of capital within their new Mualang home villages, in the form of rubber and fruit trees. When sojourners request permission to cultivate a field in someone’s regenerated fallow, (*babas* in Mualang; *jamih*, in Jangkang), the field’s customary owners retain the right to determine how much rent, if any, to demand, and in what form. The owners also retain the right to grant permission or withhold permission for the borrower or renter to plant perennial crops, and to indicate who will be the *permanent* owners of any trees planted. In some cases, a portion of the rent demanded may actually require the renters to plant the site in rubber, the trees to become the permanent property of the owners, not the renters. In some cases, owners with rights to quite a bit of land which they can spare may actually encourage renters or borrowers to plant trees in the borrowers’ own rights, to provide them with incentives to settle permanently in the village, or to join the owner’s family in marriage. However, in many cases, customary owners try to ensure that renters or borrowers gain *no* permanent or long-term rights to the borrowed site at all. In these cases, customary owners, perhaps backed by customary law leaders, actually *forbid* renters, borrowers, or sojourners from planting trees on the land they have cultivated for a single season.

4.4.6 Fires set by plantation developers or outside contract labor to clear land, with burning contained within relatively uncontested boundaries (since 1995 such burning was illegal)

When P.T. Inhutani III first started to develop its timber plantation in Sanggau in the early 1990s, they experimented with several types of land preparation. In the eastern, lowland portions of their concession, where their work initially focused on relatively degraded land without many large trees. Land negotiations with villages and land clearing began by 1993. Some of these areas were cleared in a “traditional” way familiar to shifting cultivators. included burning, especially and in the hillier western portion of their concession. Inhutani either contracted out land clearing to local crews, or made land preparation by original customary owners part of the transaction for Inhutani to gain rights to plant timber crops on the land.

According to reports in Jangkang areas, some of these early land clearing fires got out of control, and especially those set and supervised by crews from places other than the villages where they were clearing land. As long as these badly-controlled fires burned only other already-degraded areas, or areas for which negotiations to turn land over to the company had already been concluded, no one demanded sanctions against the perpetrators of such fires. However, on several occasions, adjacent rubber and *tengkawang* gardens were also burned by crews that did not include their customary owners. Sequences of threats, counter-threats, and accusations of arson followed some of these incidents. As a result of these experiences, by mid-1993 Inhutani had developed a strong preference to include land clearing by customary owners themselves as part of the negotiated agreements for Inhutani’s access to land. Thus, by late 1993 in eastern Jangkang (the areas bordering Belitang), the actual activity of land clearing had become less contentious than it had previously been (see Mayer 1996).

Inhutani’s plantings frequently failed. Some land was replanted after it had been recleared using either tractors to disk-under young vegetation, or herbicides, most often glyphosate (Monsanto Roundup™) to kill grasses, ferns, and shrubs. In the last few years of Inhutani’s planting activity (in 1995 and 1996, before Inhutani virtually abandoned their plantation except for a skeleton crew during the crises of 1997-98), most land preparation used tractors, rather than manual clearing and burning. In the areas of the Inhutani III plantation that were

taken over for development by Finnantara, mechanical land clearing was used almost to the exclusion of other means. Finnantara continues to prefer mechanical land clearing for its consistency, its speed, and its freedom from labor problems by avoiding the need to recruit, manage, and be liable in disputes with land clearing crews or contractors [Mayer 1996; Finnantara Staff 2000].

Based on field work for this project and previous research in Sanggau (e.g., Mayer 1996), it appears that mechanical land clearing using tractors and/ or bulldozers tended to exacerbate already tense relationships between plantation companies and adjacent customary land holders, and led to retaliatory burning in some cases in the early 1990s (though at least 3 of these fires targeted work camps, rather than timber plantings). From the perspective of plantation neighbors in indigenous villages, one problem with using bulldozers and tractors to clear land is that this eliminates a source of cash income for local people, including the customary owners of land that would be ceded to the plantation.

However, a far more serious problem in terms of its explosive potential was the fact that tractor and bulldozer timber plantation land preparation could actually be finished before members of local communities even knew it was going on, unless they were deliberately informed. “Mistakes” involving clearing land that had not been ceded to the plantation by its customary owners are considered serious encroachments on customary property, and have led to protests that have included threats of arson. Unlike customary owners clearing their own land, and unlike the company hiring local land clearing crews, bulldozer and tractor operators are virtually never members of the communities whose customary lands they are clearing. They are also not directly involved in site surveys, which designate land to be cleared, and areas to be left alone. Problematic situations arise when bulldozers and tractors are used to clear land at the edge of one village’s customary territory, and the adjacent village has not been a party to the land negotiations involved. Knowledgeable village residents can alert bulldozer and tractor operators to avoid areas that their communities wish to safeguard from land clearing, even surveyors have not marked them well. However, there may be little guidance from villagers when land clearing is taking place at a remote edge of a village’s territory, far from areas that villagers normally expect to protect.. While any bulldozer or tractor operator familiar with land uses in Kalimantan would think twice before leveling a young rubber garden, he might not see any reason to stop for consultation when leveling a

broad area of scrub forest and grassland. To add insult to injury in cases of such encroachment across boundaries, mechanical land clearing may also obliterate even the vegetative landmarks used to indicate such boundaries.

4.4.7 Fires set by plantation developers or outside contract labor to clear land in areas of contested land rights, leading to potential for retaliatory action; subject to sanctions under local customary law; illegal since 1995

During the 1999 field research, Mualang villagers mentioned that although there had been relatively little fire within lands actively managed by members of their communities during 1997, a great deal of land within the Patriot Andalas concession to the south had burned, some deliberately, some accidentally. One *Dusun* Merbau man estimated that up to 5000 ha of land within another company's concession during the 1997 drought, in *Kecamatan* Belitang Hilir, and Belitang Hulu to the north. Yet, it was not clear which areas had burned accidentally, and which had been deliberately burned to "free" land from persistent customary rights claims. Since Patriot Andalas did not provide data on fires within their concession for this research, additional research would be necessary to shed light on these claims.

Another man interviewed in the course of this research, who had worked for the P.T. Patriot Andalas oil palm plantation in the late 1990s, indicated that one of the foremen there had explained to him how to "finish" contentious negotiations with villagers about land access quickly, with fire: Wait for a dry day, and find a spot with a load of dry debris. Go by yourself. Do not go with anyone who could witness what you are doing. Drip a bit of kerosene around the site, but not right in the middle. Make sure to take the can away with you again. Then, place a lit mosquito repellent coil in the middle of the dry debris, though not right where you had poured the kerosene. After a few hours, if there is a breeze, the mosquito coil will ignite the debris around it. That small fire will spread easily to where it will be "happy" to find items still moist with remaining kerosene, or kerosene fumes. By the time the kerosene-sprinkled area ignites, the fire will be large. And after the fire is dead, all will appear to investigators like a "natural" fire. An alternative is to do the same with a cigarette, instead of a mosquito coil. However, cigarettes tend to go out by themselves too quickly, while mosquito coils burn longer without going out (and so are more likely to ignite surrounding debris), and they leave no evidence.

In the course of this research, we interviewed no one who admitted to having done such a thing himself. Nor did we find any reports of such arson or accusations of it at police offices in the *Kecamatan* centers, where arson reports would first be handled before being passed on to higher levels. However, several *Kecamatan*-level police indicated that they had heard such stories, off the record, though no official complaints had been registered. Since there is no record of anyone successfully prosecuting such a case against a large corporation in this area, or against people suspected of arson at a company's behest, it is reasonable to assume that without more "hard" evidence, and without money and legal expertise, it would be futile to pursue such a case under current circumstances.

4.4.8 Fires that local people believe were set to intimidate them into ceding their customary land rights or other resources to plantation developers (corporate arson; this research did not substantiate any incident by accounts from plantation staff themselves, or by official investigation)

In June 1998, an area that had recently been cleared for the expansion of the P.T. Patriot Andalas oil palm plantation caught fire in Pakit Engkuning and Entabuk, two *kampung* of *Desa* Tapang Pulau in the southeastern part of *Kecamatan* Belitang Hilir. This location is shown on the map of Fire Affected Areas in *Kecamatan* Belitang Hilir in **Figure 4-6**. Landsat TM images of this area in Southeastern Belitang Hilir from September 1991 (**Figure 4-7**) and March 2000 (**Figure 4-8**) show land cover changes in this area, from an extensive remnant primary forest island in 1991 to a massive complex of burn scars in early 2000, following two years of major fires in Pakit Engkuning, in 1998 and 1999. P.T. Patriot Andalas, with a concession area of some 23,000 hectares [see **Figure 2-2**], is a subsidiary of Bakrie Brothers, a conglomerate with assets in many sectors, including oil palm. Logs from land cleared for the plantation burned, in an area adjacent to villagers' rubber gardens. The fire spread through dry peat soil for a week before it was extinguished, threatening both the plantation and local communities' forest and rubber gardens (*kebun/ getah*), as well as to smallholders' recovering fallow swidden plots (*uma*). It remains unclear whether the company was deliberately using fire for land clearing, despite the ban on commercial land clearing burning since 1995.

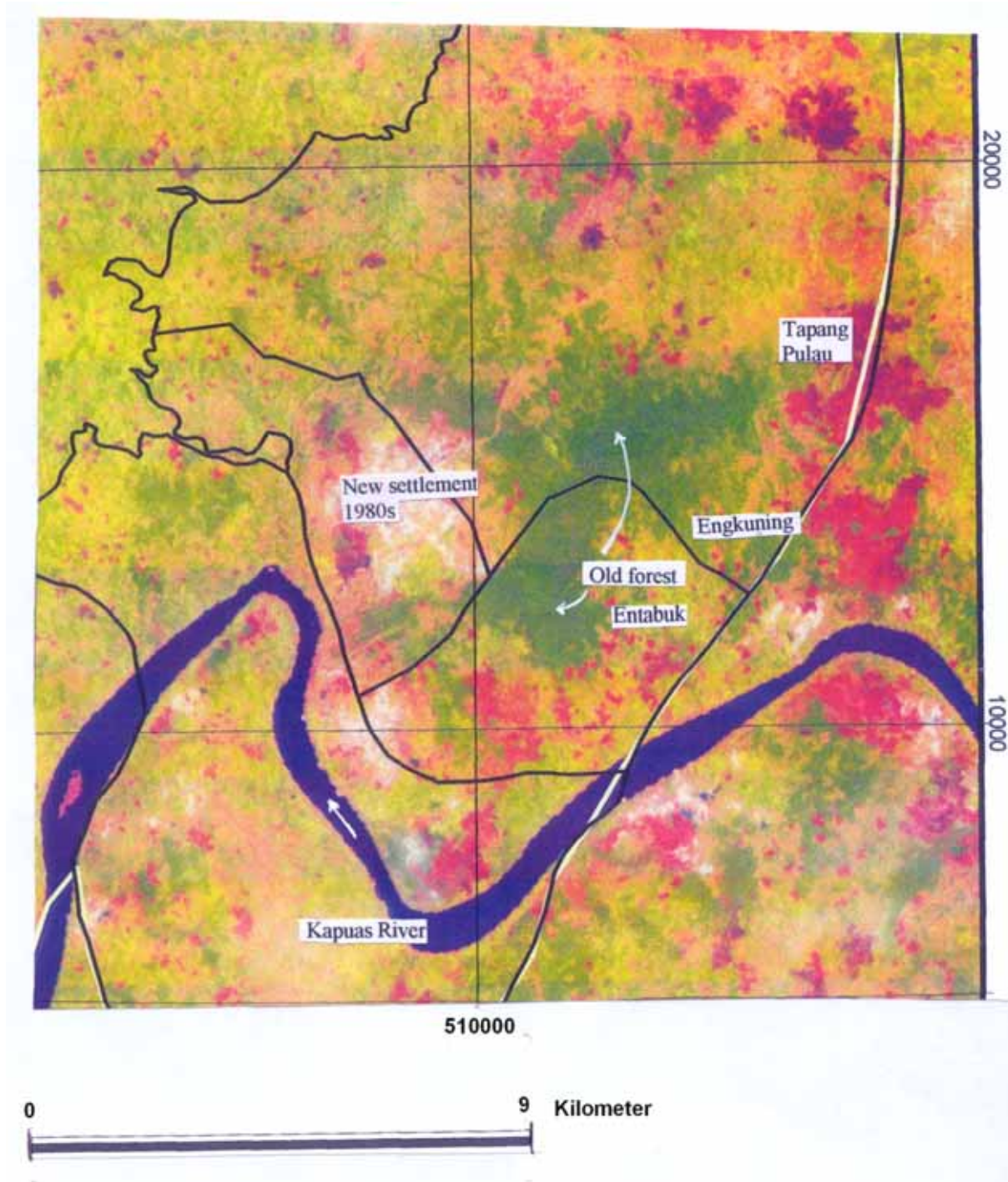


Figure 4-7 Southeastern Belitang Hilir, Landsat TM Image, 16 September 1991

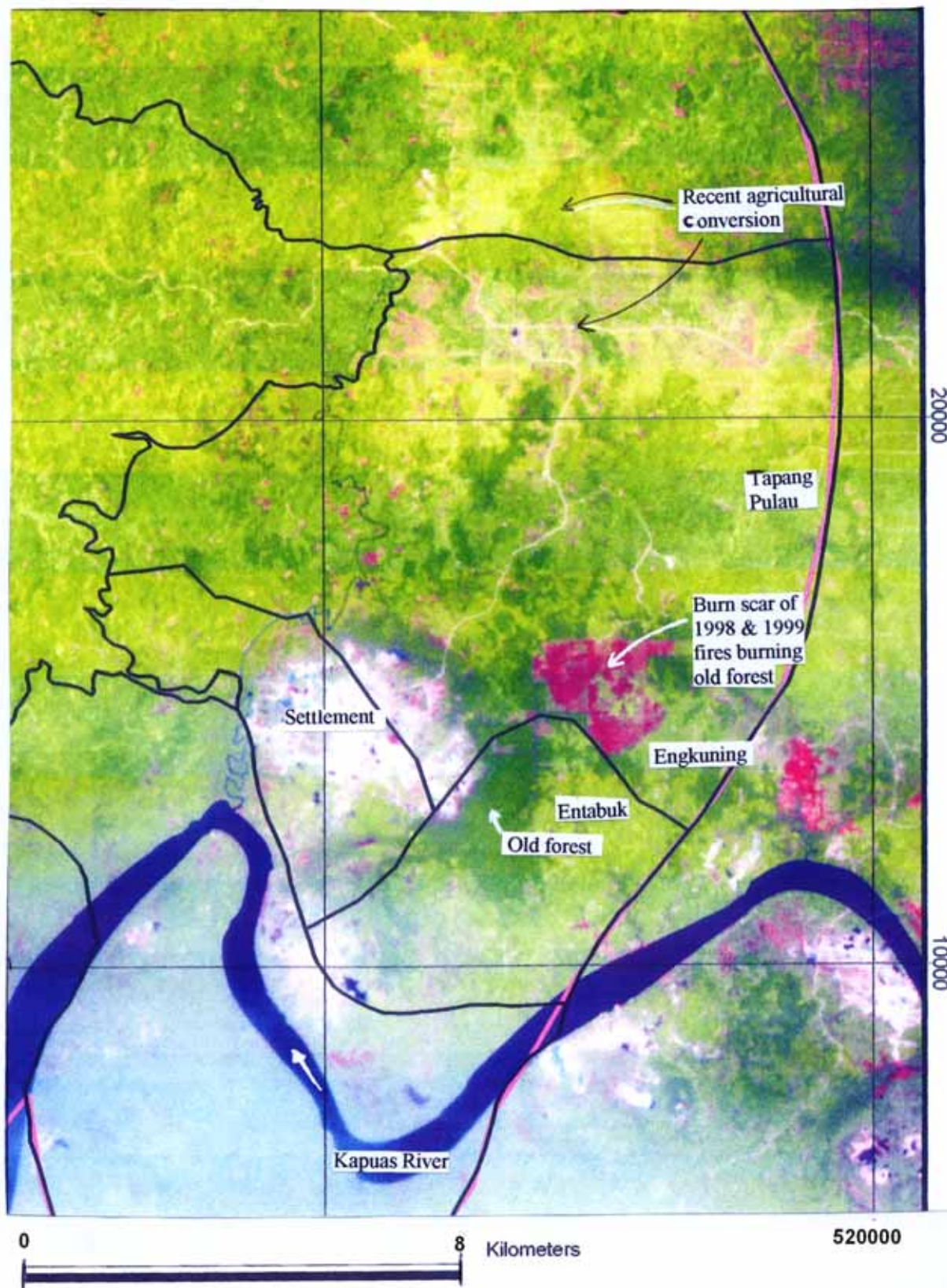


Figure 4-8 Southeastern Belintang Hilir, Landsat TM Image, 8 March 2000

Several village men interviewed in Pakit Engkuning believed that someone from the company had set the original fire, though possible reasons for this are somewhat convoluted, and the accusation has not been substantiated. There had been a dispute over the disposition of commercially valuable logs from land clearing within the Pakit Engkuning village territory, which the company had offered to “manage” (“*mengolah*”, in this case euphemistically meaning to sell), but village people still claimed this timber as well. Before this disagreement had been definitively settled, the logs caught fire and burned. (Landsat TM images from March 2000 show the most extensive and serious recent burn scar in the entire Sanggau site in this area. Although the story recounted here could account for extensive burning in 1998, the recent appearance of the burn scar in the Year 2000 remote sensing image suggests that there may have been additional extensive burning in 1999 not accounted for here. If the suggestion of deliberate burning by the company are true, it appears that this oil palm operation found a very effective way of clearing much of their concession in one fell swoop. Note that when field research for this project was done, researchers had not yet seen Landsat images from Year 2000.)

In 1996/97, PT Patriot Andalas began “opening” land from its concession for their oil palm plantation, with 15,000 hectares targeted in *Kecamatan* Belitang Hilir (see map in **Figure 2**). Much of the area targeted for oil palm development in this concession was largely primary and very old secondary forest, including the most extensive old forest island remaining in the southern portion of the Sanggau research site. The planned plantation includes land in the Belitang *desa* of Kumpang Bis, Tapang Pulau, and Entabuk. Some 1000 hectares of the planned plantation are located within *kampung* Pakit Engkuning (in *desa* Tapang Pulau) and *kampung* Entabuk, within *Desa* Entabuk (see the concession map in **Figure 2-2**, and the location of the fire-affected area in **Figures 4-6, 4-7, and 4-8**). As of July 2000, some 30 households of Pakit Engkuning’s 72 households had agreed to cede some of their customary rights land to the plantation. People who ceded to the plantation relatively healthy older forest, over which they had rights, explained that they could not effectively use those lands themselves for agriculture in any case. Making swidden fields in or adjacent to old forest comes with pest problems, especially wild pigs and monkeys that destroy crops.

Field surveys for plantation land clearing in this area took place in 1997 and 1998. The mismanaged surveying and land acquisition process caused deep animosity among local populations. Plantation surveyors encountered many overlapping claims (which should be no surprise in a customary tenure system that recognizes rights to use particular areas by multiple members of a bilateral descent group), without realizing that they were, in effect, committing the company to compensate two sets of owners for the same land. Former Patriot Andalas staff members who had followed this case estimated that the total area subject to such double claims (surveyed twice, and presumably paid for twice as part of the company's land negotiations with village people) amounted to about 100 hectares, costing the company over Rp. 60 million in double payments to customary owners. This says nothing of cases where one customary owner might have wanted to sell, while another refused. The second owner would still have been entitled to compensation when the land was cleared. Based on experiences in other communities (since the research team did not have enough time to confirm a common experience in Pakit Engkuning) it is likely that village people's animosity toward the company remained for fomenting this confusion within Pakit Engkuning, and creating "social jealousy" in the wake intra-family disputes about who had rights to make decisions to sell land or refuse, and who had rights to negotiate for, and receive, compensation payments for the land. P.T. Patriot Andalas also met problems in dealing with transmigration site land adjacent to their concession. The company had cleared approximately 60 hectares of land belonging to some 80 formal title holders from the transmigration settlement, each of whom received Rp. 50,000 in compensation from Patriot Andalas.

Prior to the Patriot Andalas fiasco, the Pakit Engkuning area already had a history of major land-appropriating projects since 1986, when the government established a transmigration project on the border of *Kampung* Pakit Engkuning, and *Kampung* Tapang Pulau. These communities' experience with land expropriation for government development schemes has made them suspicious of the motives of anyone demanding their land. Local people received no monetary compensation for the land they ceded to the transmigration project. However, each household providing land could claim the right to own a transmigration project plot under the standard "local transmigration" package of that period: $\frac{1}{4}$ ha for a house and yard, plus $\frac{3}{4}$ ha of the agricultural land prepared by the project (*lahan satu*), and 1 hectare of land which they would have a right to develop themselves, and own under formal title (*lahan dua*).

Residents of Pakit Engkuning have reason to be skeptical about promises of a prosperous future in exchange for giving up their customary land to government-mandated projects. Most believe that the transmigration project developed on their land in the 1980s has been a dismal failure. Many of the new transmigrants from Java sold their plots and returned to Java. Some local transmigrants from Tapang Pulau and Pakit Engkuning moved on to new transmigration projects in nearby Sekadau. Complaining of no quality drinking water at the transmigration site, most of the local transmigrants left their houses at the resettlement site to return to their old village homes. However, local people continue to grow crops on their transmigration land as well as their customary rights land in the old *kampung*. Today, only 5 households remain at the old village site of Pakit Engkuning (down from some 40 households before the road and transmigration project were built) while the *dusun* of Pakit Engkuning has grown to 72 households, including 20 along the new road.

Whether or not the original fire was set by people acting at the behest of the company, the fact that many local people believe this to be so reduces the likelihood that Pakit Engkuning people would enthusiastically cooperate with the company in fire prevention or fire suppression efforts in the near future.

4.4.9 Fires set by local customary landholders for land clearing prior to ceding their land to a plantation concession (burned using techniques similar to conventional swiddening, but often without traditional fire safety measures)

Although this type of burning is clearly counter to the spirit of the national prohibition against commercial burning for plantation land preparation since 1995, most people interviewed believed that it was not technically illegal. In any case, no one believed that the prohibitions on burning would or could be enforced in these cases, nor does anyone interviewed in Jangkang or Belitang Hilir believe that they have been enforced.

Two cases of high-risk burning encountered within the Sanggau research site exemplify different aspects of burning practices that can have extensive and long-lasting impacts on the regional landscape. These examples also point out ways in which policy changes may influence fire use decisions.

In the first example, in May 1999, at the start of the dry season and months before the traditional burning period for swiddens in West Kalimantan, we observed a lone man burning a very large rectangular field (at least 3 hectares) along the main road from Balai Sebut, the Jangkang *Kecamatan* center, south to Kedukul, on the Kapuas River. While the road formed a fire break along the field's eastern side, it appeared that no precautions against escaping fire were taken along the field's other borders. When asked why he was burning, why such a large field, why during that odd season, and why he was alone, the man simply stated that he was making a *ladang* (swidden field) for his own family. When asked explicitly if he was preparing the land for an oil palm company, he emphatically insisted that he was not!

In July 2000, we found it and several nearby plots to the south and west planted in year-old oil palm trees. Local residents told us the plantation was owned by oil palm company CNIS (Citra Nusa Inti Sawit, which appears locally to be an independent corporation, but which may have links to a larger parent corporation). The land now covered in oil palm had been used for shifting cultivation by Sape residents, who had not previously planted it in rubber because they deemed that the soil was of poor quality for rubber. In principle, the area was within the timber plantation concession originally held by P.T. Inhutani III (which also had not been eager to plant this land due to poor soil quality and difficult negotiations with local populations), and would have been included in the concession area transferred to P.T. Finnantara Intiga, in which Inhutani III is a partner.

Apparently exercising newly appropriated regional land allocation authority, the Sanggau Bupati had granted an oil palm concession to CNIS in which some land happened to overlap the previously-designated Inhutani III timber plantation concession, as well as the subsequent (and larger) Finnantara plantation. Yet, villagers who had been convinced to release their customary property to the oil palm company were not certain of the basis for the oil palm plantation's rights to negotiate for the use of their land. They simply assumed that if company representatives had approached them, then "the government" had officially redesignated their customary land from Inhutani's or Finnantara's timber plantation concession to CNIS' oil palm concession. It made little difference to them. In fact, they believed that the oil palm company would be able to provide them with more regular wage work in the future than the timber plantation could.

The second case, related to oil palm plantation development, of fire set by customary land holders, is more worrisome than the first, relative to its potential for both uncontrolled fire and violent conflict. It also highlights current confusion that has arisen in Sanggau in the wake of impending “devolution” of land allocation decision-making (and revenue collection) authority to regional governments, a major *reformasi* program.

According to Finnantara Intiga field reports (Finnantara 1999, “*Berita Acara*”), on the afternoon on 6 September 1999, a fire that had been set to clear land for the CNIS oil palm plantation development in the village of Layak Omang II (Mukok) jumped an ill-protected boundary, and destroyed some 8064 *Acacia mangium* trees planted two years before over some 7 hectares in Finnantara’s plantation. Finnantara estimated their losses due to this fire at Rp. 77,414,400. Although Finnantara staff knew that this fire had been a result of land clearing for the CNIS plantation, and that such plantation burning was prohibited in 1999, the company made no complaint to the police about CNIS liability, and as far as we know collected no compensation from CNIS for their losses.

It is not clear who had actually set this fire, but it is likely that CNIS had contracted with local villagers in Layak Omang II to clear their own customary land, since residents in Layak Omang in particular have a strong reputation for retaliating against companies they believe have wronged them, or usurped rights from them, for example, by contracting out work on their customary land to outsiders. The villages of Layak Omang and nearby Empurang were at the center of a series of well-known land and labor disputes with Inhutani III in 1993 and 1994, one of which resulted in villagers setting fire to an Inhutani work camp, and uprooting plantation trees (Mayer 1996). According to one local resident commenting on villagers’ reactions to land clearing for a series of non-local corporations, once an arbitrary government decree had taken their customary land, it does not matter which company controls it. Local village people have little concern or interest in taking bothersome measures to protect one company’s assets from fires set for another company. Villagers were contracted to set fires to clear land for the oil palm company, but they bore little liability for controlling them under chaotic conditions of 1999.

In fact, according to interviews with both village people and regional officials, many plantation companies have developed a wide repertoire of ways to circumvent the Indonesian

government's ban on commercial burning for land clearing, which was clarified in a 1995 decree following the serious fires of the 1994 drought in Kalimantan and other areas of Indonesia. One of these ways is for plantation companies to negotiate conditions for customary land owners to cede land to the companies only after the customary owners themselves have prepared the land for planting. In this way, the customary owners themselves burn the land they will cede to the company, rather than the company burning it directly. If these village owners' burning is challenged, they can claim that they are burning for traditional shifting cultivation (for which burning is not prohibited), rather than for commercial land clearing. Prior to such burning, there may not even be any written evidence of a land access transaction in company records. And the customary owner could, conceivably, actually plant a "traditional" crop on the land rather than releasing the land to the plantation company that season. Thus, even after plantation crops actually appear on the burned land, a government officer would find it difficult to prove that the burning had been intended, from the start, for plantation development, and not for the smallholder's own use. Both the smallholder and the plantation company could claim that the decision to release the land to the plantation had taken place after the smallholder had slashed vegetation and burned it, thus plantation managers could claim they had not broken the rules on burning. From a fire management perspective, this type of "double faced" burning is especially problematic, since there is little incentive for any party to manage fire carefully, as each party can squeeze out of liability claiming that the other party ought to bear responsibility for damage caused by escaped fires.

Several people interviewed in Sanggau for this research mentioned that both Inhutani III (in 1995 and 1996) and CNIS (which began operations in Jangkang in early 1999) had used this subterfuge between 1995 and 1999. Note that by July of 2000, the reform government's Environmental Impact Control Agency (BAPEDAL) had announced that it would attempt to enforce strict responsibility for all burning on land over which any company has a *de jure* resource concession of any kind, regardless of whether they were already planting or extracting resources from a particular location within it. If this enforcement strategy will actually be implemented, then such a subterfuge would no longer make sense (Kartodihardjo and Heru 2000).

This transfer of land development rights to CNIS was done without consultation with local

village residents or with managers of Finnantara Intiga, who believe that much of CNIS' operations in the area are illegal [Finnantara 2000b]. The result is a tight matrix of concession areas designated for plantation timber, interspersed with others designated for oil palm planting by a different company, with pockets of land "enclaved" for continued use by villagers (the customary owners of this land). The multiplicity of groups with rights and responsibilities for land management, including control of fire, within small areas vastly increases risks that uncontrolled fires will cross boundaries between these groups' areas of responsibility, while these parties have few common understandings about appropriate uses and controls for fire.

4.4.10 Fires set by local customary smallholders for routine swidden land clearing, but which escape and burn adjacent commercial plantation trees

Since 1999, managers of the P.T. Finnantara Intiga timber plantation have organized their fire records to make them more accessible, and thus make it easier to reconstruct fire events [Finnantara 2000a]. All together, this set of reports indicates that escaped swidden fires burned about 70 hectares of Finnantara's planted area in Sanggau in 1999. (Finnantara data for 1998 and 1997 were not available at the time of this writing, however, 1997 and 1998 represented a hiatus in company activities in the region. Stories indicated by these records should be cross-checked with memories of local residents, however, since they may represent managers' need to "fix blame" for fires quickly, but without adequate investigation.) Evidence of fires which damaged the company's already-planted areas indicates that many of the fires between 1997 and 1999 were symptomatic of the chaotic political climate regarding land and forest uses and designations. Land allocated or reallocated in concessions since 1997 has often been subject to contentious negotiations and precipitous unilateral actions, including burning, by plantation companies as well as villagers.

In cases where customary owners are contracted by plantation companies to "prepare" their land by slashing vegetation and burning it before turning it over to the company, the underlying problem with regard to impacts to the landscape is not fire management *per se*, but the national and regional government policies which have allocated so much land for "conversion" to plantation use in the first place, and given plantation developers a great deal of latitude in how they negotiate land clearing processes with both local communities and

regional governments.

This research has documented many examples of villagers burning their customary land both prior to ceding it to plantation concessions, and afterwards. In most of these cases, villagers do not consider these fires problematic unless they also accidentally burn land which other customary owners have not intended to cede to the plantation. This is a particularly murky area of the land conversion process in much of Kalimantan. Customary owners are often extremely upset if these fires burn mature tree gardens (especially rubber or fruit), and angrily demand apologies and full compensation from the plantation developers as well as from their negligent neighbors. However, if these fires spread to fallow land or very young gardens, customary owners may be willing to settle for routine compensation packages from the plantation development companies and may end up ceding that land after all, and to forgive their negligent neighbors. Thus, the stage is set for a great deal of such “accidental” or “negligent” burning.

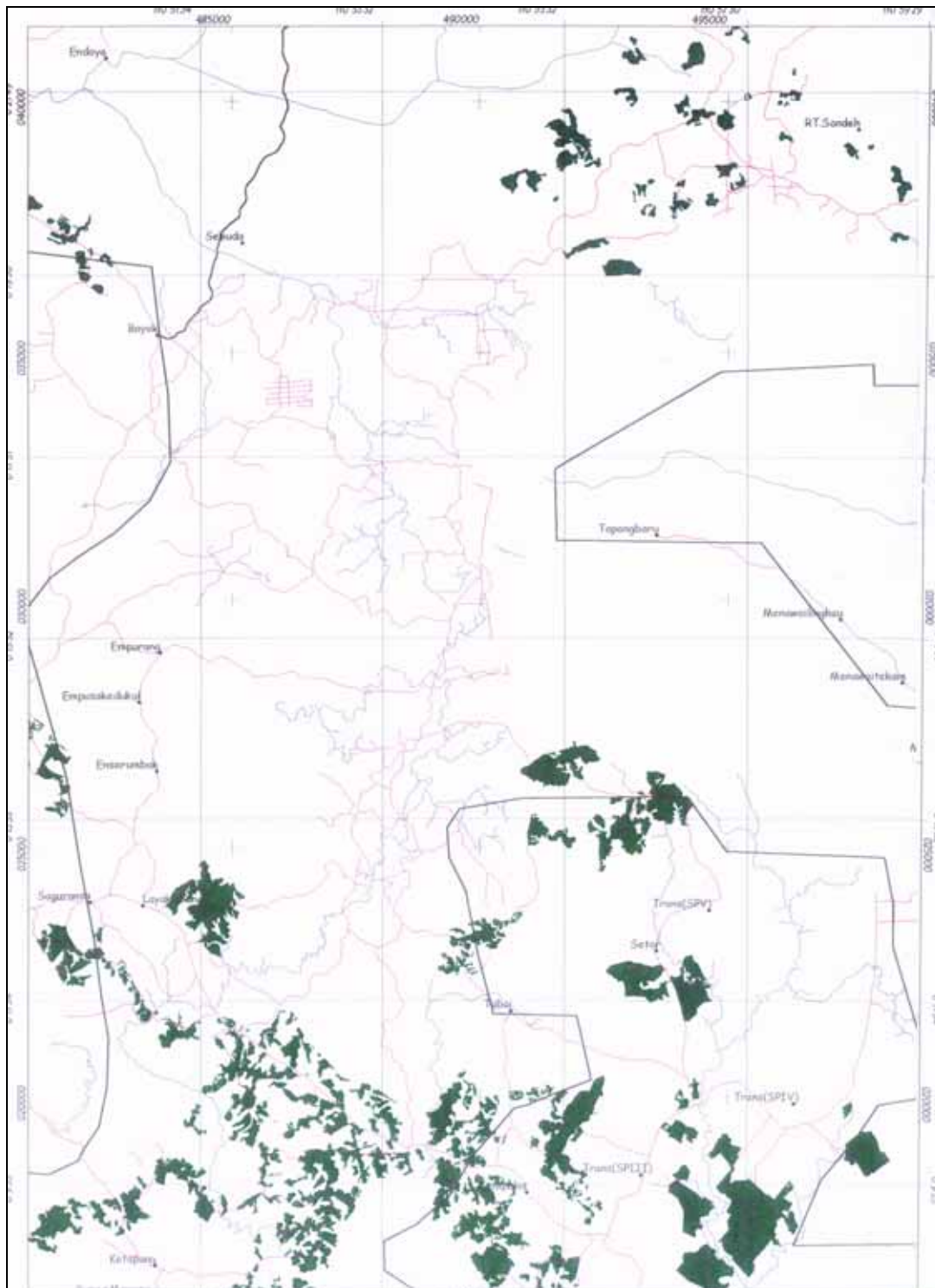
Plantation developers are especially concerned, however, with two kinds of burning which cause costly damage to areas which they have already planted. The first type involves only plantations which continue to clear land themselves by burning (in spite of the clear national ban on such burning since 1995), or which include agreements for the plantation to use land ceded by customary owners and which either require or condone the customary owners to burn prior to releasing the land as a condition of land contracts (a strategem contrary to the spirit of the commercial burning ban, but never legally prosecuted up to the time of this writing). The second involves conditions arising out of the chaos surrounding land allocations in the wake of “*reformasi*” and devolution of land use designations to regional governments.

Finnantara Intiga has kept detailed records of instances of damage to their planted areas. Records from 1997 and 1998, during the hiatus in Finnantara’s activities at the site, have been difficult to reassemble. However, during the dry season 1999 alone, company records show that accidental fires damaged their plantings in areas included in this research project’s Sanggau study site in several dozen incidents. Not surprisingly, these incidents were focused around areas where Finnantara’s land access had been somewhat contentious to begin with, since these places are the locations of a tight matrix of areas controlled by Finnantara

interspersed with areas that continue under local customary uses.

Government officials, including both Sector Police and regional Forestry Department staff, do not have systematic records of such fires in this area. Neither Finnantara nor Inhutani pursued criminal arson accusations for burning that affected their plantings, nor were civil legal actions initiated. In 1999, Finnantara records indicate that some 42 fires destroyed plantation trees over some 70 hectares within the area of this project's Sanggau research site in 1999. The villages where these fires took place are concentrated in Finnantara's *Wilayah III* (Area III), including Mukok and southern Jangkang, especially in Engkam (2 *kampung*), Beringin Lama, and Layak Omang II. Over 54 hectares of Finnantara plantings were burned during the period of August 1999 to October 1999 alone. Within the Sanggau study site in 1999, the largest area of the timber plantation damaged in a single accidental fire incident that involved fires which spread from traditional shifting cultivation was approximately 10 hectares. Most of the fires burned 3 hectares or less, however.

This does *not* include any land burned within Finnantara's large concession area (see the map of Areas Planted by P.T. Finnantara Intiga in **Figure 4-9**), but which the company had not yet planted with timber. Nor does it include land within Finnantara's current concession which had been planted by P.T. Inhutani III alone on its original concession, prior to the joint venture, but which Finnantara does not actively manage. Finnantara has not kept records of fires that have burned areas of the concession that were planted by Inhutani III, but where Finnantara has not yet assumed direct management responsibility. However, Finnantara and Inhutani staff, as well as residents in surrounding villages, point out that escaped swidden fires following the withdrawal of Inhutani III's field staff from the area have burned a great deal of the planted area of Inhutani's plantation. Land reoccupation by customary owners (discussed below) has involved burning extensive areas of the Inhutani timber plantation as well. (Note that under current forest law and regulations, P.T. Finnantara Intiga might be held legally responsible for controlling fires on any land within its concession, whether or not the company's own plantings are affected. Even in 1999, the company assumed no management or safety responsibility over land within its concession where it was engaged in no planting or active land management activity, and no government agency would have insisted that the company bear any liability for fire damage in areas it had not cleared or planted.)



□ Work Map of PT Finnantara Intiga, West Kalimantan Province (Site Sekadag), July 2000.

Figure 4-9 Concession Boundaries and areas planted by P.T. Finnantara Intiga, July 2000

In all cases of fires affecting land that had been planted by the company, Finnantara “*Berita Acara*” (fire incident reports) note the identity of the owner of the swidden field from which fire had escaped to burn plantation trees. However, where fires had originated in land clearing operations of an adjacent oil palm plantation, only the plantation company was noted, not the identities of people actually doing the burning, even if their names were actually known. The reports note the date of each fire, the time when observers believed it started, and when it was extinguished (though not by whom, since this information is stated in a passive voice), the fire’s location within the company’s planting compartments, as well as the *kampung* in which the fire was located. The reports also note the number of company-owned trees destroyed, and their species. (These reports do not count any destruction to local communities’ own smallholder agroforestry plantings as a result of any of these same uncontrolled fires.) The reports note immediate causes of each fire, including a general note of escaped swidden fires from particular local farmers’ land, or a note of burning by a particular palm oil company. While local government officials apparently share this concern, members of local communities did not mention such fires as causes for particular worry, though company accounts cast blame for these fires on indigenous agricultural burning.

Estimating effects of these fires on company assets, staff reckoned fire damages assuming approximately 1250 trees per hectare (planted in a 4 meter by 2 meter grid). Finnantara staff estimated the costs of these fire damages to their company according to current replanting costs at the time of each fire, plus the value of each stand of trees destroyed according to its species and the age of trees damaged (older trees worth more; presumably, plant maintenance costs are reflected in increasing values as trees grow). Pre-fire health of trees in each affected stand was not taken into account in these calculations. By company estimates, the most costly of the Sanggau plantation fires in October 1999 (a relatively serious fire month) burned some 7.6 hectares of plantation timber in the village of Engkam Lama, with damages estimated at Rp. 91,411,200, or approximately Rp. 12,700,000 per hectare. [Data provided by Arijanto of P.T. Finnantara Intiga, Pontianak, July 2000.] By these estimates, Finnantara’s fire damages during October 1999 alone in its *Wilayah* I, II, and III of southern Sanggau (an area approximately congruent with this research project’s Sanggau study site) were nearly Rp. 316,500,000, or about US\$ 40,000 at 1999 rates [Finnantara 2000].

4.4.11 Fires set by local people in reoccupying plantation land previously ceded by customary owners; also fires set by village members and allowed to burn out of control, where community members assume they have no long-term stake in plantation trees once they have ceded their customary land to the plantation

Reoccupation of P.T. Inhutani III plantation land: Large-scale reoccupation of timber plantation land by members of villages who had previously ceded the land for timber plantation development has been a source of extensive fires since 1997 in the *Desa Sape, Kecamatan Jangkang*. Finnantara staff informally monitoring this situation estimated that some 200 hectares were burned in 1999, and that up to 200 hectares in addition would be burned in the year 2000 season. Since 1997, as Inhutani activities at their Sanggau plantation came to a halt, members of some indigenous communities that had ceded customary lands to the plantation in the early 1990s began to fell trees and make shifting cultivation fields on Inhutani plantation land. Beginning to take over plantation land for swiddening in locations where timber plantings had clearly failed, by the dry season of year 2000, villagers from *kampung* Sebuda and Sungei Omang were felling company timber even in areas where plantation crops appeared to be doing well. In most cases, reoccupying this land involved selecting a location for the year's household swidden field within Inhutani's planted area, rather than in another location where the farmer has customary land use rights. In 1999, Jangkang villagers in the *kampung* of Sebuda and Sungei Omang (*Desa Sape, Kecamatan Jangkang*) reoccupied an extensive contiguous area in this way, felling *Acacia mangium* and *Albizia (sengon)* trees up to 6 or 7 years old to make way for their swidden fields (see photo of Felling Inhutani III timber plantation trees in **Figure 4-10**).



□ Judith Meyer

Figure 4-10 Felling Inhutani III Timber Plantation Trees in Preparation for Planting Swidden Field on This Site; Reoccupation of Timber Plantation Land by People of Sungei Omang and Sebuda village (in Desa Sape), July 2000

Preventing this land reoccupation, and resulting uncontrolled fires, did not appear to be possible for limited local Inhutani staff, and regional officials appeared to have no interest in meddling in this land controversy as long as it did not become violent. Inhutani III had withdrawn its staff from the Sanggau plantation at the height of the economic and political crises in 1997 and 1998, after the 1997 drought did significant damage to the plantation. According to Inhutani administrators in West Kalimantan, although Inhutani continues to maintain a 10-man skeleton staff in Sanggau, this is insufficient to prevent such burning of timber plantation assets. Nor can this tiny staff effectively counter local communities' reoccupation of plantation land within their village's customary territory. Even records of these fires are incomplete and inconsistent, and sent to Sanggau's continuing administrative office in Nanga Pinoh, Sintang, rather than retained anywhere in Sanggau [Tinus 2000; Yusuf 2000].

Observing this felling and slashing of plantation timber in July 2000, a Sebuda man who is also a foreman with Finnantara estimated that the reoccupation of Inhutani land by Sebuda and neighboring Sungei Omang people reclaiming plantation land within their customary territories, begun with their felling of Inhutani plantation timber, would result in the burning of some 200 hectares of plantation land for the year 2000 planting season, in addition to extensive areas already reclaimed in previous years. Village swiddeners were actually felling and slashing vegetation over a considerably smaller total area, but village informants and Finnantara staff indicated that if burning was done without traditional control measures, as it had been in 1999, then a much more extensive area would burn than the reoccupying farmers could possibly plant that year, or effectively manage. It appears that some of these extensive burns due to village people's reoccupation of timber plantation land over the past few years may correspond to the hotspots indicated in the map of Hot-spots 1999 and 1998 in **Figure 4-11**.

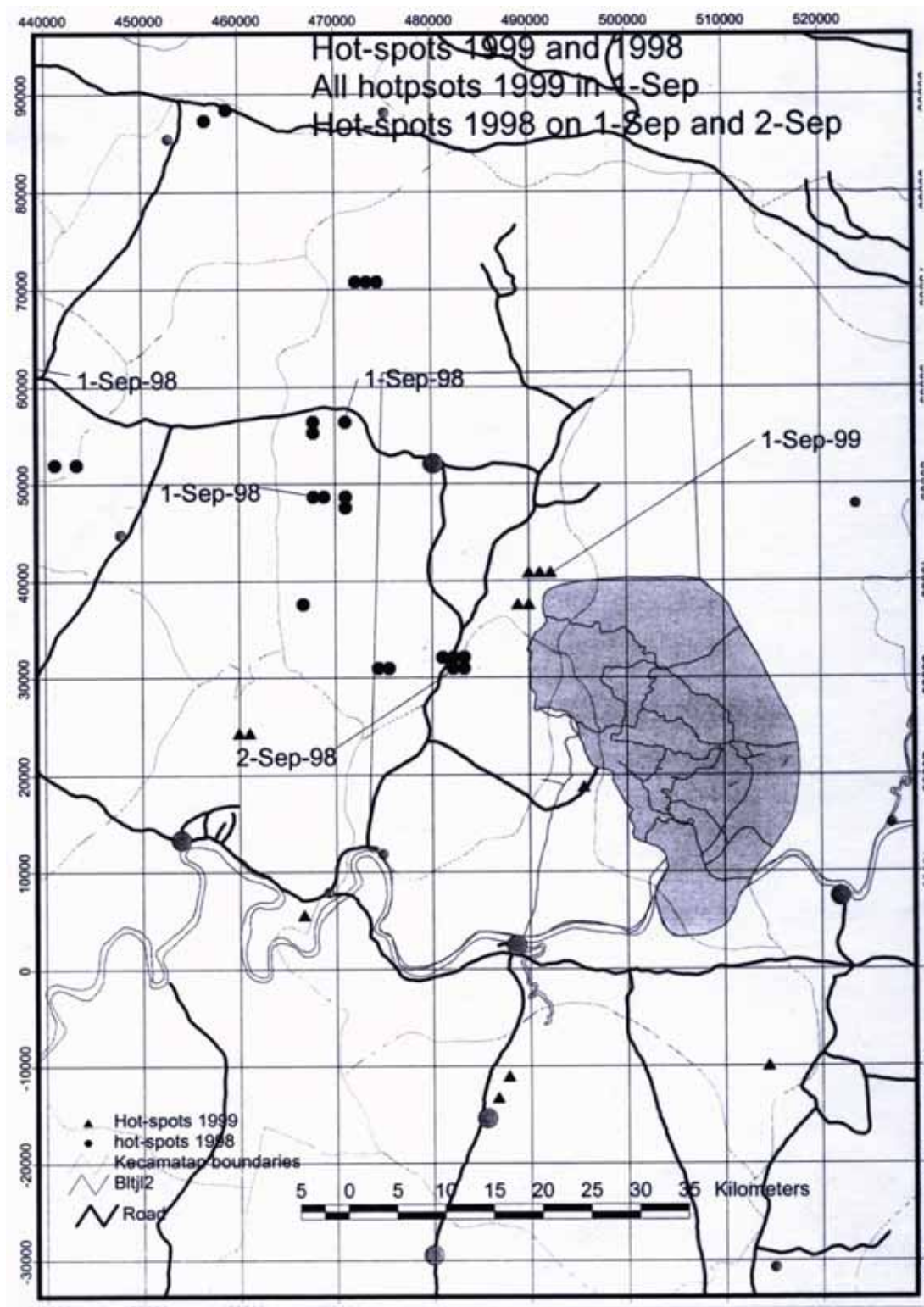


Figure 4-11 Hot-spots 1998 and 1999

Destruction of plantation test plots: Another indication of the chaos surrounding land reallocation in the wake of incipient, or as yet incomplete, devolution of land use designation authority to regional governments has been of particular concern to timber plantation developers Finnantara Intiga in Sanggau. In October 1999, some 5 hectares of an 8-year-old timber plantation trial plot complex in *Desa Sape, Kecamatan Jangkang* were destroyed. The test plots were originally planted in 1992 and 1993 to test a variety of silvicultural species and techniques by a subsidiary of the Finnish forestry corporation Enso Gutzeit. (Enso Gutzeit was the original Finnish parent company of the direct foreign investor in the Finnantara Intiga company. Enso has since merged with Swedish timber corporation Stora, to form a Nordic mega-company, StoraEnso, which is now the parent corporation involved in the Finnantara Intiga joint venture with Indonesian state forestry corporation Inhutani III.) The plots were originally conceived in association with construction of a large-scale “permanent” tree nursery complex located within P.T. Inhutani III’s timber plantation concession, on the main road 8 km south of the *Kecamatan* center, Balai Sebut. Finnida, the Finnish bilateral aid agency, had provided funds for this nursery to the Indonesian Ministry of Forestry in conjunction with development of the Sanggau Inhutani III timber plantation, which also received assistance in the form of a loan from the Asian Development Bank as part of a four-site timber plantation development project (see Mayer 1996).

Finnantara estimates that the cost to the company of this particular 5 hectare “occupation” at some Rp. 6 million (about US\$ 750 at 1999 rates). For them, this fire is emblematic of the confusion on the ground engendered by expectations of devolution of land use controls in the course of the post-Suharto “*reformasi*”, without adequate structures to negotiate, specify criteria or legal conditions for such reallocations, or even to publish land reallocation decisions.

While the area affected in this case was not particularly large, this “disturbance” was one of the most costly in terms of lost opportunities to monitor these test plots over the full cycle of timber plantation crops and silvicultural techniques they were intended to test. The “occupation” of this site by the new palm oil plantation, with apparent cooperation of the local community on whose customary land the test plots had been developed, is emblematic of Finnantara’s (or any centrally-licensed timber plantation company’s) vulnerability to unilateral changes in land designations due to conflicting or “overlapping” land claims and

reallocation by regional governments. Although conclusive maps of such recent reallocations at the Kabupaten level were not available for this research, it is even possible that the area in question had not been legally redesignated at the Kabupaten level, or through any other official process, but that the oil palm company simply assumed that it would wield enough political influence that it would not be subject to any official sanctions for taking over the plantation test plot land, and that official boundaries for its operations would eventually be designated simply according to plantings already in the ground!

This apparent change or conflict in land use designations also deepened the confusion of village populations in Jangkang as to exactly where the legal boundaries lay for each of the several corporate entities demanding to use villagers' customary land, and eroded the legitimacy of any such designations, in all cases made without prior consultation with village populations, and often without their prior knowledge. Local confusion is understandable, and may have been deliberately fostered by CNIS managers, and possibly by the former Jangkang *Camat* (administrative head of the *Kecamatan*), who local informants believe may have benefited personally from "selling" his approval or acquiescence to the new CNIS concession, with some areas apparently overlapping the old Inhutani concession. Confusion has certainly not been reduced at the *Kabupaten* level, which has "not yet" definitively published its own revised concession and land use maps at a scale usable to settle these local disputes on "overlapping" (*tumpang tindih*) use and development rights. Nor, in general, has it been reduced by recent actions of Inhutani III, since it removed its administrative staff from the area in late 1997 and 1998.

Recent actions by Finnantara itself also add to the confusion, but may ultimately clarify the situation. In fact, Finnantara has been renegotiating the boundaries of its own concession at Provincial and National levels to reflect more realistically the areas the company has already planted, which now include contract tree farming plots outside the boundaries of its concession, and areas which company managers anticipate being able to plant in the future. Finnantara's standard procedures include avoiding customary lands of communities where they are coolly received, or where cooperation is not forthcoming. This is the major reason that Finnantara has contracted with local farmers to plant and maintain trees in many areas beyond its official concession boundaries (see P.T. Finnantara Intiga's timber plantation concession boundaries and planted area in **Figure 4-9**). These companies' policies have

important implications relative to recent government policies, proposed by BAPPEDA, which would make concession-holders legally responsible for fire control of all areas within their concessions, whether or not they actively manage them for their own production purposes, let alone monitor them for fire risks. Companies' own policies and practices are particularly important in light of recent administrative reforms devolving a wide range of responsibilities and powers from the central government to regional government authorities, who assume them with widely varying levels of preparation, administrative acumen, technical expertise, and with widely varying relationships to companies operating in their regions.

Jangkang villagers with whom we discussed "occupation", and local community members' part in it, had somewhat different perspectives. Many villagers believe that when they ceded land to Inhutani and Enso (prior to the establishment of Finnantara) for development as timber plantation test plots, they ceded use rights to the land, but did NOT give up their community's permanent residual territorial rights to the area. This land still remained within the boundaries of the village, even if villagers no longer controlled its use. To these villagers, ceding (*menyerah*) their customary tenure rights over the land to the timber concession was conditional on the plantation company's active and productive use of that land. This applies even to a concession developing land in the name of the state, with transfers of land rights witnessed by representatives of the regional government (the *Camat*, etc.). Apparently, many villagers considered such transfers of rights conditional upon the specific developments for which they negotiated. Thus, when Inhutani removed its administrative staff from the area, and Finnantara's activities appeared to have come to a standstill in 1998 and early 1999, many villagers believed that they were free to reassume control over their customary property/territory previously which they had previously ceded for the purpose of the timber development project. Because of the conditional nature of the previous transfer in their conception, they believed they were free to reallocate it for use by a new company with a new legitimate purpose (with development rights probably repurchased with additional "compensation" money by CNIS). Note that this point of view is NOT universally held among members of local communities in Sanggau, however. Many people, especially those with considerable experience with transactions in the region's growing "formal sector", believe that ceding rights to a state corporation should be considered permanent, unless a specific time limit is set in the contract. Several people interviewed in Sanggau, including

village leaders, believe that disagreements over this point will cause future tension as “devolution” of official land allocation responsibility progresses, and as land development and conservation priorities are reassessed.

4.4.12 Fires set by members of local communities to protest perceived injustice or unresponsiveness by plantation developers (protest arson; openly admitted in some cases, hidden in others)

One example occurred in 1998, on land in the customary territory of *Kampung Sungkap* (*Desa Semadu*; see map of Estimated Location of 1998 Sungkap Fire in **Figure 4-1**), adjacent to the timber plantation area that village people believed Finnantara Intiga had taken over from its predecessor (and joint venture partner) P.T. Inhutani III in 1996/97. (Finnantara managers interviewed in 1999 and 2000 indicated that they have not yet actually taken over active management of areas originally planted by Inhutani, however, and may never do so within before Inhutani’s initial plantings are harvested, if they survive to that point.) Although most of the area that the timber plantation had developed was located across the border in *Kecamatan Jangkang*, 3 households in Sungkat ceded a total of only 9 hectares to the plantation, which were then planted in *Acacia* and *Albizia* species within the northern boundary of *Kampung Sungkap*. Because lands ceded to the plantation were interspersed with areas remaining under local customary control, in 1998 some Sungkap people were still clearing and burning their swidden fields adjacent to plantation timber within this plantation/*kampung* agroforestry mosaic. Some Sungkap men were angered when the plantation company recruited foremen from nearby village Nebok Sengkabang, but did not hire anyone from Sungkap. During the dry season of 1998, some of the people burning their swidden fields near plantation plots intentionally let fire from these clearings spread into the pulp plantation. (This assertion of arson is based on an account to PPSDAK staff by the outgoing Village Head of *Desa Semadu*, and so has considerable credibility.) No record of these fires was available from either Inhutani or Finnantara at the time of this field research, and the field foremen who would have been responsible for overseeing this area were understandably unavailable for comment, since they would likely have been the foremen from Nebok Sengkabang, whose hiring without parallel hiring from Sungkap had caused such ill-feeling in the first place.

In this case fire was used as a weapon, as an instrument of protest against large-scale commercial plantation development, and as a sign of perceptions of unfair company actions toward members of local communities. Fire-setters may act as individuals in personal anger, or as members of a local community collectively offended. In many cases, such burning of plantation trees begins accidentally, as local farmers' routine agricultural fires spread beyond their originally intended boundaries, and fire-setters and other community members guarding the fire site decide not to try too hard to bring the escaped fire under control. Plantation company managers identify these fires as arson, though rarely report them to police or other civil authorities. Plantation staff explain that unless the fire-setters are caught in the act of firing plantation trees, lack of conclusive evidence means that police cannot really do much but aggravate the situation, and proof against any individual is almost impossible to obtain. In many cases, plantation managers also admit that community members may have had legitimate grievances (whether or not these are best redressed by deliberate burning of plantations' assets), and may not have wanted to highlight these grievances through pursuing police or legal action.

During the mid-1990s there were several cases of protest arson against Inhutani work camps and equipment in response to specific grievances, and some cases of villagers cutting down or uprooting plantation trees, though not burning them [see Mayer 1996; discussions with Inhutani and Finnantara staff, 1999 and 2000]. In none of these cases, however, did burning of buildings or equipment spread to become significant land fires.

4.4.13 Fires with unknown immediate causes, but located in areas locally understood to be fire prone, especially adjacent to customary borders

Finally, this research encountered 3 cases in the late 1990s of fires that local people considered to be worth noting, but which no one is able to attribute to any specific cause of ignition. Each of these fires burned areas along communities' customary borders, or spread from beyond the borders into land within their community's own borders, which local people monitor more closely. All of these fires burned mainly degraded grassland and scrub forest which had already been targeted for plantation development by Inhutani or by Finnantara, but which the plantation had not yet cleared. By the time either local village residents or plantation staff became aware of these fires, it was not clear whether they were accidental, or

whether perpetrators were afraid to identify themselves.

Both village people and plantation staff are ambivalent about the possibility that significant fires, burning more than a hectare of land, could have been ignited by discarded cigarette butts by people traversing the area. They believe that sources of ignition linked to other careless uses of fire are more likely, including neglected cooking fires. In any case, questions about these fires yielded responses that indicated that people must learn to be more careful with fire. There were no assertions that these fires had ignited through unknown natural causes.

4.5 Community-based fire management measures

Although this research focuses on identifying underlying causes and impacts of unwanted and uncontrolled fires, field research also encountered considerable information about ways in which communities have taken action (or intend to take action in the near future) to reduce risks of fire, as well as information on commercial ventures' and government agencies' fire mitigation activities. Future policy-oriented research may analyze government and businesses' fire prevention and fire response approaches, and suggestions for new fire management practices in Indonesia call for cooperation between members of local communities, local companies, and government [e.g., Pagaribuan 1999; Gubernur KalBar 1999 and 2000; PemDa KalBar 1998; Nichols and Beebe 1999a and 1999b]. However, examples of communities' own approaches to reducing fire risks are highlighted here.

One of the most remarkable set of fire prevention actions encountered in this research was in the Belitang Hilir village of Resak Balai (*Desa Merbang*), where increasingly serious fires have burned during drought years from 1964 to 1991. Using *adat*-like customary consultation procedures, and eventually embodied in a formal *adat* decision that was actually written and signed by *adat* functionaries, the village developed an agreement which obliges all members of the community to practice clearly indicated fire safety measures [Resak Balai 1996]. The written agreement was later endorsed by representatives of all village households, who agreed to abide by strict rules for burning, and accept defined sanctions for damaging agroforestry property through careless uses of fire. The agreement provides strict sanctions against anyone responsible for fire damage to someone else's agroforestry property. Compensation to the owner of a burned fruit tree is set at Rp. 30,000 for a mature productive tree, Rp. 10,000 for a

medium tree (young productive), and Rp. 3000 for a small tree. Compensation for burned rubber trees is set at Rp. 5000 for a productive tree, Rp. 3000 for a medium tree, and Rp. 1000 for a small tree. In addition, the agreement provides that carelessness in dry field burning will cost 10 times the expense of the dry field (presumably, 10 times what it would cost to rent the field for a season, a considerable sum). Village residents also indicated that these amounts were seen as provisional, and could be changed by future consensus under new economic conditions. While local customary law (*adat*) systems all over Borneo tend to provide for compensation for damage from negligent burning, this agreement sets the fines in cash rather than in in-kind compensation, traditional fine objects (specified ceramics, pigs, etc), and at levels that actually provide a disincentive to careless burning.

Resak Balai leaders recognize that reducing fire risks overall in their community will require that neighbors across their borders accept similar rules. So, they are encouraging adjacent villages to adopt similar agreements. PPSDAK- Pancur Kasih, the nongovernmental organization that helped all of these villages develop community resource maps, will assist these other villages in developing their own agreements, in the hope that the regional government and forestry agency will also offer assistance in the form of fire fighting equipment and training. Resak Balai people have also discussed approaching Finnantara managers about cooperating on some aspects of fire prevention and fire control. Leaders and others interviewed from Resak Balai, as well as from other Belitang communities that have undertaken detailed community resource mapping with the help of PPSDAK believe that the understandings gained of their land capability and fire risk factors gained through resource mapping, as well as from mapping past fires and discussing associated risks for future fires as part of the research process reported here, believe that these community processes are also significant steps in developing locally based strategic plans to address fire problems in their communities and relative to adjacent land uses. This enthusiasm is what led members of these communities to participate in the present fire research. Resak Balai representatives at fire research and mapping meetings in March and July 1999 explained that, whatever the government and corporations intend to do about reducing fire risks, they hope that their decisions and actions will respect local community agreements and procedures already in place, based on local knowledge, community needs and capacities, and local customary law. They also hope that other communities in the region will emulate their example by developing

similar measures to reduce fire risks. Through these actions, Resak Balai leaders hope to end accusations that the region's "fire problem" is caused by careless and backward Dayak shifting cultivators.

While many community-based fire management practices have obvious functional benefits in terms of preventing the accidental spread of fire, others are aimed at ensuring that swidden fires are hot and complete enough to prepare the field for good crop yields (creating fertile ash, eliminating pests, and pleasing or placating resident land spirits). PPSDAK interviewers asked specifically about fire use practices to people in several Belitang (ethnic Mualang) villages. Responding explanations of burning practices did not separate those aimed ensuring satisfactory "hot" burns from those aimed at preventing escaped fires. In the traditional art of controlled burning, successful "hot" (*hangus*) burns to ensure household livelihood is linked to protecting the community at large by preventing fire from escaping its intended area. Yet, respondents also included varying combinations of necessary actions in their explanations, indicating that some of the advised practices are not (or are no longer) universally observed.

Explanations took for granted the need to select a field site where fire can be controlled, and to burn in dry weather, after slashed vegetation has dried for long enough. In these Mualang villages (as in Jangkang areas), no individual or group directs or regulates selection of sites or timing of burns; these are entirely individual household choices, guided by customary tenure rights and established social norms. Expectations aimed at reducing wildfire risks include several practical measures (backed by *adat* sanctions if precautions against fire accidents are neglected). Field owners must cut a fire break of sufficient width around the perimeter of the field (*meladak*, in Mualang; *sekat* in Jangkang). Trees must be felled toward the center of the field, and brush pushed away from the edges (for a hot burn, as well as to control fire). Fields must be burned only in the afternoon (preferably late afternoon, when air cools but winds are low, and burning embers can be seen in the subsequent dusk and evening). Fires should only be lit when there are enough people to supervise and extinguish escaping fire (a costly proposition, since field owners must provide fire watchers with refreshments, and are usually expected to supervise burning of those people's field in return). Field owners should prepare reserves of water and bamboo sprayers in advance at the field. No one is allowed to cross or go past a field when it is being burned without helping to burn and to supervise the fire (in addition to basic safety, this reinforces mutual aid in supervising each other's burns,

especially among people whose fields and gardens are in the same general vicinity, along the same forest path). Burners should inform other people in the village immediately if fire spreads beyond the fire-watchers' own capabilities to contain it, and ask for immediate help in extinguishing or controlling the spread of escaped fire.

Other common practices mentioned by people in Belitang communities function on both practical and spiritual/ supernatural levels. Burners must not bathe on the day of the burn before burning is complete and the fire has been extinguished (bathing would “dampen” the fire, which should burn as hot as possible; leaving the fire site too early at the normal late afternoon bathing time could also mean leaving the burn site while ground fires are still smouldering, which would increase wildfire risks). No pregnant woman may be present at a burn (her “water” would dampen the burn; and it would be unsafe for both her and for others). Burners should watch for particular omen birds, and refrain from burning if they are observed on the day planned for burning, especially in the field to be burned, or on the path to it. Interestingly, Mualang respondents mentioned no particular rituals or ceremonies conducted prior to burning. (Most of the Mualang in this area are Catholic, since Catholic missionaries became active in the area during the late 1940s). By contrast, among the Jangkang, pre-fire rituals involving ritual-language prayers (*boca*) and customary offerings to field and forest spirits are conducted before fields are burned (although this is no longer a universal practice). Prayers are also offered for hot but safe fires and for fertile fields as part of Catholic worship services as the burning season approaches in late August and early September (observed by the J. Mayer, 1994 and 1995).

4.6 Plantation fire measures

Plantation developers have also committed resources to fire prevention and fire suppression in the study area, though their efforts to date are extremely limited, given the risks that fire poses to their own assets. P.T. Finnantara Intiga is extremely sensitive about fire issues, due to the company's own insistence since the Sanggau plantation's inception that burning would not be used for clearing land at that plantation, in large part due to risks of wildfire (Potess and Mikkilä 1995; personal communication with Finnantara planning staff and field managers, 1999 and 2000). Recent accusations by the Head of BAPEDAL (the environmental impact agency), that Finnantara has been burning illegally, and counter to its own policies, have

created a sense of urgency about putting in place effective fire strategies before the next drought season. Managers indicate that Finnantara's new management plan (expected in 2001) will specify more extensive measures. In conjunction with its new management plan, Finnantara managers are considering various models for organizing fire prevention and firefighting work in the future.

Managers at P.T. Finnantara Intiga mention a series of fire training courses since 1999, attended by selected members of their field staff, in cooperation with the regional forestry department. Until now, however, Finnantara's ability to prevent fires within its concession area depends largely on maintaining cooperative relationships with members of communities in their vicinity. Not only does this reduce the likelihood that disgruntled neighbors will torch their planted timber. Such good relations also improve the chance that small fires which could burn the company's planted areas will be brought to field staff's attention quickly, while they can still be extinguished, or circumscribed, using readily available equipment, familiar skills, and the work of a limited number of people. The company has built fire watch towers widely distributed at relatively high points around the site. However, researchers for this project found that in 1999 and 2000, some towers were overgrown with vegetation, and surrounding trees had nearly blocked its view. Staff mentioned that during the worst haze of the 1997 fire season, the towers were useless as lookouts in any case due to poor visibility. Finnantara has distributed a very limited number of 1000 liter water tanks for fighting fires around its planted areas, and can mount several water tanks on trucks to supply them from streams and ponds identified for that purpose. However, managers admit that the water which they could supply would do little to suppress a rapidly-spreading fire during drought conditions, when some of the water sources they depend on would also dry up. Simple firefighting equipment is also kept at each company camp, including hoses, fire swatters, rakes, and spray tanks. However, there are very few of them, and are not necessarily kept in working order. The best physical measure limiting the spread of fires among young trees is actually the extensive road network within planted areas, which also serve as fire breaks. Managers recognize that, unlike oil palms, as Finnantara's acacia and eucalyptus trees mature, they become increasingly vulnerable to fire.

Finnantara is concerned about the risks of adjacent smallholders' fires spreading into their planted areas. They have requested that people planning to burn fields adjacent to their

plantation inform plantation staff before burning, and accept help from plantation staff in cutting or bulldozing fire breaks between their fields and the plantation. To date, however, this has only rarely been done.

Inhutani did use fire for landclearing in areas that were first developed as a timber plantation beginning in 1992. By the time of the burning ban in 1995, Inhutani already tended to use other means of clearing land. Fire prevention and suppression activities at the P.T. Inhutani III timber plantation have virtually stopped since company staff were withdrawn, especially since 1997. In 1999, only a skeleton staff of 10 men, mainly members of local communities, remained in the area. Inhutani maintains no firefighting equipment and only these very limited personnel at its extensive Sanggau plantation site. As land reoccupations of Inhutani's planted areas continue, using relatively risky burning techniques, Inhutani has done virtually nothing to stop this burning of their plantation trees, or to stop these fires from spreading. One result has been the very extensive fires (some 400 hectares, during 1999 and 2000) originating in "reoccupation" of plantation land in *Desa Sape* in 1999, and in 2000. It is not clear what the company will do to reduce fire risks in its planted area. That may depend, in part, on the future legal relationship between Inhutani and Finnantara, which should also clarify who has responsibility for which fire-related activities in the timber plantation area.

5. UNDERLYING CAUSES AND IMMEDIATE CAUSES

The examples of fires described in this report illustrate the diversity of underlying and immediate causes of unwanted or uncontrolled fires in the Sanggau study site. An “elegant” explanatory scheme for causes of fire in this region might first focus on the wide diversity of immediate causes of particular fires, but then analyze these in a single unified framework highlighting a singular set of underlying causes. Perhaps because fire events in this region have not been as dramatically destructive as they have been elsewhere in Kalimantan and Sumatra, it is more difficult to explain their underlying social causes in such an elegant causal framework.

It would be convenient, but misleading, to conclude simply that agroindustrial expansion has been responsible for the recent fires in this region, or simply that shifting cultivators are to blame for the extensive burning in recent years. It is also insufficient to proclaim that fires of the 1990s were largely results of a political system that encourages large commercial land development schemes at the expense of indigenous smallholders’ land and resource tenure security. Close scrutiny of the cases presented here also shows that the fires of the 1990s in the Sanggau study site were not inevitable results of a conjunction of political, economic, and environmental crisis. Numerous efforts by both smallholders and large corporate actors to prevent fires and reduce fire risks were relatively successful. The larger story in Sanggau remains somewhat more complex. Making sense of it, from either a landscape history or a policy perspective, requires a more nuanced understanding, if such understanding is aimed at preventing regional fire tragedies in the future.

From a longer historical perspective, however, recent fires are associated with a historical trajectory in which large-scale state-sanctioned enterprises and land development schemes have made rapid inroads on landscapes that were already being rapidly transformed by cumulative effects of thousands of land and fire use decisions by members of longstanding indigenous communities and recently established settlements, which in turn have responded to broader economic and demographic dynamics. Together, these actions have increased fire risks along both a large-scale state-sponsored “resource frontier”, and multiple “smaller” resource frontiers within community landscapes, formed by a history of indigenous settlement and resource use. The variety of fire causes in this area appears to be a conjunction of

dynamics associated with freewheeling expansion of large plantation and logging developments, and dynamics associated with land and fire uses by smallholder forest farmers both expanding and intensifying their own agroforestry practices in a context of increasing meteorological, economic, and political uncertainty, which came to a climax in the high fire years of the late 1990s.

Causes of fires in the Sanggau site during the 1990s are consistent with a broader landscape history of this “frontier” region. Uncontrolled fires continued to be concentrated along boundaries that simultaneously represented divisions between Mualang and Jangkang ethnic/linguistic groups; between Belitang and Mengkiang watersheds; between Belitang Hilir and Jangkang administrative/ political jurisdictions; and between longstanding Dayak communities and new timber plantations, logging operations, and oil palm plantations, as well as along the roads built to provide access to them, and to growing population centers associated with them. Landscapes in these boundary lands, especially where land and resource rights have been contested, have gradually become more fire-prone over the past century of settlement and resource use, and especially in the last 25 years.

Since the mid-1990s, a significant portion of serious fires in the study area have resulted from a vacuum of effective responsibility in areas within the concession boundaries of agroindustrial plantations, especially where companies had recently negotiated to take over from customary owners, or where land had been ceded to the plantation but not yet planted in tree crops, or which companies had cleared without customary owners’ permission. Other serious fires, or concentrations of unwanted fires, resulted from ongoing processes of “frontier” expansion by indigenous Dayak populations, as well as from reduced accountability for damages resulting from “traditional” indigenous shifting cultivation fire practices within an increasingly fire-prone landscape.

The Mualang people of Belitang Hilir and the Ayak River area attribute the swathe of fire-prone grassland and scrub forest that bisects the Sanggau site from north to south to a history of deliberate burning for hunting by Jangkang people to the west. Some Jangkang people attribute it to aggressive expansion of shifting cultivation by the Mualang to the east. The national government originally targeted this swathe of fire-prone degraded land for “regreening” in the 1970s, transmigration settlements in the 1980s, and an industrial timber

plantation in the 1990s, with little understanding of the underlying causes of continuing land degradation and recurring fires, or of the tensions that would arise in the wake of the state's arbitrary reallocation of resource rights in this long-contested area.

Local customary law sanctions for damages to agroforestry property due to negligent use of fire are being reinforced and reinterpreted in many communities. They seem to be effective as incentives for cautious fire use on a small scale, but small-scale burners whose fires spread out of control rarely have the resources to restore or compensate their neighbors for large-scale damages, fulfilling all aspects of deterrent customary law, aimed at preventing careless burning and uncontrolled fire.

Members of longstanding indigenous communities have not been eager to help suppress fires on former customary lands that they have already released to timber or oil palm plantations, unless those fires threaten their own remaining forest gardens or houses. In fact, in some Jangkang areas, members of communities that had formerly ceded rights to extensive parts of their customary territory to a timber plantation are "reoccupying" some of this land. When they reclear plantation land to make their own swidden fields on it, they burn without traditional precautions. Many members of these communities consider such land reoccupation as neither protest nor arson, but making practical use of their old customary holdings.

Primary forests have been seriously degraded during the 1990s, as competition for resources between local people and "outsiders" licensed by government authorities has increased. New roads (many constructed for commercial logging, plantation access, or as infrastructure initially -uilt to serve transmigration settlements) opened remnant forest areas to both government licensed concession-holders and exploitation for local markets. Fire has been used in these areas for subsequent land clearing by both plantation developers and local shifting cultivators and cash crop gardening (mainly rubber), and has done considerable damage to these old forest remnants. It is unrealistic to claim that the larger primary forest islands of the 1980s would have remained intact were it not for fires. However, wildfire, and the ease of using fire to clear even old forest land during drought conditions, contributed to the rapid degradation and destruction of these primary forest remnants during the 1990s. Virtually all of the primary forests that have been converted to other uses were also burned in

the process.

While many remaining primary forests were seriously degraded or destroyed during the 1990s, in many communities the total area covered by mixed-species forest gardens has increased in the last generation, as forest farmers have planted rubber and fruit trees in former shifting cultivation fields. The resulting forest garden matrix has created community landscapes that are relatively resistant to wildfire.

Few of the cases in which villagers have accused oil palm plantation developers of deliberately burning villagers' agroforestry property to coerce village people into ceding land to the plantation have been substantiated. However, even unsupported accusations provide motivations for retaliatory burning, which may clearly be acts of protest, or may appear accidental. In other cases, village shifting cultivators have allowed their slash fires to spread to company-planted areas to protest compensation rates for plantation land expropriation, or labor and contracting practices.

In-depth studies at research subsites in Sanggau include several villages that have resisted demands to cede customary rights land to timber and oil palm companies, even when they are located within these companies' concession areas. They have also been relatively free of extensive fires, except along their borders with the plantations, or other concession-related resource uses. These two facts appear to be related. The same characteristics that have allowed communities to prevent wildfire, and to collectively suppress uncontrolled fires before they do a great deal of damage have also allowed communities to resist land encroachment and expropriation by politically powerful agroindustrial companies. Communities that have been cohesive and confident in the viability of their own land use systems, and who have maintained or developed their own customary or locally-based governance institutions, appear to have institutional characteristics are also likely boost the effectiveness of local practices and institutions to prevent wildfire and to collectively suppress uncontrolled fires.

Members of longstanding local communities and managers of new commercial plantations all believe that fire in this area can be effectively controlled, with provision of appropriate materials and skills, and with improved institutions controlling land use and resource access. (Of course, definitions of "improvements" vary, with some calling for more responsive and

socially equitable decision-making at all levels, others seeing the issue as one of efficient administration and technical work, and others insisting on stricter and more effective regulation of anything to do with fire.)

None believe that the fires their region has experienced in recent years are inevitable. Virtually everyone with whom this research process discussed fires in this region agrees that the majority of 1990s fires of concern in Sanggau were neither unavoidable consequences of drought, inherent consequences of a particular form of development, inevitable consequences of greed or of backwardness, nor inescapable consequences of contested resource rights.

In no case have local actors seen the fires of the 1990s as a result of tragic forces that are beyond their ability to comprehend, even if making sense of specific fire events has required considerable speculation on their parts, and on the parts of researchers trying to understand fire incidence. The causes of recent fires are neither mysterious to local people, nor beyond either common levels of ecological or political sophistication. Based on analysis of the narratives of specific fire events assembled for this research in Sanggau, and on mapping these fires events in local case studies, it is clear that while many of the fires have obvious immediate causes in local land and fire use practices, many underlying causes of “fires of concern”, especially the most extensive and locally damaging ones, extend far beyond the control or influence of the people whose lives, livelihoods, and communities have been tragically affected by recent fires.

6. POLICY IMPLICATIONS AND SUGGESTIONS

The continuing extension of agroindustrial plantations (timber and oil palm), commercial logging operations, road networks, and other developments that have transformed much of Sanggau's rural landscape beyond recognition in the past generation. Many of these changes, and the rapid rate at which they are taking place, seem inevitable to many rural people in Sanggau, for better or worse, and part and parcel of regional development to their proponents. However, few people in Sanggau believe that fire, especially uncontrolled fire, must be a concomitant of these processes of landscape transformation and "development". Because few people in Sanggau are fatalistically resigned to the inevitability of uncontrolled fire, broad possibilities remain open for future cooperation among multiple parties in the area for effective and socially sensitive fire management.

We should not assume that efforts toward fire monitoring, or toward fire prevention and suppression focused on either large-scale land development enterprises, or on local smallholders alone will necessarily have a significant effect on many of the largest, most damaging fires in this region. To a great extent, the examples presented in these case studies, combined with analysis of hot-spot locations and burn scars during the 1990s, suggest that underlying causes of the most extensive fires in this region lay in the complex consequences of the relationships among smallholders, large land development enterprises, and the Indonesian state.

The following measures are suggested based on the findings of the fire research project in Sanggau. Note that these policy recommendations are those of the Principal Author of this report, and do not necessarily reflect official views of any of the organizations sponsoring this research.

The legal prohibition against clearing land for large-scale agroindustrial plantations by burning, which has been clearly articulated since 1995, should be strictly enforced at the regional (Provincial) level, or at the national level, if regional officials are unwilling to develop sufficient evidence to support enforcement action. Establishing the basis for the burden of proof and appropriate evidence in these cases will require considerable judicial attention, probably followed by regulatory reforms specific to such fire-related cases .

Evidence from remote sensing and concession boundary overlay data alone should not be considered sufficient in such cases. Models currently being explored in the use of judicial teams (*tim yustisi*) developed in collaboration with the national BAPEDAL (Environmental Impact Agency, which is responsible for finding ways to implement a wide range of environmental laws) should be developed and modified to provide for broadly supported tests of the burden of proof for fires and burning.

Companies should be required to keep records of all fires within their concession areas, especially in areas that they are actively managing, whether fires were deliberately set or accidental, including origins of fires (if known), extent of fires (mapped, with GPS locations if possible), and how they were extinguished (if they were). If they do not wish to accept this responsibility, the overall area within their concession boundaries should be limited to an area which they are willing to monitor. For responsible, law-abiding companies, such records will serve as their best defense against accusations that they have been illegally burning to clear land for expansion, or benefiting from “accidental” fires in areas which they later plant with agroindustrial crops. Such a record-keeping requirement will discourage company burning by shifting the burden of proof to the company itself, that the company has not been burning, or relying on burning on its behalf. *Companies must be required to cooperate with outside investigators to determine origins and causes of fires which company managers claim not to know.* Not only will such monitoring and record keeping help with investigations of fires which the company claims has harmed its own interests (e.g., fires that have burned its planted areas, whether deliberate or accidental), such records may also provide evidence to support investigations of allegations that the company has burned illegally, or beyond its legitimate boundaries. From the perspective of local communities, such record-keeping could be problematic, however, unless it is matched by similar records created by, or on behalf of, local communities themselves. The psychological and even legal power of written records against remembered oral accounts alone is increasingly important in judicial or quasi-judicial proceedings in Indonesia, and in rural Kalimantan, whether in civil courts or in the context of local *adat* proceedings.

One example of the benefits of fire monitoring for companies themselves involves a company that has attracted national attention as a result of accusations by the Head of BAPEDAL (the environmental impact enforcement agency) that they have burned illegally, apparently

founded mainly on hot-spot data. Since 1999, managers of the P.T. Finnantara Intiga timber plantation have organized their fire records to make them more accessible, and thus make it easier to reconstruct fire events after the fact. Such company record-keeping practices are important to this research, and to formulation of any policy that may arise from it, on several levels. First, detailed company fire records provide a “continuing” account of how the company has used fire, if at all, and how fire has affected particular places.. This is extremely important as “institutional memory” within both private and state-owned corporations, and within regional government bureaucracies, is remarkably short. (Managers and staff arrive unaware of local situations, and often leave within 2 or 3 years.) Local field staff and locally-hired foremen tend to have longer and more detailed memories of events that have marked the landscape within plantation boundaries (in many cases, events which occurred within the customary boundaries of their own communities). However, information from these sources is likely to be colored by built-in biases, since the responsibilities of these local staff people often include guarding the company’s planted areas against disturbances of any kind, including burning of these planted areas. Any fire within the company’s already-planted area can be seen as the employee’s failure to do his job, whether fire was accidental (e.g., escaped swidden fires or carelessly dropped cigarettes) or deliberate (local customary owners re-claiming land from a plantation; or burning in the course of re-ceding customary land to another plantation). A darker view of companies that have continued landclearing by burning after the 1995 ban would indicate that local foremen could also receive personal benefits from either turning a blind eye to such burning, or actively promoting such fires against the spirit of the burn ban, if not against the letter of the law.

Recent changes in national forestry law and further proposed reforms are intended to impose strict responsibility for fires throughout a resource concession area on the resource concession-holder. These measures are intended as strong deterrents to land developers against illegal burning as a cheap technique to clear land. Quick access to remote sensing data, especially hot-spot monitoring, boost the capabilities of BAPEDAL and provincial agencies charged with enforcing the no-burn policy. *If timber and plantation concession-holders are to be held legally responsible for all fires or any burning within their concession areas, then the boundaries of their concession areas should be limited to locations that they are actively managing, or which they have already established the means to actively manage*

in the immediate future. This will reduce concession-holders' liability for fires which they did not set, and from which they will not benefit. However, along with the record-keeping requirements explained above, limiting concession areas to locations of active company management will also clarify the logic of strict "burden of proof" requirements, which will benefit responsible, law-abiding companies in the end, while benefiting local customary land-holders as well. The enormous resource concession borders (for timber and plantations) originally drawn in the 1970s to early 1990s, at worst failed to recognize local communities and their resource rights, or at best "enclaved" them in ridiculously limited areas. *Policy-makers should recognize that enormous concession areas that include land which the concession holder cannot manage should be recognized as a significant factor in increasing fire risks, especially in areas near concession borders, and in and around "enclaved" areas, as volatile local "micro-politics" of contested resource allocation are played out with fire.*

Local institutional practices and innovative developments that reinforce community cohesion to facilitate wildfire prevention and suppression should be encouraged by government recognition, and assistance if requested, directly by communities themselves, Desa or Kecamatan level regional governments, or through regional NGOs. Technical and institutional support should be provided for local communities of all types, in collaboration with regional government and NGOs and quasi-government institutions to develop broadly participatory measures to develop familiar types of participatory local institutions to regulate smallholder burning, to ensure that fires do not spread out of control.

Communities that have been involved in community empowerment and customary land rights advocacy activities (including community mapping of resources) have tended to be relatively capable of initiating voluntary proactive steps to prevent the spread of future fires. Use of participatory means of improving understanding of local resources, land capabilities, and fire risks appears to be a successful means of promoting effective local fire management. *Fire and land use policy-makers should support such local institutional measures, and provide them with technical assistance and equipment, as well as political support, when requested by members of local communities. They should also consult with leaders of these communities to identify institutional and material measures (techniques; equipment) that have been successful in managing fire and reducing fire risks in their areas, and develop ways to help other communities develop similar capabilities.*

Any effort to prohibit all agricultural burning by indigenous smallholder shifting cultivators and forest gardeners will undermine broader fire control efforts. Such prohibition of smallholder burning is not, presently, being seriously considered by any West Kalimantan Provincial government agency. (Most higher-level forestry and agriculture officials now recognize that most West Kalimantan smallholders have very limited alternatives to burning to support basic rural food production, and to establish smallholder agroforestry gardens, such as rubber, for income production). However, political pressure from outside this region could force regional government to attempt such a prohibition in the future (diverting attention from large-scale prooject land-clearing fires) especially if measures to enforce burning prohibitions on plantation developers and other land development corporations and projects appear to be ineffective or insufficient to significantly reduce smoke pollution affecting Malaysia and Singapore. *Targeted dissemination of research findings showing relative contributions of various types of burning, on various types of land, to regional air pollution loads should be used to help support this policy choice.*

Increased technical and institutional support should be provided for efforts aimed at assisting smallholders in developing agroforestry models that emphasize perennial tree crops, based on adaptations of well-established local and indigenous customary practices and tenure institutions (i.e., including state validation of local customary tenure and land management institutions). Models to be encouraged should balance production of food, diverse forest products, and smallholder models for agroforestry cash crops. Resulting landscapes will produce sustainable livelihoods for members of local communities, gradually “reclaim” degraded lands, and over time create landscape matrixes that will be relatively resistant to wildfire, both from underlying social and biophysical causes.

Government and private enterprises’ action to prevent and suppress fires must be prompt and respectful of local communities’ existing resources, values, and knowledge, and should help build local capabilities for fire management within familiar institutional means in existing communities. This should be supplemented with “outside” technical support and personnel in emergency conditions, but in accordance with locally developed plans and procedures.

Large enterprises with well-developed infrastructure, such as timber and oil palm plantations, can be effective foci for mobilization of regional efforts to prevent, contain, and suppress

wildfires, with guidance from government forestry and agricultural staff with training and experience in fire management and fire suppression. However, concession-holding companies should NOT be given any responsibility to impose, administer, or enforce any fire regulation regime on customary smallholders within their concession areas. The result would likely be sequence of attempted burn prohibitions and protests (which may include arson), which will not effectively reduce risks of wildfire in the longrun. (We understand that this recommendation is counter to the general direction of policies recently suggested by regional government actions in West Kalimantan [see Gubernur 1999 and 2000], and gaining support at national levels.) Some initiatives suggest that community-based fire monitoring and fire-fighting teams should be organized on a voluntary basis, within concession-holders' fire response frameworks for the sake of training, efficiency, and discipline. However, members of communities in the vicinity of plantation and timber concessions should not be expected to cooperate eagerly, or without pay, in fire-related activities focused on, or primarily oriented toward, protection of plantation crops. To the extent that fire does not "recognize" boundaries between companies' assets and those of local communities, close cooperation of fire-related efforts makes sense. However, even coordination may be difficult where there has been a history of antipathy between companies and surrounding communities. Companies' use of paid fire monitoring and fire fighting crews drawn from local communities may contribute needed cash and technical understanding to those communities. However, if insensitively organized it may also deepen social rifts within those communities at times when reducing fire risks requires social cohesion, and deprive parallel community efforts of the full attention of their most effective people during particularly high-risk periods. Fire management efforts relying on cooperation among members of local communities, locally active companies, and staff of government agencies are likely to be successful only to the extent that plantation-based and state-initiated fire management activities and decisions involve members of local communities in ways that are clearly beneficial to them. It will also call for sensitive combinations of centralized and decentralized distribution of resources for improved fire management.

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APPENDIX I:

Belitang Hilir Village Land Area and Population, 2000

Desa name	Dusun name	Area (km2)	Households	Population
Merbang	Merbang	39.32	271	1197
	Entingang	36.76	92	437
	Sumpit	15	54	243
	Resak Balai	40.84	90	425
Menawai Tekam	Menawai Tekam	32.48	55	295
	Menawai Lingkau	20.04	98	507
	Sungei Kulat	21.96	70	346
Semadu	Semadu	45.01	83	430
	Tinting Bindang	40.94	85	451
	Bejit Kabaong	33.02	52	281
	Nyanggung	12.75	106	603
Sungei Ayak I	Sungei Ayak I	33.15	251	1002
	Sungei Asam	12.75	178	747
	Ng. Sebedau	15.15	133	657
Sungei Ayak III	Sungei Ayak III	26.8	401	2111
	Sungei Ayak II	25.21	339	1491
	Sungei Ayak IV	18.25	130	604
	Pinyak	14.98	100	472
Entabuk	Entabuk	8.41	157	644
	Engkerauk	8.41	75	332
	Janang Ran	15.08	102	348
	Pelanjau	19.02	80	273
Tapang Pulau	Tapang Pulau	22.48	105	484
	Engkuning	15.9	70	354
	Sengkaraong SP2/ SP3	6.66	345	1462
	Sungei Sawak	6.24	57	307
	Melanjau	23.77	114	547
Kumpang Bis	Kumpang Bis	33.31	30	157
	Tapang Menanik	25	75	357
	Janang Balau SP 10	30.74	390	1704
	Balai Lungak	24.93	26	114
TOTAL:		724.36	4214	19382

Source: Kecamatan Belitang Hilir office, Sungei Ayak, 8 June 2000

APPENDIX II: GLOSSARY

Adat	Customary law, varying across Indonesian localities and customary and ethnic communities, and provided ambiguous status in the national Constitution and sectoral laws. Generic term refers to customs, laws, decision processes, and customary functions and functionaries, as well as a local “traditional” institutional ethos and culture. In this study, <i>adat</i> refers mainly to types of land and resource tenure, inheritance, and responsibilities not necessarily recognized formal national law.
Alang-alang	<i>Imperata cylindrica</i> grass, fire-tolerant species often indicating land degradation following repeated burning for shifting cultivation cycles.
BAPPEDA	Regional Development Coordination Agency. Operates at 2 levels: Province, and Kabupaten. Responsibilities include regional planning and official land use designations; regional focus of administrative devolution and reforms
Desa	Official village administrative jurisdiction, legally designated in 1970s national laws; in the study region, comprising up to 12 <i>Dusun</i> (formerly the lowest jurisdictional unit with official standing), or “customary” villages (<i>kampung</i>), whose autonomous jurisdictions were downgraded in 1970s and 1980s laws and administrative “regrouping”
Dusun	Lowest officially recognized village unit in study area from mid-1970s to mid-1980s. Generally equivalent to the customary village unit, or <i>kampung</i>
Jangkang	<i>Kecamatan</i> (subdistrict) located in central Sanggau, West Kalimantan; ethnic or language group whose members live mainly in <i>Kecamatan</i> Jangkang; subgroup of the “Bidoih”, or

	“Land Dayak” ethnographic group
Kabupaten / Bupati	“Level II” administrative level in Indonesia’s regional government system, below the Province (Level I). Generally referred to in English as “District” or “Regency”. Centrally-appointed Head is the <i>Bupati</i> (“District Head”, or “Regent”)
Kebakaran	Unintended or accidental fire or burning (contasting to <i>pembakaran</i>)
Kebun	Garden, or agroforestry garden. May include multiple plant species, or monocrops of specific perennials
<i>Kecamatan / Camat</i>	Regional government unit beneath the Kabupaten, often referred to as “Subdistrict”. Administered by a centrally-appointed <i>Camat</i> , or “Subdistrict Officer”
Ladang	Dry/ unirrigated field; shifting cultivation field
Mualang	Ethnic or language group whose members live mainly in the lower Belitang and Ayak River areas of eastern Sanggau, West Kalimantan; closely related to the Iban, Borneo’s most populous indigenous Dayak group
Oil palm plantation	Officially designated land unit and enterprise operating under a concession agreement, established for production of palm oil trees. Concessions were centrally approved until recent reform experiments in the late 1990s included some plantation concessions granted under other (often ambiguous) legal and administrative auspices at Provincial or Kabupaten levels
Pembakaran	Fire or burning (assumed to be intentional, contasted to <i>kebakaran</i>)

Province	“Level I” in Indonesian regional government structure; the Province of West Kalimantan is headed by a Governor appointed by Indonesia’s central government
Swidden	Shifting cultivation, traditionally involving slashing and felling old forest or secondary growth, allowing debris to dry, burning it, and planting annual and other fast-maturing crops on the site. “Traditional” Kalimantan swidden systems usually allow for the site of a fallowed swidden field to be recultivated several times, before the site is turned to other uses (especially forest gardens), or retired if the land is degraded. To avoid negative connotations of “slash and burn” agriculture, often referred to as “rotational cultivation”. In Indonesian, <i>peladangan</i> ; field referred to as <i>ladang</i>
Tembawang/ Temawa’n	Temawang/ Forest garden of mixed perennial species, usually planted on site of former habitation or cultivation, owned as common property of all descendants of trees’ original planters. A resource tenure status also used to trace community settlement and land use history, as well as kinship links
Timber plantation	Officially, Industrial Forest Plantation (<i>Hutan Produksi Hutan Tanaman Industri</i>), concessions granted by the central government, for production of industrial timber. May involve clear felling on site where plantation is to be established for pulp plantations; other types of plantations to be established on degraded land
<i>Transmigration</i>	Indonesian government-sponsored population resettlement program, relocating people from densely populated areas and disaster victims to more sparsely populated regions, including Kalimantan. Since mid-1980s, transmigration settlements have included “local transmigrants” as well, especially people from

indigenous communities that ceded their customary lands for development of the transmigration project

Mualang language terms used in maps:

<i>Babas</i>	Swidden fallow areas, recovering secondary forest
<i>Getah</i>	Rubber gardens, often mixed with other economically valuable planted tree species
<i>Julut</i>	Remnant old forest “island” (often privatized property)
<i>Pemukiman</i>	Settlement area (residential center of village, where houses are located)
<i>Rian</i>	Durian trees, important property and use right markers
<i>Rimak</i>	Old forest (often open access or common property)
<i>Sawah</i>	Irrigated rice field
<i>Tawamg</i>	Wetland
<i>Temawang</i>	Common property mixed species forest garden; important collective land right marker; many economically useful plants
<i>Tengkabang</i>	Illipe nut tree grove, important property and use right markers
<i>Uma</i>	Currently cultivated swidden field