WEAPONIZED LANDSCAPES: AN ENVIRONMENTAL HISTORY OF THE BATTLE OF OKINAWA AND ITS AFTERMATH

A thesis
by
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Abstract

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The subject of the environment has gained increasing attention in the study of military history. Japan, being less industrialized than other nations at the time, increasingly relied on weaponized landscapes for the purpose of defense following the Battle of Saipan in 1944. By the onset of the Battle of Okinawa in 1945, the Japanese had mastered the use of terrain as a defensive ally. This thesis uses Okinawa as a case study to explore the environmental history of the Pacific theater of the war and its aftermath. Through the use of interdisciplinary sources from biology, geology, and entomology, along with primary sources from the National Archives in College Park Maryland and the U.S. Army Heritage Education Center in Carlisle, Pennsylvania, this research reveals the natural world's role as an active combatant in the Battle of Okinawa. It also highlights the post-war weaponization and militarization of landscapes in the Cold War period, blurring the line between wartime and peacetime military occupation.

Acknowledgments

I would be more than remiss if I failed to begin by thanking those to whom this work is indebted. To start, my thesis director, Dr. Judkin Browning has worked tirelessly to help me achieve my academic pursuits. The completion of this project would not have been accomplished without the additional help of Dr. Bruce Stewart and Dr. Timothy Silver. Judkin, Bruce, and Tim not only guided me through the research and writing process, but they also gave me the opportunity to continue my education at Appalachian State University and helped me reach this point in my academic career. For that, I am forever grateful. I would also like to thank the staff from the Fredericksburg and Spotsylvania National Military Park for allowing me to continue and build upon my interest in the environmental history of warfare for the purpose of a battlefield tour. To my parents, Kennon and Ansley, and my siblings, Mary Katherine, Parks, and Griffin, your steadfast encouragement, love, and patience have been the greatest blessings during this journey. I love and cannot thank you all enough. To my dearest friends, Jacob, Solomon, and Brad, thank you for always standing by my side and enduring my unending history rants. To my loving girlfriend Amelia, you were not just a great research assistant at the National Archives and Army War College, but a source of constant love and support. Thank you for being willing to always listen to my frustrations and struggles – I love you. Lastly, to the Okinawans and the Japanese and American forces, this is for you.

Dedication

To Dr. Judkin Browning for his mentorship

and

To all those, human and non-human, scarred and killed during and after the Battle of Okinawa

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“As the sun disappeared below the horizon and its glare no longer reflected off a glassy sea, I thought of how beautiful the sunsets always were in the Pacific. They were even more beautiful than over Mobile Bay. Suddenly a thought hit me like a thunderbolt. Would I live to see the sunset tomorrow?”

— *Eugene B. Sledge, With the Old Breed: At Peleliu and Okinawa*

The Battle of Okinawa and Weaponized Landscapes in the Historical Narrative

Introduction:

On June 21, 1945, inside a gloomy cave on southern Okinawa, Lieutenant General Mitsuru Ushijima, commander of the 32nd Army, and his chief of staff, Lieutenant General Isamu Cho, along with senior Japanese officers were finishing their last meals before committing the sacred Japanese warrior rights of hara-kiri. One of the staff officers among Ushijima and Cho was Colonel Hiromichi Yahara, the senior operations officer who cultivated the strategic defense on the island. Rather than join them in the act of suicide, Ushijima gave Yahara one last order: "You must not die. If you do, there is no one left who knows about the Okinawa battle. Bear the temporary shame but live through it. This is an order of the Army commander."[1] As the sounds of the battle inched closer to the hidden Japanese headquarters, Ushijima and Cho composed their farewell poem in what historian and author Benis Frank called "classic Japanese style." Their poem directly invokes the natural world:

The green grass of the isle
Withers untimely before the fall,
Yet it will grow again
In the warm spring of the Empire.

Smearing Heaven and Earth with our blood,
We leave this world with our ammunition gone,
Yet our souls shall come back again and again
To guard the Empire forever.[2]

[1] Benis M. Frank, *Okinawa: The Great Island Battle* (New York: Elsevier-Dutton, 1978), 2.

[2] Frank, *Okinawa: The Great Island Battle,* 2.

Cho's last verbal message to the 32nd Army was to continue the fight to the ultimate end, explaining: "Our strategy, tactics, and techniques all were used to the utmost and we fought valiantly, but it was nothing before the material strength of the enemy." Following Cho's final order, Ushijima and Cho emerged from their hidden cave and walked towards a steep ledge outside their HQ, looking out towards the eastern sky. As they bared their abdomen to the knife for disembowelment, there was a quick scream then flash of a sword, decapitating the generals.[3] These last moments highlighted an aspect of the battle often treated as a backdrop: the environment. The final poem and the last message of Lt. General Cho revealed the importance of the environment in Japanese military thought. Nature embodied spiritual qualities to the Japanese. In the Japanese Shinto religion, "spirits" or "gods" manifest in many forms, including rocks, trees, rivers, and animals.[4] The natural world was praised and revered by the Japanese. This can also be seen through the worship of the Emperor, the claimed descendent of the sun-goddess.[5]

The Japanese military made the natural world an integral part of their defensive plans. Following the Battle of Saipan from June-July 1944, the Japanese developed a new strategy known as "trapping."[6] Rather than contesting beach landings, Japanese soldiers mastered the art of camouflage, blending into the natural world and cultivating the terrain in such a way as

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[3] Frank, *Okinawa: The Great Island Battle,* 1-3.

[4] Carmen Blacker, "Shinto and the Sacred Dimension of Nature," Excerpted from the international symposium, "Shinto and Japanese Culture," accessed on March 19, 2019, https://web.archive.org/web/20071222193053/http://www.shinto.org/isri/eng/dr.carmen-e.html.

[5] Michael Hoffman, "Land of the Sun Goddess," *Japan Times* (July 12, 2009), accessed on March 18, 2019, https://www.japantimes.co.jp/life/2009/07/12/general/land-of-the-sun-goddess/#.XJgNT-zYqzw.

[6] 32nd Army Battle Instruction No. 3, Feb. 15, 1945, p. 2, Geographic Files, Record Group 127, Records of United States Marine Corps; National Archives Building, College Park, MD. (hereafter RG 127)

to employ it as a weapon. The art of weaponizing the landscape placed the environment at the center of the Japanese strategy for victory. In fact, General Ushijima ordered 32nd Army forces to "take advantage of natural features and objects."[7] The battle scheme for the Japanese was simple, use the natural world as an ally and defensive weapon. The environment places natural forces upon humans in peacetime and in wartime. Not only terrain, but weather, disease, insects and other animal species affect a soldier's morale and cognitive ability in the field. The environment is not merely a backdrop but an active combatant and agent within the historical narrative.

However, little attention has been given to the environment's role in the Second World War and the Battle of Okinawa. In 2004, *Natural Enemy, Natural Ally: Toward an Environmental History of War*, edited by Richard P. Tucker and Edmund Russell, aimed to examine the historical connections between the environment and war. In 2009, *War and the Environment: Military Destruction in the Modern Age*, edited by Charles E. Closmann, addressed basic questions such as how has war transformed the environment, and in what ways have environmental conditions changed the nature of combat?[8] Both works are a collection of essays and although some authors cover the Second World War, the majority are not solely dedicated to it. In 2017, historians Simo Laakkonen, Richard P. Tucker, and Timo Olavi Vuorisalo edited a collection of essays which constituted the first book-length work on the global environmental perspectives of the Second World War, *The Long Shadows: A Global Environmental History of the Second World War.* Instead of simply

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[7] 32nd Army Battle Instruction No.13, April 5, 1945, p. 12, Geographic Files, RG 127.

[8] Richard P. Tucker and Edmund Russell, *Natural Enemy, Natural Ally: Toward an Environmental History of Warfare* (Corvallis: Oregon State University Press, 2004); Charles Closmann, *War and the Environment: Military Destruction in the Modern Age* (College Station: Texas A&M University Press), 1.

exploring resource extraction and the social and environmental impacts of the war, the essays explored the war's long shadow of environmental damage extending into the post-World War II world, an aspect that cannot be ignored while researching Okinawa.[9]

Scholarship on the battle of Okinawa has traditionally focused on the Japanese and American combatants. In 1948, Roy Edgar Appleman, with the help of several U.S. Army historians attached to the U.S. Tenth Army during the campaign, published an in-depth history of the battle, *Okinawa: The Last Battle*. Rather than focus on individual soldiers, *Okinawa: The Last Battle* offered painstaking detail to combat operations and mainly outlined the U.S. perspective. Benis Frank's, *Okinawa: The Great Island Battle* was similar to Appleman's work, however, with less detail. Nevertheless, Frank provided an overview of the Joint Chiefs of Staff's decision to invade Okinawa, as well as an exploration into the 32nd Army defenders and their plans for the defense. In just over one-hundred concise pages, his battle narrative traced the various stages of the campaign, from north to south. A lesser known work, George Rottman's, *Okinawa 1945: The Last Battle* offered a short overview of the campaign and an introductory understanding of the land battle and U.S. Navy effort to confront Kamikaze attacks.[10]

Another major work on Okinawa was George Feifer's gripping *Tennozan: The Battle of Okinawa and the Atomic Bomb* (1992). Feifer explored the collision of three cultures during the battle: the Japanese, Americans, and Okinawans. Employing rich secondary and

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[9] Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo, *The Long Shadows: A Global Environmental History of the Second World War* (Corvallis: Oregon State University Press, 2017).

[10] Roy E. Appleman, *Okinawa: The Last Battle* (Washington, D.C.: Center of Military History, 1993); Frank, *Okinawa: The Great Island Battle;* Gordon Rottman, *Okinawa 1945: The Last Battle* (Oxford: Osprey Publishing, 2002).

primary sources, including interviews, Feifer detailed the horror experienced by combatants on all sides. In doing so, he revealed the motivation of President Harry Truman's decision to drop the two atomic bombs on Hiroshima and Nagasaki. However, instead of ending with the bomb, Feifer brings his historical narrative into 1987, highlighting the reconciliation ceremony between American veterans, Japanese veterans, and Okinawan civilians.[11]

Although each of these works explored the Battle of Okinawa from various perspectives, Appleman, Frank, Rottman, and Feifer failed to treat the environment as an active combatant. To Second World War scholars and veterans who experienced the nightmare environment on the island, Okinawa emerges as the pivotal and last great island battle. Much of the scholarship attributed the attrition of the combat to the defensive network established by the Japanese 32nd Army, and the fact Okinawa constituted a portion of the 'inner ring' of the Imperial Japanese Empire. Although these arguments are valid, scholars have not focused enough attention on the natural environment of the island itself. Furthermore, even with immense devastation to the natural world on Okinawa, scholars of the battle and the larger field of the Second World War have continually neglected to explore the environment's role in the war and its recovery in subsequent decades.

The Japanese 32nd Army weaponized the Okinawa landscape and as a result, insects, vermin, bacteria, weather, and terrain engaged in combat against human enemies. Eugene Sledge, a young Marine, noted that the combat in the Pacific was of "savage" quality.[12] This was a common theme throughout the Pacific War, but why? What made combat in the

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[11] George Feifer, *Tennozan: The Battle of Okinawa and the Atomic Bomb* (New York: Ticknor & Fields, 1992).

[12] Eugene Sledge, *With the Old Breed on Peleliu and Okinawa* (New York: Presidio Press, 2007), 121.

Pacific, and in this case Okinawa, so grueling? What drives combatants on both sides to revert to animal-like instincts? Is it simply racial hatred or is there more?

These questions will be examined in the first two chapters. Chapter one, "Weaponized Landscapes: The Natural World and the Battle of Okinawa," focuses on the respective strategies of the two sides and on the combat to the north. It argues that the weaponized landscape, along with the seasonal rains, combined to make the initial American movements grueling and treacherous. Thus, the prolonged and brutal nature of combat experienced by U.S. troops had as much to do with environmental factors as it did with the fierce resistance of the 32nd Army. To help develop this point, chapter one details the evolutionary history of Okinawa's natural world, highlighting the various geographic formations on and around the island. This section also explores the soil, flora, and fauna native to Okinawa. An understanding of the island's natural world allows for a critique of the Japanese and American perceptions of the environment before and during the campaign.

Chapter two, "The South: Into the Abyss," continues the discussion of weaponized landscapes as U.S. forces directed their attention south towards the main Japanese defensive positions at the Shuri line. Careful attention to the mosquito, lice, and tick populations on Okinawa reveals how the landscape and weather helped exacerbate the problems of diseases. This chapter explores the mechanics of the diseases present on the island and the ways in which these illnesses played a role in deteriorating the morale and combat effectiveness of military personnel on both sides. Sickness, terrain, and poor weather created miserable conditions for combat forces. The combination of all these effects leads to the conclusion that perhaps the kamikaze, banzai charge, and execution of prisoners was more a reaction to extreme environmental conditions, presenting the natural world as the catalyst to such

actions. This argument is contrary to John Dower's conclusion in *War Without Mercy: Race & Power in the Pacific War*. To Dower, the inhumane nature of the Pacific war is best explained through the racial hatred and propaganda of the Japanese and Americans. Racism was in fact a major aspect of the Pacific war. However, racism also acted as a justification for violence. To understand this claim, it is important to explore the role of the environment during the Okinawa campaign.[13]

The third and final chapter, "Weaponized Landscapes and the Post-War Shadow," receives its title and inspiration from the book, *The Long Shadows: A Global Environmental History of the Second World War.* Most scholars and "buffs" of the Second World War believe the destruction of Okinawa stopped with the conclusion of the battle on June 22, 1945. However, research into the U.S. Cold War policy reveals that weaponization of the island for the purpose of military bases continued the path of destruction with shocking levels of neglect and pollution. The military practices through the Cold War era and into the 21st Century blurs the line between wartime and peacetime weaponization of landscapes. Furthermore, it reveals the long shadow of environmental destruction brought on by the war and military occupation. This chapter also recognizes how, in some cases, the natural world heals over time, connecting instances of environmental regrowth on Okinawa to the reconciliation of Japanese and American forces in 1987.

Countless marines and soldiers referred to combat in the Pacific and on Okinawa as "the abyss." Eugene Sledge claimed that those involved were the "harvest of man's stupidity" and described the destruction of the Pacific War as the "fruit of the holocaust."[14]

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[13] John Dower, *War Without Mercy: Race and Power in the Pacific War* (New York: Pantheon Books, 1986).

[14] Sledge, *With the Old Breed*, 270, 315.

Okinawa, like no other battle, embodied these statements. It was the final battle of the Pacific war, lasting from April 1--June 22, 1945. The Battle of Okinawa serves as a microcosm of the entire Pacific theater, and as the smoke cleared on June 22, 1945, the familiar site of mass death and environmental destruction abounded. The Japanese suffered 110,00 casualties and the Americans 49,151. Likewise, the Okinawans suffered 142,058 casualties and their cultural landscapes and peaceful agrarian and fishing lifestyle was forever changed by war and occupation of foreign militaries.[15] Although the Battle of Okinawa ended in 1945, the environment's story of pollution and degradation was only beginning. The natural world is not outside of the historical narrative. This is an environmental history of Okinawa during the final months of the war and decades after. As Okinawa shows, war is an ecological event, and its transformative nature continues long after nations make peace.

[15] Appleman, *Okinawa: The Last Battle*, 473; Feifer, *Tennozan*, 558.

I

Weaponized Landscapes: The Natural World and the Battle of Okinawa

Retired Marine Corps Colonel and historian Joseph Alexander wrote, "Throughout the war, the Americans failed to appreciate or anticipate the digging ability of the common Japanese soldier."[1] Chief of Operations and defense construction, General Yahara fulfilled that declaration and created a masterful underground network, altering the Okinawan earth into a defensive weapon with the sole purpose of inflicting the greatest number of casualties against a vastly superior force. The 32nd Army Headquarters embodied the genius of Yahara's defense. Located in a cave below the ancient Shuri Castle, a structure built in the 14th century as the palace for the Ryukyu Kingdom, the main tunnel was fifty feet underground at its shallowest point. In all, the southern portion of Okinawa housed sixty miles of tunnels for 32nd Army men and supplies. The Japanese objective required the use of nature as a weapon, and the end goal, if necessary, required Japanese troops to rejoin the natural world that provided for their defense.[2]

On June 5, 1945, towards the end of the Okinawa campaign, three Marines, William Manchester, Izzy Levy, and Rip Thorpe were cooking breakfast on a formerly occupied Japanese defensive position on the reverse slope of a hill located somewhere on the Oroku Peninsula of southern Okinawa.[3] Hearing the familiar shriek of an enemy shell, Manchester, Levy, and Thorpe calculated that the shell had "a thousand to one" chance of clearing the top of the hill and landing on the reverse slope they occupied. Regardless of their calculation,

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[1] Joseph Alexander, *Storm Landings* (Annapolis: Naval Institute Press, 2013), 154.

[2] Feifer, *Tennozan*, 102, 109.

[3] William Manchester, *Goodbye Darkness: A Memoir of the Pacific War* (Boston: Little, Brown, 1980), 384.

Manchester took several steps into a burial tomb that was formerly a gun emplacement. Okinawa's many hills were honeycombed with caves and burial tombs for use as gun emplacements. These positions had been constructed, prepared, and modified by the Japanese 32nd Army as a weaponized or militarized landscape. The surrounding terrain of caves and tombs merged human and environmental combatants into a singular weapon against the American invaders.

As the shell whistled overhead, the three men remained convinced they were safe from danger. To Manchester's surprise, the rogue, eight-inch shell found its way onto their exact position in front of the tomb. Thorpe absorbed most of the shell and was immediately vaporized, "his flesh, blood, brains, and intestines" encompassed Manchester. Levy was severely wounded and blinded by the blast, as was Manchester, but the burial tomb protected him.[4] The natural world operated as an offensive enemy when manned by a Japanese machine gun, but also as a defensive ally when protecting those it housed from death.

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Japanese military leaders discussed a possible conflict with the United States as early as 1918 after the culmination of the First World War. As Japan's conquest of Manchuria and the Pacific islands continued at a rapid pace, debates began to swirl about when best to launch a preemptive strike against the United States. The Japanese Imperial Navy and air forces targeted Pearl Harbor, Hawaii on December 7, 1941. The United States now became entrenched in its second global war, and they had to address how to confront their Japanese enemy on the battlefield.

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[4] Manchester, *Goodbye Darkness*, 384.

For the Japanese military, their experience prior to 1941 made them combat veterans. Despite gaining military experience from the imperial incursions into Manchuria in 1931, Japanese military leaders knew the superior fighting potential of the United States made it unlikely that they could inflict a crushing defeat against the U.S.[5] Furthermore, the vast distances separating each nation made it unlikely for Japan to attack the U.S. mainland, and the Japanese were not solely contending with the U.S., but also with Great Britain, the Netherlands, China, Australia, and New Zealand.[6] With the odds of decisive victory stacked against them, it was imperative to conduct a defensive war of attrition.

The initial planning for the Japanese had two rival strategies. The army generals advocated for a defensive strategy for the protection of the occupied islands, and the naval officers argued for an offensive strategy for the purpose of military expansion. Japan chose the offensive strategy. The adoption of an offensive strategy instigated Japanese expansion to the north, south, and central Pacific. As a result, the Imperial Navy and military resources were spread thin. This became a larger issue after the Imperial Navy's defeat at Midway in June 1942. Dwindling resources forced the Japanese military to adopt a defensive strategy of attrition for the remainder of the war. The goal of the new Japanese strategy became the utilization of the vast Pacific islands and their ecosystems in order to inflict high casualty numbers on the allies, while simultaneously slowing their advance.[7] The Japanese cultivated

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[5] John Price, "Review of *The Dominion and the Rising Sun: Canada Encounters Japan," The International History Review* 28, no. 3 (2006): 625.

[6] General Douglas MacArthur, Reports of General MacArthur: Volume II, Part I: Japanese Operations in the Southwest Pacific Area (Washington, DC : Center of Military History, U.S. Army, 1994): 44, accessed Oct. 13, 2018, https://archive.org/details/ReportsOfGeneralMacarthurJapaneseOperations/page/n61.

[7] John Costello, *The Pacific War 1941-1945* (New York: Quill, 1982), 218-221.

a militarized and weaponized landscape to conduct a defensive war of attrition by utilizing all aspects of an island's terrain and natural features. Based on Japanese estimations, the U.S. and her allies would sue for peace at the sight of the mass death of their countrymen.[8]

Similar to the Japanese larger strategy for the war, the strategy on Okinawa required an emphasis on defensive attrition through the terrain. When one enters an untamed or unknown ecosystem, they expose themselves to an ecological world capable of inflicting death at any moment. By recognizing this quality, the Japanese strategy focused on using the natural world as an ally in their fight against the United States. Their goal was not to simply slow the American advance, but also to have the environment act as a weapon by tiring, confusing, and exposing U.S. personnel to deadly fire from superior terrain positions. This strategy was known as "trapping."[9] These superior positions remain dormant while enemy forces move forward into the field of fire. Once lured into the "trap," the surrounding positions envelope the opposing force with concentrated fire.[10]

Okinawa is merely a microcosm of the larger Pacific conflict, and sheds light on how the natural world acts as an active agent in warfare. Conditions in nature, whether it be rain, mud, dirt, insects, vermin, or disease, fueled the war of attrition and acts of barbarity during Okinawa and the entire Pacific War. However, it is first necessary to establish an understanding of the existing environment and cultural landscape on the island, and how each side prepared, if any, for the hellish world they were entering.

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[8] Jeffrey Record, "Japan's Decision for War in 1941: Some Enduring Lessons," *Strategic Studies Institute (SSI)* (February 2009): 31, accessed November 12, 2018, https://ssi.armywarcollege.edu/pdffiles/pub905.pdf.

[9] 32nd Army Battle Instruction No. 2, February, 1945, Geographic Files, RG 127.

[10] U.S. Tenth Army, Tenth U.S. Army Ryukyus campaign intelligence monograph, 1945, Box 1, U.S. Army History Education Center, Carlisle, PA. (hereafter USAHEC)

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The Ryukyu island chain is roughly 400 miles from the Japanese mainland. Okinawa is the southernmost island punctuating the Japanese archipelago and the Ryukyu chain. The Ryukyus consist of several small islands. The limestone formations and reefs defining Ryukyu topography on Okinawa were formed in the Pleistocene Period, roughly 1.8 to 12,000 years ago. Okinawa and the other islands in the Ryukyu arc are a volcanic system formed by the subduction of the Philippine Sea into the Eurasian Plate, which according to the U.S. Geological Survey, "occurs when an oceanic plate runs into a continental plate and slides beneath it."[11] Although the formation of the islands in the northern Ryukyu chain have been more heavily influenced by the volcanic activity, the southern islands, including Okinawa, experienced some volcanic activity that shaped portions of the island's topography. This is most notable in the mountainous terrain on the Motobu Peninsula in northern Okinawa. As Earth's plates shifted during the Pleistocene Period, the distinct terrain features of Okinawa such as the mountains, ridges, valleys, hills, and cliffs formed, creating a landscape ideal for weaponizing.[12]

Okinawa took its final shape during the Holocene Period, over the last 12,000 years.[13] The island's geology from the Holocene Period to 1945 consists of uplifted coral, limestone, and red clay to the south and "highly deformed, metamorphosed limestone, sandstone, shale, and volcanic rock overlain by a varying thickness of soil, and on the outer portions of

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[11] Richard Pearson, *Ancient Ryukyu: An Archaeological Study of Island Communities* (Honolulu: University of Hawai'i Press, 2013), 18; U.S. Geological Survey, "EarthWord–Subduction," *USGS.gov* (September 12, 2016), accessed on December 2, 2018, https://www.usgs.gov/news/earthword-subduction.

[12] Pearson, *Ancient Ryukyu*, 18.

[13] Pearson, *Ancient Ryukyu*, 19.

terraces, coarse sand and gravel" to the north.[14] The northern geology is less hospitable for farming, and as U.S personnel discovered, for digging foxholes; however, the soil to the south, despite housing large limestone pockets, is made up primarily of red, clay-like soil, suitable for both farming and fox hole digging. Eugene Sledge, a U.S. Marine, discussed the soil on Okinawa at length, expressing that the "claylike soil was easy, a luxury after the coral rock of Peleliu."[15] Unfortunately for Sledge and American combat troops, the soil would take on a much more sinister role of combatant when the summer rains arrived.

As a result of the Ryukyus' volcanic formation, large coral reefs, abundant in marine life, surround Okinawa.[16] According to Mick Corliss, a writer for the *Japan Times*, "Its subtropical climate, combined with its position between the tropics of Southeast Asia and the more temperate Japanese mainland, have turned the island into a biological melting pot."[17] The immense coral reefs form a protective barrier around the island which came into play during the U.S. military storm landings on April 1, 1945.

One of the most unique ecological worlds within the larger ecosystem resides in the pine forest known as Yanbaru. Extending from the central to the northernmost point of the island and spanning from the villages of Higashi, Kunigami, and Ōgimit, the Yanbaru Forest

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[14] Intelligence Division, Office of The Engineer Headquarters United States Army Japan with Personnel of The United States Geological Survey, "Military Geology Of Okinawa-jima, Ryukyu-retto," Introduction And Engineering Aspects, vol. 1, 1957, 3, accessed on December 1, 2018, https://pubs.usgs.gov/fedgov/70039235/report.pdf.

[15] Sledge, *With the Old Breed*, 208.

[16] Ryukyu Islands, "Okinawa Prefecture," October 17, 2016, accessed on November 11, 2018. https://www.japan-guide.com/list/e1247.html.

[17] Mick Corliss, "Fears for Okinawa's Unique Ecosystem," *The Japan Times*. July 20, 2000, accessed on November 7, 2018, https://www.japantimes.co.jp/life/2000/07/20/environment/fears-for-okinawas-unique-ecosystem.

is home to almost two-hundred native species. Various snake species, birds, vermin, and insects occupy Okinawa's natural world.[18] Although it occupies a region of Okinawa that played a minor part in the overall campaign, it provided an adequate defensive terrain, and more interestingly, a protective geography for Okinawan citizens hiding from combat to the south.[19]

Okinawa presents a diverse geography that shaped the cultural landscapes and, by the onset of World War II, the weaponized landscapes. Due to the island's red soil, it is not surprising that agriculture became the staple practice of the population. Farmers practiced terrace farming due to the abundance of rolling hills in the lowlands to the south. This agricultural practice along hillsides was step like and makes the trek towards an enemy pill box arduous and dangerous, an experience soon to come for American personnel.

Potatoes, rice, vegetables, sugarcane, and tea are some of the important crops produced on the island.[20] An American naval research unit, following the start of the Okinawa campaign, noted that potatoes grew abundantly throughout the island everywhere they dug; however, they contained typhoid-causing bacteria, but most of the locals developed a resistance to the bacteria due to years of consumption.[21] The connection between typhoid bacteria and the potatoes results from the ground being "generously fertilized with night soil - a rich source...of typhoid and paratyphoid bacilli."[22] This rich soil was comprised almost

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[18] Corliss, "Fears for Okinawa's Unique Ecosystem."

[19] Miyume Tanji, *Myth, Protest and Struggle in Okinawa* (United Kingdom: Routledge, 2007), 164.

[20] Richard M. Bohart, *Mosquitoes of Okinawa and islands in the central Pacific* (Washington, D.C.: Navy Department, Bureau of Medicine and Surgery, 1946), 45.

[21] Feifer, *Tennozan*, 61.

[22] Feifer, *Tennozan*, 64.

entirely of human excrement. The abundance of night soil would cause issues during the campaign once troops began eating the potatoes.

Rainfall experienced between the months of May and September ensured steady rice production, which many farmers considered to be a luxury. The rice paddies on Okinawa tended to be located near rivers or large bodies of water, housing large mosquito populations which burgeoned before and during the battle.[23] The bombardments from both the Japanese and Americans created craters throughout the island, and once they filled with stagnant water, formed another home for mosquitoes to breed. [24]

In addition to the agricultural practices, terrain alterations for the creation of burial tombs constituted a religious aspect of the cultural landscape. Centuries before the Second World War, the Ryukyu kingdom built tombs, or "hakas," from limestone rock to house the bodies of their ancestors. Most tombs were constructed during the fifteenth century, and date their influence to the Ming Dynasty in China. For the Chinese, the tomb design carried environmental connotations in the way it mirrors the turtle, a sacred creature in ancient China. However, the Okinawans adopted a slightly different environmental meaning. In an interview for *Stars and Stripes*, an American military newspaper, Okinawa native Gisho Nakama explained that "in the Ryukyus, the turtle-shaped grave, or kikkobaka, is said to be a shape of mother's womb, from where everyone is born and from there everyone returns." Birth is a natural process in all levels of the animal kingdom. The idea of the tomb as a womb draws on that element, and takes it further in the way it equates death to the return to the

[23] Bohart, *Mosquitoes of Okinawa*, 45.

[24] Feifer, *Tennozan*, 64.

natural world.[25] The natural features of the terrain created the cultural landscape of an agricultural community. With the arrival of the Japanese army, the cultural landscape became a weapon. 32nd Army soldiers and engineers greatly altered the land and used burial tombs and terraced hills as gun emplacements, contributing to the development of a weaponized and militarized landscape within the pre-existing cultural landscape.[26]

Wildlife, despite not being a specific feature in either nation's battle plans, actively participated in the island struggle. Thus, several species native to the island should be highlighted. The Habu snake is native to Okinawa, but several other species exist, such as the Himehabu and Sakishima habu. Each of these snakes pose a threat to humans, and the Habu specifically appeared to pester U.S. personnel just enough to earn a reference in George Feifer's, *Tennozan: The Battle of Okinawa and The Atomic Bomb.*[27] Other animals active on Okinawa from April - June 1945 were the Ryukyu Long-tailed Giant Rat, the Spinous Country Rat, and native goats, each of whose population carried a flourishing lice population with the potential to spread a debilitating and possibly deadly disease known as Japanese B encephalitis. The human death and destruction created a perfect environment for certain species and bacteria to spread sickness among military ranks. Diseases carried by these rodents, goats, and their parasitic lice companions, as well as numerous other insects such as

[25] David Allen. "On Okinawa, Families Show Respect for the Dead with Tradition." *Stars and Stripes*. April 15, 2006, accessed on November 11, 2018. https://www.stripes.com/lifestyle/on-okinawa-families-show-respect-for-the-dead-with-tradition-1.49217.

[26] Corliss, "Fears for Okinawa's Unique Ecosystem."

[27] George Feifer, *Tennozan*, 332.

flies, ticks, & mosquitoes, added to the psychological and physical destruction of U.S. and Japanese troops.[28]

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In December 1941, Army Colonel Masanobu Tsuji wrote and published a pamphlet titled, *Read This Alone-And The War Can Be Won.* From this pamphlet, the Japanese determined how to engage their new foe throughout the Pacific war and on Okinawa. Tsuji's work dealt with all aspects of tropical-island warfare - jungle fighting, cave development, camouflage, etc. Moreover, it reiterated the idea of using the existing landscapes on islands for the purpose of creating weaponized landscapes.[29] The commander of the Imperial 32nd Army, General Mitsuru Ushijima, soon revealed the deadly nature of Tsuji's teaching through its application on the Okinawan battlefield.

General Ushijima gained a flourishing reputation from his success as an infantry officer in Manchuria. As a result of his military exploits earlier in the war, Ushijima received an appointment to command the Imperial Academy, Japan's equivalent to West Point, in 1942. Known as a calm and serene individual who generated immense loyalty from his officers and men, Ushijima accepted his assignment as commander of the 32nd Army for the defense of Okinawa. Upon arriving on Okinawa and studying the terrain, Ushijima quickly realized the defensive strength provided by the terrain rising over flat plains, and the towering defensive position of Shuri Castle.

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[28] Samuel Simmons and William Uphold, "Disease Control With Insecticides A Review Of The Literature," *World Health Organization, 1951* vol. 3 no. 4, 544, accessed on October 15, 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2554026/; Feifer, *Tennozan,* 64.

[29] Costello, *The Pacific War*, 97-98.

Ushijima continued to reiterate to his men that when attacking the enemy, "take advantage of natural features and objects." The continual references to the natural world as an ally of the Japanese soldier littered Ushijima's battle instructions. Recognizing their stark disadvantages, Ushijima and his general staff composed a plan that would offer the best chance of success. The emphasis on concealed natural positions, supported by "octopus-pot" positions, created triangular defense systems to integrate interlocking fields of fire for mortars, machine guns, artillery and small arms from superior vantage points along the hills and the heights.[30] The "octopus-pot" or pimple positions received their name for the resemblance to a pot used to cook octopus in Japan. The position was merely a hastily dug foxhole, with camouflage covering the top and a small peep hole for observation.[31] These well-hidden foxholes helped direct machine gun and artillery fire onto American troops. These interlocking positions facilitated deadly killing zones made possible by the natural features of the island.

If the Japanese planned to delay the American advance and break their will to continue the war onto the home island, the Japanese needed to direct their attention towards the advantage of Okinawa's geological composition and cultural landscapes. Ushijima issued an order to his troops on Okinawa exclaiming, "One plane for one warship. One boat for one ship. One man for ten of the enemy or one tank."[32] Although these are offensive orders, the Japanese general orchestrated an overall strategy geared towards a defensive war of attrition. The Japanese strategy for Okinawa called for the enlistment of all the natural features and

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[30] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1, Geographic Files, RG 127.

[31] 32nd Army Combat Directive, May 5, 1945, p. 5, Geographic Files, RG 127.

[32] 32nd Army Battle Instruction No. 1-4, Feb. 15, 1945, p. 2, Geographic Files, RG 127.

elements of the island, including the limestone terrain features, the Yanbaru Forest, the burial tombs, and the typhoons. General Ushijima commissioned Colonel Hiromichi Yahara as the mastermind in crafting the natural world into a formidable defensive weapon.[33] With his fervent "Imperial War radical," Chief of Staff, General Isamu Cho and Chief of Operations, Colonel Hiromichi Yahara by his side, the work to mold the natural world of Okinawa in their favor began in August 1944.[34]

Yahara understood the importance of waging a defensive war of attrition. Following the unexpected loss and transfer of the veteran Ninth Division to reinforce Formosa, Yahara, Ushijima, and Cho recognized that the terrain lining the western beaches was no longer feasible to defend. In their view, the terrain along the Shuri Line created a "steel ring," thereby making it impossible for American tanks to maneuver.[35] Following the experience on Iwo Jima, Japanese generals grappled with how to deal with the increased use of tanks, flamethrowers and explosives by the United States.[36] The U.S. was more technologically-oriented. Japanese leaders knew the Americans maintained the superior technology and immense combat numbers and resources; therefore, it became necessary to stress stillness and trigger control to Japanese defenders. According to 32nd Army Battle Instruction no. 7, the enemy must be "lured on by the deadly stillness."[37] By doing so, the Japanese could

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[33] Feifer, *Tennozan*, 105.

[34] Feifer, *Tennozan*, 94-101.

[35] 32nd Army Battle Instruction No. 7 & 13, March 2, 1945 & April 5, 1945, p. 5 & p. 13, Geographic Files, RG 127.

[36] 32nd Army Battle Instruction No. 10, March 6, 1945, p. 8, Geographic Files, RG 127.

[37] 32nd Army Battle Instruction No. 7, p. 7, Geographic Files, RG 127.

better adopt "jack-in-the-box positions."[38] Such a position allowed the defending soldier to hide underground, emerging suddenly to inflict the most damage at close quarters. This not only added the element of surprise, but it placed the Japanese in the favorable scenario of hand-to hand combat, a style of fighting the Japanese were more well-versed in since their military thought stressed that the enemy could only be defeated "by putting away all thought of their own lives."[39] The Japanese also built trenches to destroy tanks from the underbelly, and they crafted additional tank traps at the foot of hills, valley floors, and near rice paddies to lure American tanks into no man zones.[40]

In order to lure U.S. troops into killing zones, the Japanese required thoroughly camouflaged and well-dug emplacements. The 32nd Army placed guns at the mouth of caves for deadly accuracy, dug and camouflaged holes and tank traps, turned rice paddies into mine fields, and tunneled caves to connect various gun positions and provide escape routes for defenders.[41] Since limestone is hard and durable, the abundance of the rock on the island allowed the Japanese to use this key ingredient to create concrete for the purpose of reinforcing limestone and coral caves.[42] In order to create concrete, Ushijima rationed water usage, limiting the amount consumed and used for maintaining basic hygiene.[43]

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[38] 32nd Army Battle Instruction No. 13, April 5, 1945, p.12, Geographic Files, RG 127.

[39] Feifer, *Tennozan*, 49-56.

[40] 32nd Army Battle Instruction No. 10-11 & 13, March 6, 1945, p. 1, p. 8, & p. 13, Geographic Files, RG 127; 32nd Army Combat Directive, May 5, 1945, p. 5, Geographic Files, RG 127.

[41] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1, Geographic Files, RG 127.

[42] Claude Goguen and Paul D. Tennis, "Portland-Limestone Cement," June 02, 2014, accessed on November 27, 2018, https://precast.org/2014/06/portland-limestone-cement/.

[43] Feifer, *Tennozan*, 103.

By 1945, the Japanese were well aware of the accuracy of U.S. aerial and naval bombardments. The Japanese built well concealed defensive position to decrease the impact of U.S. heavy artillery.[44] The caves, burial tombs, and forward and reverse slopes of Okinawa's commanding hills provided the perfect terrain for their desired approach to combat. The positions promised to not only protect their human soldiers within the hidden tunnels, caves and hills, but they also provided shelter for artillery, which stayed protected during daylight bombardments and emerged at night to inflict terror and death on American forces. One soldier in the 32nd Army remembered, "our activities begin in the evening, when the worst of the air raids are over."[45]

The soldiers' feverish digging throughout 1944 and 1945 gouged out hillsides, caves, ridges, and burial tombs for gun emplacements. The digging continued every day for several months before the invasion, with soldiers using their hands when shovels were not available. Soldiers completed the majority of the digging by mid-December 1944.[46] This is perhaps the most astonishing fact about the cave defense and tunnel system. Digging through limestone is backbreaking work.[47] Sandstone and shale, both equally difficult to dig through, compose large portions of the island terrain. The geography of Okinawa, although difficult to manipulate, naturally contained features beneficial for an army wishing to weaponize a landscape for the purpose of a defensive battle of attrition. The fact that soldiers completed

[44] 32nd Army Battle Instruction No. 10, March 6, 1945, p. 8, Geographic Files, RG 127.

[45] Feifer, *Tennozan,* 134.

[46] Feifer, *Tennozan*, 85.

[47] Goguen and Tennis, "Portland-Limestone Cement."

the defensive cave and tunnel network almost entirely by hand or shovel, reflects an environmental and military masterpiece.

The Japanese saw the pre-existing burial tombs as sites suitable for pillboxes, gun emplacements and bunkers. Some tombs required additional work to widen the mouths, but most were already suitable for Japanese defenders. The slogan for the Japanese during the construction process became "confidence in victory will be born from strong fortifications," and from this slogan the Japanese embraced nature as its protective ally and also as a spiritual resting place for soldiers in a fanatical final stand.[48] Just as the Okinawans built their tombs into the ground and hills symbolizing that their ancestors are now one with the Earth, the Japanese military pamphlet, *Read This Alone - And The War Can Be Won,* similarly stated that upon death during a glorious defense, the Japanese soldiers will now be "corpses drifting swollen in the depths of the sea/corpses rafting in the mountain grass."[49]

Ushijima and his general staff were correct in their assumption that if the U.S. was to defeat the Japanese environmental ally, it must first, according to American military thought, pummel the natural world into submission. However, American forces would discover that this was easier said than done. Ushijima expected U.S. forces to approach the environmental challenges with an insistence on technological power. This played to the Japanese advantage because their experience fighting the Americans taught them that the U.S. relied heavily on naval, air, and field artillery support to dislodge formidable defensive positions. In the words of the 32nd Army Battle Directive, "a blanket bombardment changes the topography," which

[48] Feifer, *Tennozan,* 102 - 110.

[49] Feifer, *Tennozan,* 117.

in turn will support the Japanese defensive plan of attrition by creating a bevy of natural hurdles to overcome logistically and offensively.[50]

Even more beneficial to the Japanese was their understanding of Okinawa weather patterns. If terrain would cause difficulty for the U.S. with and without a bombardment, adding rain and fog to the growing list of Japanese allies would merely serve to prolong the bloodshed and offensive difficulties.[51] The "Okinawa baiu" or summer rainy season begins in early May but ends in late June as the storm cycle moves northward toward Japan.[52] The summer rain system begins in China and moves south towards Okinawa. The arrival of the baiu system brings about "extratropical cyclones and frontal systems" that create typhoons.[53] Okinawa consistently experiences prevailing winds from the south throughout the year and as the rains arrive, these winds create massive storms, increasing the likelihood for flash floods significantly.[54]

The arrival of the summer rainy season reaches peak precipitation in mid-May at roughly 10.1 inches based on a Weatherspark report analyzing the historical hourly weather reports on Okinawa.[55] Although this precipitation level remains relatively consistent, the rainfall on Okinawa during mid-May 1945 reached fourteen inches according to the April 22

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[50] Feifer, *Tennozan*, 5.

[51] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1; Geographic Files, RG 127.

[52] Yasuko Okada and Koji Yamazaki, "Climatological Evolution of the Okinawa Baiu and Differences in Large-Scale Features during May and June," *Journal of Climate* (September 2012), 1, https://doi.org/10.1175/JCLI-D-11-00631.1.

[53] Okada and Yamazaki, "Climatological Evolution."

[54] Okada and Yamazaki, "Climatological Evolution."

[55] Weatherspark, "Average Weather in Okinawa," accessed on March 21, 2019, https://weatherspark.com/y/142278/Average-Weather-in-Okinawa-Japan-Year-Round.

to June 31 Action Reports from the First Separate Engineer Battalion, Third Amphibious Corps.[56] This clearly exceeded normal levels. The Japanese would have been well aware of the Okinawa baiu because Japan had controlled the island since its annexation in 1879.[57] With knowledge of Okinawa weather patterns, Ushijima could count on rainfall and typhoons to slow U.S. movements, ground aircraft, decrease bombardment accuracy, all the while giving his men momentary rest from U.S. precision air and naval and ground attacks.

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Similar to the Japanese, American strategists discussed and planned for war between the U.S. and Japan under war plan ORANGE during the interwar years following the Great War. The plan called for a Germany first approach, placing secondary importance on the Pacific theater. The majority of the American public, as well as military leadership, was unaware of atomic tests conducted in the New Mexico desert and most still expected that the war with Japan could only come to end by a continuance of the island hopping strategy. Following the Casablanca and Quebec Conferences in 1943, the U.S. Joint Chiefs of Staff (JCS) recommended the "optimum strategy" for invading and defeating Japan.[58] The strategy implemented five working parts:

> ***1.)*** Application of full and unremitting pressure against Japan by strategic bombing and carrier raids to reduce war-making potential and morale in preparation for invasion.
> ***2.)*** Use air and naval forces to tighten the blockade, to include severing communication with Korea.

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[56] Action Report, Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 22 - June 30, 1945, p. 10, Geographic Files, RG 127.

[57] Michael Hoffman, "Okinawa: a long history of hardship," *Japan Times*, accessed on November 27, 2018, https://www.japantimes.co.jp/culture/2012/06/10/books/book-reviews/okinawa-a-long-history-of-hardship/#.XAcpzKhKizw.

[58] Richard B. Frank, *Downfall* (New York: Random House, 1999), 27-36.

3.) Limit contributory operations to only those essentially as prerequisites to invasion.
4.) Invade Japan at the earliest predictable date.
5.) Occupy such industrial areas as required to bring about unconditional surrender and to establish absolute military control.[59]

Much still had to be discussed surrounding the proposed strategy by the JCS, and some American strategists at the time, as well as a 1922 study, concluded that any invasion of Japan offered "almost no prospect for success."[60] However, by the Second World War and the invasion of Okinawa in April 1945, many members of the JCS saw Japan as the next likely target following the seizure of the Ryukyu islands.

It is not surprising that the U.S. adopted a grand strategy of annihilation for Japan. Russell Weigley, historian and writer of *The American Way of War: A History of United States Military Strategy and Policy*, asserts that the strategy of annihilation - destruction of the home front and enemy army - developed as the preferred and distinctly American way of war during Ulysses S. Grant's 1864 Overland Campaign.[61] For this military approach to work, the U.S. relied on powerful technology and overwhelming numbers. The JCS knew these factors were necessary if an invasion was to be successful because the casualty estimates for the invasion of Japan varied anywhere from 500,000 to one million.[62]

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[59] Frank, *Downfall*, 36.

[60] Frank, *Downfall*, 21.

[61] Russell F. Weigley, *The American Way of War: a History of United States Military Strategy and Policy* (New York: Macmillan, 1973), 313.

[62] D. M. Giangreco, "Casualty Projections for the U.S. Invasions of Japan, 1945-1946: Planning and Policy Implications," *The Journal of Military History* 61, no. 3 (1997): 541.

Nevertheless, the battle of Okinawa solidified the belief that Japan would be too costly to invade.

The plan for the invasion of mainland Japan remained when military planners settled on Okinawa. Similar to the overall Pacific strategy, annihilation was deployed on a micro level during Okinawa. Beginning in October, American bombardments forced Japanese soldiers to utilize their cave positions. The heaviest bombardment fell on October 10, 1944. Under the leadership of Admiral Raymond Spruance, Task Force 58 of the U.S. Fifth Fleet struck Okinawa one week after U.S. Admirals made the decision to select Okinawa as the best strategic objective before the proposed invasion of Japan. Fourteen hundred strikes dropped six hundred tons of bombs and fired thousands of rockets on Okinawa as an opening shot to the coming invasion.[63] Although the Japanese were well-guarded by the complex underground cave and tunnel systems, the attacks destroyed Japanese cargo ships carrying food supplies and necessary resources for the 32nd Army.

U.S. air assaults targeted cargo ships regularly. Historian, William Tsutsui's examination of environmental changes in wartime Japan detailed how between 1944 and 1945 Japanese petroleum supplies dwindled due to the restriction of its sea lanes and the acceleration of U.S. bombings. The loss of petroleum supplies forced the Japanese government to become more reliant on the environment and natural world for defense. For instance, the Yamato Battleship ran solely on "edible refined soybean oil" during its final mission to Okinawa on April 7, 1945.[64] The natural world was no longer the backdrop to battles, it was a weapon operating as either a living enemy or ally.

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[63] Weigley, *The American Way of War*, 88.

[64] William Tsutsui, "Landscapes in the Dark Valley: Toward an Environmental History of Wartime Japan," *Environmental History*, vol. 8, no. 2 (April 2003): 300.

Americans did not know much about Okinawa and according to U.S. intelligence, "the Ryukyus were among the world's least explored inhabited areas."[65] The island was scattered with small villages, patchwork fields, ridges, mountains, escarpments and rises that added to the beauty. One U.S. sailor aboard a battleship before the pre-invasion bombardment noted:

> "Rich green hills, rolling and irregular, alternately sunny and shaded, jut abruptly out of a calm deep blue sea...The air is warm and mild; the sun bright and refulgent...Think I'll advertise Travel Tours after the war. 'Russet, jade hillsides above azure water, neath crimson and gold of setting sun…' Oh What a setting!"[66]

Naive to the chaos it would inflict, American service members thought of the island as tantalizingly gorgeous. Ignorance became common while preparing for the invasion. U.S. planners knew of a large Japanese force located on Okinawa, but intelligence fell short in preparing for the island's turbulent weather.

In a document titled "Special Study of the Enemy Situation," U.S. Army officials stated, "rain is not heavy and does not last more than 3 or 4 days at maximum."[67] In fact, the month of May experienced long periods of rain, and the island received roughly sixty inches annually.[68] This error would prove deadly for countless American soldiers and Marines. U.S. planners also asserted that despite light rain being a non-issue, Okinawa experienced heavy storms that may plague the progress of advancing troops and supplies, as well as bombing

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[65] Feifer, *Tennozan*, 59.

[66] Feifer, *Tennozan*, 60

[67] D-2 Special Study of the Enemy Situation, Okinawa, May-June, p. 7, World War II Command Files Record Group 38, Records of the Office of the Chief of Naval Operations; National Archives Building, College Park, MD. (hereafter RG 38).

[68] "History of nursing activities on Okinawa," 3 May 1945-15 January 1946, Box 8, Folder 115, Papers of Catherine E. Breisacher, USAHEC.

and reconnaissance missions. The studies also acknowledged typhoons; however, the U.S. believed engineer units could drain roads and build strong bridges to withstand prevailing winds and rising waters. [69] In a similar planning study prior to the start of the campaign, strategists concluded that "operations can be best carried out in May and June...with the least likelihood of storms."[70] Clearly, the Americans had some knowledge of the Okinawa baiu weather patterns, however, they underestimated the baiu's force and prevalence during the months of May and June.

The construction of roads and the strategy to blast through the natural coral barriers and defenses created by the environment and the Japanese resonated as the preferred strategic approach for handling environmental difficulties brought on by weather and rough seas. In case of heavy rain, the XXIV Army Corps Engineer Plans outlined in February 1945 gave painstaking attention to each possible engineering difficulty which may be experienced during the amphibious landings and eventual inland combat. The report placed importance on securing roads for widening construction and also emphasized that "in all road construction, particular attention will be paid to drainage."[71] This was of pressing concern because if the Okinawa red soil mixes with large quantities of rain, the soil turns into a sticky, suction substance, making large movements of men and supplies taxing.[72] Additional planning also determined that Naval Underwater Demolition teams were necessary to destroy underwater

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[69] D-2 Special Study of the Enemy Situation, Okinawa, May-June, p. 8; World War II Command Files, RG 38.

[70] Okinawa Planning Study, p. 20; World War II Command Files, RG 38.

[71] United States Army 24th Corps, *XXIV Administrative order 10*, February-March 1945, pp.1-8, Box 80, Folder 13, USAHEC; XXIV Corps Engineer Plan, February 15, 1945, p. 7, Box 80, Folder 13, USAHEC.

[72] Kubotera Hideo, "The Factors and Assumed Mechanisms of the Hardening of Red Soils and Yellow Soils in Subtropical Okinawa Island, Japan," *Japan International Research Center for Agricultural Sciences* 40, no. 3 (2006): 199.

obstacles such as mines and coral reefs.[73] This would be a challenging task because the U.S. speculated that conditions in the East China Sea "may be difficult but not dangerous."[74]

As preparations for the invasion continued, so too did reconnaissance missions. Reconnaissance was fairly accurate minus errors in road locations and certain geographic positionings. U.S. forces saw the honeycombed defensive positions in the hills and ridges, and the various road networks that existed in both the north and south. Nevertheless, many of the reconnaissance photographs were classified as unhelpful according to the Aerial Photo Support System Study conducted between May 17 and June 22, 1945.[75] Based on another report by the Division of Plans and Policies by the Headquarters of Army Ground Forces, the two terrain models received by the Marine and Army Divisions were inadequate and "only good for broad orientations."[76]

During the Okinawa planning study, American strategists accounted for problems ranging from water supply needs to insect and plant-borne diseases. When analyzing the water sources located on the island, planners pointed out several unpolluted water well points from the Yontan Airfield, a mile north from the landing beaches on the west coast, to Naha, a large port city south of the landing beaches along the west coast. The report also found that the majority of water sources were located on the northern peninsula.[77] However, the

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[73] United States Army 24th Corps; Box 80, Folder 13, USAHEC.

[74] D-2 Special Study of the Enemy Situation, Okinawa, May-June, p. 7, World War II Command Files RG 38.

[75] Aerial Photo Support System Study, May 17-June 22, 1945, p. 12, Geographic Files, RG 127.

[76] Army Ground Forces Headquarters, Division of Plans and Policies, June 20, 1945, p. 4, Geographic Files, RG 127.

[77] Benis M. Frank, *Okinawa*, 5, 54; Okinawa Planning Study, p. 10, World War II Command Files, RG 38; Bohart, *Mosquitoes of Okinawa, 45.*

planners failed to take into account the possibility of polluting these water wells through intense naval, ground, and aerial bombardments. Undoubtedly, bombardments inflicted heavy casualties not only on the Japanese but also wildlife. Such extreme devastation to human, animal, and plant life caused immense amounts of pollution in water wells deemed safe for consumption. Luckily, U.S. forces changed their disposition on the water supplies after further study, deeming them polluted with large amounts of dysentery organisms.[78]

This change in stance certainly protected the health of countless U.S. personnel, but it did not totally immunize them from the sickness.[79] Solving this problem required units for combating insects, rodents, and parasitic enemies existing in bounty across the Pacific islands. The 214th Malaria Unit and various other pest or" sanitation squads" represent the clearest example of a U.S. effort to wage war on environmental enemies.[80] Rather than solely fight Japanese soldiers, they sanitized areas of contact including American military camps and Okinawa villages. The units tasked with these duties sprayed Dichlorodiphenyltrichloroethane (DDT) in order to protect America G.I.'s from mosquitoes, rodents, and flies carrying diseases such as malaria, dysentery, and Japanese B encephalitis. Sanitation squads also handed out malaria suppressants such as quinine and atabrine.[81]

American ground forces for the Okinawa campaign were placed under the umbrella of the U.S. Tenth Army commanded by General Simon Bolivar Buckner, Jr. They composed

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[78] U.S. Tenth Army, Tenth U.S. Army Ryukyus campaign intelligence monograph, 1945, Box 1, USAHEC.

[79] Okinawa Planning Study, p. 10-15; World War II Command Files, RG 38.

[80] *XXIV Administrative order 10*, February-March 1945, pp.1-8; Box 80, Folder 13, USAHEC; Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 25, 1945, p. 1, Geographic Files, RG 127.

[81] US Navy Medicine, "Malaria Control Units at Okinawa," accessed December 03, 2018. https://www.med.navy.mil/bumed/nmhistory/Pages/showcase/Innovations/Malaria/main.aspx.

task forces or task groups. Although other task groups and forces existed and participated in the invasion, such as Task Force 51 for minesweeping operations, this study directed its focus towards the main ground force units. One unit was Task Force 53, an assault force consisting of the 3rd Marine Amphibious Corps commanded by General Roy S. Geiger. It included the 1st and the 6th Marine Divisions. Within Task Force 55 was Major General John L. Hodges' XXIV Army Corps, comprised of the 7th and 96th Infantry Divisions. Also involved in the invasion were Task Groups 51.1, 51.2, and 51.3 led by the 77th Infantry Division, 2nd Marine Division and the 27th Infantry Division in the Floating Reserve Group.[82] In total, the Tenth Army housed 182, 821 personnel under its command.[83] The stage was set, and on April 1, 1945 these units began their approach into the unforgiving environment of Okinawa. The natural world and the Japanese army waited.

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American strategists chose the Hagushi beaches as the landing beaches for Love Day (L-Day), April 1, 1945. The beaches bordered the East China Sea on the western coast. In order to help with the landing process, the 2nd Marine Division conducted a false landing demonstration on the Minatoga beaches along the southeastern coastline. The shallow waters operated as a Japanese ally in the early stages of battle planning by making it relatively easy for the Japanese to plant large numbers of mines below the surface. Fortunately for the Americans, naval underwater demolition teams and Task Force 51 achieved relative success in clearing the landing zones of the anti-shipping mines. Overall, the landing day operations went extraordinarily well in comparison to past storm landings such as Tarawa. The

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[82] Frank, *Okinawa,* 26-27; Costello, *The Pacific War*, 554.

[83] Rottman, *Okinawa 1945: The Last Battle*, 40.

American forces and Admiral Richmond Kelly Turner, head of amphibious forces under Admiral Spruance, took pleasure in the weather conditions.[84] Cloudy to clear skies, no chance of rain and a moderate surf could not be more pristine weather for an amphibious operation, and H-Hour was set for 0830.

On March 26th, the 77th Division conducted the first phase, making their way ashore at Kerama Retto, a cluster of islands sixty miles west of the Okinawa mainland, to secure the island's anchorage for emergency repairs needed for the Fifth Fleet.[85] After this success, 1,300 transport vessels, warships, and assault divisions maneuvered in position, and Admiral Turner, head of the Task Force 51 and the northern attack force, gave the go ahead, "Land the landing force." (Map 1)[86] The Amtracs began the approach and hoped the protective shelling of heavy guns and aircraft-delivered bombs and rockets had loosened up Japanese beach defenses. U.S. intelligence predicted that landing resistance would inflict greater casualties than those witnessed on Iwo Jima, so many of the landing vessels required extra medical teams to support the wounded during the first phase. To their surprise, no force existed near the shoreline to resist the storm landings. Within the first hour the Tenth Army placed roughly 16,000 combat soldiers ashore but problems began to mount.[87]

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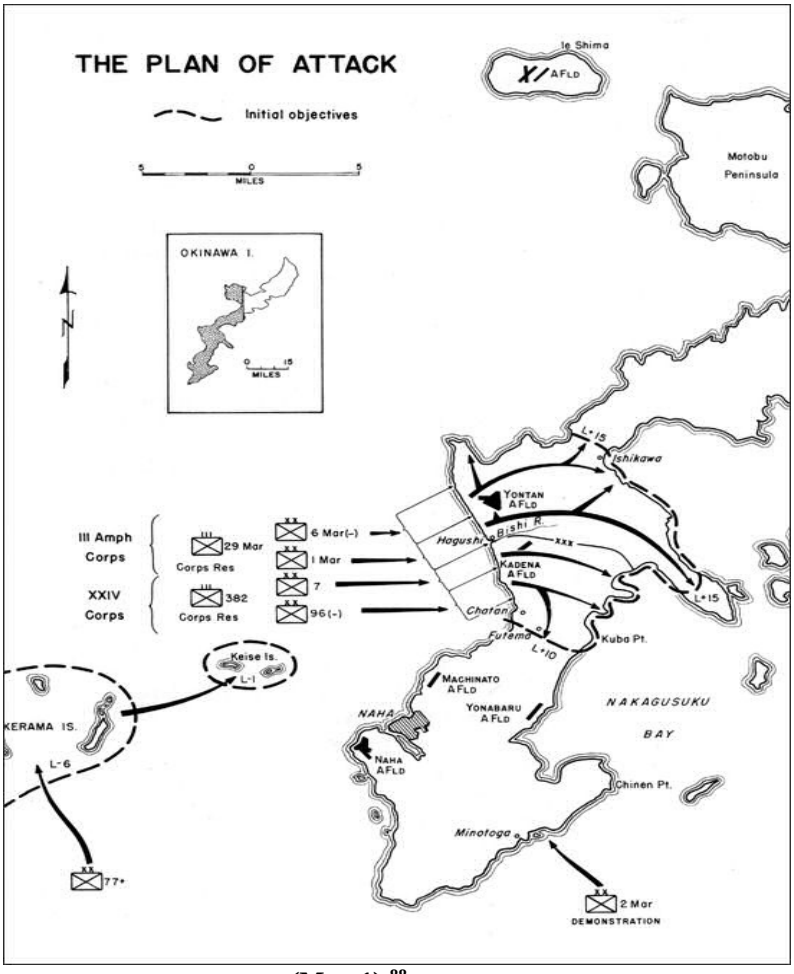
[84] Alexander, *Storm Landings,* 154.

[85] Frank, *Okinawa,* 45-46.

[86] Costello, *Pacific War,* 557.

[87] Alexander, *Storm Landings,* 156.



(Map 1) [88]

Countless Landing Vehicle Tracks (LVTs) became stranded during the storm landing phase despite successful landings in the first hour, accurate reconnaissance detailing the coral reefs protecting Okinawa, and reef destruction by Naval Underwater Demolition teams. Sherman tanks destined for the beachhead became stuck along with LVTs, and the men of the 3rd Battalion 1st Marines involuntarily spent the night of April 1 on their boats because the U.S. military could not muster additional LVTs for transfer operations. As the coral reefs picked off landing crafts, the Americans deliberated how to speed up a supply system made

[88] Frank, *Okinawa*, 22.

more sluggish by stranded troops.[89] A vast ocean was difficult enough to subdue, but adding coral to the mix merely prolonged the struggle of U.S. logistics.

Adding to the problems during the early morning landings, an estimated 700 Kamikaze ("Divine Wind") suicide planes launched an attack against the U.S. Fifth Fleet off the Okinawan coast. Struck by a Kamikaze, Admiral Spruance's flagship, the *Indianapolis,* limped into Kerama Retto for repairs.[90] The Kamikaze gained international fame during the Second World War, specifically during Okinawa; however, the origins trace back to the thirteenth century, and is strikingly environmental.

In 1274, as a massive Mongolian fleet under Kublai Khan approached the Japanese mainland, a typhoon emerged. The powerful winds forced the fleet off its course and ultimately destroyed it.[91] The Japanese never forgot this lesson and although pilots early in the war flew their planes into enemy warships as a last resort, the Okinawa campaign saw their enactment as a strategic weapon. Japanese military minds maintained awareness of their resource and supply problems. Realizing the difficulty of contending with the U.S. fleet and the necessity to use the environment as a weapon, Ushijima and his fellow officers, harking back to the story of the Kamikaze saving the mainland from Mongolian invaders, hoped the wind, or perhaps, mechanized wind, would once again bring them victory.

Kamikazes harassed the American fleet, but garnered no success in repelling the amphibious forces coming ashore. Early intelligence reported the honeycomb-like structures lining hillsides and roads prior to the invasion force landings, but the unoccupied honeycomb

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[89] Alexander, *Storm Landings*, 158.

[90] Costello, *Pacific War*, 558.

[91] Feifer, *Tennozan*, 79.

positions covering the shoreline left American forces wondering where the Japanese were.[92] Despite uncertainty about Japanese intentions, the U.S. forces began their push inland. Resistance started surprisingly light, and with April 1 being both April Fools and Easter Sunday, soldiers and marines felt unsure whether to view the light resistance as a joke or a heavenly blessing. Within the first hour, elements of the of the 6th Marines and 7th Infantry Division seized the Yontan and Kadena Airfields located half a mile from the landing beaches.[93] The early success energized American spirits and work quickly began on the airfields in order to make them operational for strategic bombings and reconnaissance.

Reconnaissance was an unsustainable practice during the early stages of the invasion and at this point in the year. A photo support and planning study conducted before and during the invasion found that recon and photo missions were best after June when cloudiness subsided. The consistent cloud cover during the months of April and May made pinpointing enemy targets "exceptionally difficult."[94] Once again, the environment operated as a natural Japanese ally; not only did they weaponize the landscape to use against U.S. forces, but they also received assistance from dense clouds. This may seem insignificant, but as U.S. bombardments ramped up as they approached closer to Shuri in May, cloud cover and visibility issues presented Japanese soldiers with moments of rest from constant ground and aerial assaults.

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[92] D-3 Journal: First Marine Division F.M.F, March 27-June 28, 1945, Geographic Files, RG 127.

[93] Feifer, *Tennozan*, 144-45.

[94] Okinawa Planning Study, p. 10-15, World War II Command Files, RG 38; Aerial Photo Support System Study, May 17-June 22, 1945, pp.3-5, Geographic Files, RG 127.

Once General Buckner saw that the landings were successful, he redirected his attention towards Phase II, the seizure of the Motobu Peninsula and Ie Shima to the north. The 1st and 6th Marine Divisions would move north, while the 7th Division would split Okinawa into two by driving to the east coast. The weather proved favorable at the onset and by April 2nd the 17th infantry of the 7th Division controlled high ground overlooking Nakagusuku Bay on the east coast. On April 3rd the XXIV Army Corps containing the 96th and elements of 7th Divisions wheeled to the south to begin their push towards Shuri, while the 1st and 6th Marines continued their push north toward the Katchin Peninsula in the northeast and Motobu in the northwest.[95]

Although Ushijima settled on the southern portion of the island as the main line of defense in his strategy, he ordered Colonel Takehido Udo and his force of twenty-five hundred men to defend the northern portion of the island stretching toward Motobu. This portion was of little significance to the overall plan, but it is important to note because Colonel Udo and his men utilized the Yanbaru Forest and the towering Yae-Dake Mountain in their defense.

U.S. troops advancing north moved through a region that made up two-thirds of the island's 70 miles. The terrain to the north was rugged and mountainous. A central ridge runs the length of this portion with terraces bordering along the east and west, dissected by large ravines.[96] The roads leading north were extremely poor and coupled with the dense pine forests and undergrowth, made logistics and troop movement difficult. The 1st Marines moved toward the Ishimmi-Kutoku and Chatan line, but their advance continued to slow as a

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[95] Appleman, *Okinawa: The Last Battle*, 76.

[96] Appleman, *Okinawa: The Last Battle*, 9.

result of scattered Japanese resistance and poor road networks. The 6th Marines met perhaps the fiercest resistance to the north as they moved against the Yontan-Zan foothills and the coastal town of Nagahama on April 2. This portion of the battlefield displayed a maze of crisscrossing primitive trails and caves lined with coral walls and steep gorges. Udo's defensive landscape marked the 6th Marines first major run-in with weaponized terrain, and the Japanese posted a tenacious defense by occupying the tops of ridges, caves, and burial tombs. The advance was futile and deadly against a hail storm of Japanese machine guns and Ni mortars. Nevertheless, the division gained "3,000 to 7,000" yards in its sector and by April 3, they were firmly situated at the base of the Ishikawa Isthmus, a narrow portion of the island's west coast leading to the northern tip.[97]

The 6th Marine arrival and subsequent takeover of the Ishikawa Isthmus was pleasant news to General Buckner and the Tenth Army. This placed American forces twelve days ahead of schedule and as a result, General Buckner ordered them to continue movements north without delay.[98] There were several reasons Buckner desired an immediate push to secure the Motobu Peninsula. First, the Americans began to come in contact with the Japanese's weaponized terrain. The faster they could secure the north, the faster they could move toward to the Shuri line in the south. Secondly, reports reached American Headquarters regarding Colonel Udo's plan to enlist native Okinawans to fight as guerrillas in the northern mountains and woodlands of Yanbaru. The dense pine forest became a haven for concealed Japanese machine gun emplacements. Often times, the gun emplacements were so well

[97] Carleton, 6th Mar Div. Hits, pp. 15-18; Tenth Army Actn Rpt, 7-III-3, Geographic Files, RG 127; Appleman. *Okinawa: The Last Battle*, 138; Frank, *Okinawa*, 59.

[98] Frank, *Okinawa*, 59.

hidden that they could not be noticed until direct contact was made and lives lost.[99] Lastly, General Buckner feared that the Japanese would conduct counter landings on the ports in northern Okinawa. If the campaign was to stay ahead or on schedule for a joint push south, the north had to be quickly secured.[100]

As the push inland continued, American forces noticed that the Japanese relied on night combat to conceal their movements and artillery fire, and attack America positions. William Manchester remembered that "the Nips were so skillful at infiltration, the rule had been established that after night had fallen, no Marine could leave his foxhole for any reason."[101] The night attacks spread paranoia through American ranks. Furthermore, the Habu snake was unknowingly adding to paranoia of infiltration. These poisonous vipers found themselves slipping into foxholes with soldiers and Marines, inflicting venomous bites and instigating sleepless nights.[102]

In attempts to solve these issues, the Marine Corps and U.S. Army used canines as guards and even scouts during day and night patrols. The United States Army and the Marine Corps began experimenting with the use of dogs in war early on. In 1942, the U.S. military began a secret program known as "the Cat Island program." The unfounded belief that the Japanese, whether by diet or racial characteristics, had an odor dogs could pick up served as

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[99] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1, Geographic Files, RG 127.

[100] Appleman. *Okinawa : The Last Battle,* 138.

[101] Manchester, *Goodbye Darkness,* 358.

[102] Feifer, *Tennozan*, 332.

the foundation for this program. The operation failed to produce the desired results and eventually the U.S. military shut it down.[103]

Despite the failed "Cat Island program," by 1943, the 1st Marine War Dog Platoon became an active force in the Pacific. The platoon averaged 36 dogs and 55 handlers, and Lieutenant Clyde A. Henderson, a former school teacher and dog trainer, led this platoon. The platoon witnessed fierce combat on Bougainville, Guam, Saipan, Peleliu, Iwo Jima and Okinawa. Lt. Henderson, so impressed by the dogs' performance, referred to them as "living radar." Based on a study conducted by the University of Tennessee's College of Veterinary Medicine, "The dogs used signals to alert the soldiers of Japanese presence as they were trained not to bark. The dogs could detect a human scent up to one-half mile away. During the war, the Japanese ambushed none of the War Dog platoons."[104] The dogs protected their handlers and fellow marines, but they also fell victim to the horrors of war. Some dogs, like their human counterparts, experienced shell shock and even combat fatigue. One dog, "Ruff," maintained a superb record with the 2nd Marine Raider Regiment, but after several combat experiences the military deemed him "unsatisfactory for combat...due to a nervous condition from shell fire."[105]

Often times, historians are strictly concerned with the human drama unfolding within the historical narrative. But animals, like the natural world, are not outside history. As seen

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[103] Seth Paltzer, "The Dogs of War: The U.S. Army's Use of Canines in WWII," National Museum of the United States Army, June 2, 2016, accessed on November 7, 2018, https://armyhistory.org/the-dogs-of-war-the-u-s-armys-use-of-canines-in-wwii/.

[104] Dana Prince, "War Dog Background," UT College of Veterinary Medicine, accessed on November 7, 2018, https://vetmed.tennessee.edu/home/Pages/war_dog_background.aspx.

[105] M.C. Lang, "Let the Records Bark!," Personal Stories of Some Special Marines in World War II, December 15, 2017, accessed on November 7, 2018, https://www.archives.gov/publications/prologue/2011/winter/marine-dogs.html.

through the First Marine War Dog Platoon, animals act against and with humans in various forms, including warfare. Dogs fought and dogs died, and their use reminds scholars that the Second World War was a total war, requiring the deployment of all possible resources.

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The Japanese mastered the natural world and in turn allowed the terrain and foliage to work as not merely a weapon but as an invisible cloak of protection from enemy detection and fire. While surveying caves around the centrally located Kadena Airfield, the Tenth Army Campaign Intelligence Monograph observed that many of the prepared cave positions "were so well defiladed" that it was nearly impossible to deliver accurate fire to destroy the position.[106] Another U.S. army report on Japanese combat methods detailed that the machine gun emplacements were at such distance and so well-concealed that it was difficult to locate their position for the purpose of neutralizing the target position.[107]

In the north, on the Motobu Peninsula, Japanese defenders capitalized on the lush evergreen forest underbrush. The soldiers were so well-disciplined that "they would lay in wait, weapons zeroed in on trail opening."[108] Even in the lowlands further south, near the center of the island, the U.S. planning study of Okinawa discovered that the "tall grasses near rivers or lowlands" were utilized for concealed gun emplacements. The study also noted that clearing and approaching these conditions were grueling not only because enemy fire but because the tall grasses "are generally infested with typhus bearing mites."[109]

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[106] U.S. Tenth Army, Tenth U.S. Army Ryukyus campaign intelligence monograph, 1945, Box 1, USAHEC.

[107] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1, Geographic Files, RG 127.

[108] Okinawa Planning Study, p. 15, World War II Command Files, RG 38.

[109] Frank, *Okinawa*, 61.

To make matters worse, the April rains came approximately two weeks after L-Day and further bogged down movements in the north and south. Since the supply logistics were already slow in the north due to poor roads, the rain made it worse. Drainage became a primary concern for American engineers.[110] The rain affected U.S. forces marching or sprinting against enemy fire from the ridges and heights. The red, clay-like dirt on Okinawa worked as a suction cup as men trudged through it. Eugene Sledge wrote that movements in the mud was "physically exhausting and utterly exasperating."[111] Catherine Breisacher, a nurse on Okinawa recounted that "Everyone on Okinawa was certain that there was no more sticky, clinging, treacherous mud in the world."[112] The mud also created difficulties for tanks and vehicles. William Manchester described how "muck was waist-deep. Jeeps, artillery pieces, even bulldozers...sank in it."[113] With tanks becoming either slowed or stuck in mud, U.S. forces relied increasingly on tractors or amtracs to move troops and supplies, however, they too became mired on occasion.[114]

The rain made movements nerve-racking. Yae-Dake Mountain became the 1500 foot Japanese fallback position in the north. The mountain served as a formidable foe with its equally formidable ally - the 32nd Army - residing on the peak and ridges. The sheer scale of the cliffs forced marines to endure relentless enemy fire and deadly instability on the cliff

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[110] Action Report, Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 22 - June 30, 1945, p. 4, Geographic Files, RG 127.

[111] Sledge, *With the Old Breed*, 233.

[112] "History of nursing activities on Okinawa," 3 May 1945-15 January 1946, Box 8, Folder 115, Papers of Catherine E. Breisacher, p. 2, USAHEC.

[113] Manchester, *Goodbye Darkness*, 361.

[114] Manchester, *Goodbye Darkness*, 361.

walls. Naval guns bombarded the mountain to loosen up the defenses before U.S. assaults. The shelling, grossly ineffective, failed to destroy the well-tunneled positions and their Japanese allies. The traditional American approach of blunt, superior force failed thus far on Okinawa. Despite its inability to destroy the terrain protecting the Japanese, General Buckner remained unwavering in his belief in the Grantian approach to warfare. Hence, what followed became four days of intense close quarter, hand to hand combat on the mountain's peak.[115] Consequently, much of the Okinawa campaign became characterized with World War I-style frontal assaults against an enemy protected by dominating terrain features.[116] As the fighting continued at Yae-Dake, Japanese counter-attacks emerging from underground and unseen positions wreaked havoc, confusion, and psychological trauma on Marines fighting to secure the objective. Finally, the Yae-Dake Mountain fell to American control on April 16, and U.S. forces declared northern Okinawa secure by April 20.

Even prior to the fall of Yae-Dake, the Americans began preparing the 77th Division for an early seizure of Ie Shima. When news broke on April 17 that Yae-Dake was secure, Admiral Turner gave the order to attack Ie Shima, the oval shaped, island northwest of the Hagushi Beaches. The reason for occupying Ie Shima was two-fold. First, the Japanese garrison on the island presented a security concern for U.S. forces, as they could travel across the East China Sea for a counter invasion of northern Okinawa. Second, the island was a great location for airfield development, a reality that did not escape the Japanese because they already created three airstrips a mile in length on Ie Shima.[117]

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[115] George Feifer, *Battle of Okinawa: The Blood and the Bomb* (Guilford, CT.: Globe Pequot Press, 2011), 120.

[116] Feifer, *Battle of Okinawa,* 359.

[117] Frank, *Okinawa*, 68-69.

Ie Shima is three and one-half miles off the coast of Okinawa and about five miles long and two miles wide. Similar to Okinawa, coral reefs form a defensive barrier around the island. The land rises with steep, mountainous cliffs containing numerous caves along the north and northwest coasts. The majority of the terrain is composed of a 165-foot plateau that is broken in the east by the Iegusugu Yama Mountain. The region of the island broken by the mountain reaches 600 feet above level ground and is appropriately named "the Pinnacle." The Japanese wanted to make the southeastern portions near the town of Ie and the Pinnacle appear as the most suitable area for landing a large force. The beaches on the southeast coast designated as "Red 3 and 4" appeared to be the safest for landing large equipment, but luckily U.S. reconnaissance successfully ascertained information that the Japanese built concealed installations for the purpose of continuing their "trapping" plan of luring enemy soldiers into kill zones unknowingly.[118]

The ruse to lure the Americans into the southeastern zone failed, and the 77th Division moved to attack the southwest beaches. The Preliminary bombardments began on the morning of April 16 at 0725. The 77th met no resistance on the beach, but by afternoon Japanese rear guard units in concealed caves and tombs contested every inch of ground the 77th Division attempted to take. Movements became sluggish for six days as the 77th Division pushed towards the main defense at the Iegusugu Yama Mountain. The terrain surrounding the mountain on Ie Shima was a maze of hidden fire positions. The American approach was flanked by enemy gun emplacements the whole way to the peak of Iegusugu Yama.[119] The top of the mountain earned the name "Government house" due to its

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[118] Appleman. *Okinawa: The Last Battle,* 149-152.

[119] Frank, *Okinawa*, 70.

impregnable appearance, and its steep rise received the name "Bloody Ridge."[120] The attempts to seize these positions turned, in most cases, into hand-to-hand combat because the weaponized terrain brought American forced face-to-face with Japanese in camouflage positions. Despite the grim outlook many had about seizing the final bastion of Japanese resistance on Ie Shima, the 77th Division declared the island secure on April 21, one day after the seizure of Motobu.[121] The Marine and Army experience in the north and on Ie Shima taught the Americans that the weaponized terrain and natural world was not their ally. It also foreshadowed the hell to come in the south.[122]

[120] Frank, *Okinawa*, 70.

[121] John D. Flemming Papers, "Ie Shima Diary," p. 3, Box 34, Folder 4, USAHEC.

[122] Feifer, *Tennozan*, 158-162.

II

The South: Into the Abyss

When first seeing veteran combat Marines on Guadalcanal, Norris Buchter, a young Marine from Connecticut noted: "They were jungle animals, nothing we could relate to...dirty and really tough and probably on the verge of going wacky from battle fatigue...they belonged to another world."[1] After six weeks on Okinawa, Buchter remembered a replacement Marine making the same observation of his group. The realization that combat eroded him to an animal state caused him to reflect and conclude that "it's from living on the edge too long, living in the ground all the time...not just like an animal but a haunted animal. You do what you have to but you've seen so much awfulness and horror, it's just a different life, indescribable."[2] Erosion of a human's civilized identity is a common occurrence in combat, and Buchter is only one example of the reality experienced on Okinawa.

The Chief of Staff of the 32nd Army, Isamu Cho, pressed the Army to complete an "effective complex of fortification."[3] Southern Okinawa served as General Ushijima's main line of defense. After the fall of the northern region, General Buckner and the Tenth Army turned their focus to crushing the southern defenses. Ordered to move forward for support, elements of the 1st and 6th Marine Divisions from the north joined the XXIV Corps for an all-out push towards the southern coast. The combat that followed in the southern advance witnessed one of the fiercest militarized defenses of the war.

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[1] Feifer, *Tennozan*, 286.

[2] Feifer, *Tennozan*, 286.

[3] Feifer, *Tennozan*, 102.

The natural world, for the most part, operated as an ally to the Japanese during combat, but the alterations to geography created a plethora of issues for the 32nd Army. Supplies became an increasing concern as American bombers destroyed Japanese cargo ships in the months leading up to the invasion. With minimal resources and the imperative need to reinforce the coral and limestone-lined caves and tombs with concrete, the Japanese military enforced extreme rationing. This rationing included a reduction in water usage, which only added to the physical and mental deterioration of the Japanese forces. Japanese culture placed immense importance on cleanliness, but dehydration, mixed with hygiene deficiencies, caused an outbreak of skin diseases and bacterial infections.[4] A Japanese soldier later lamented, "We couldn't wash our dishes, our clothes, even our hands after relieving ourselves."[5] Although the specific condition of itchy skin plaguing the 32nd Army is unknown, the symptoms of dark, red, and inflamed portions of the body make it likely that the men had contracted a form Dermatitis. The disease was common to the island and known to cause inflamed and irritated skin.[6] The Japanese had resided in the damp caves of Okinawa since October. These caves also served as hatcheries for bacillus, tuberculosis, and various other illnesses. As a result of rationing, the 32nd increasingly became susceptible to disease.[7]

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[4] Feifer, *Tennozan*, 103.

[5] Feifer, *Tennozan*, 103.

[6] The Medical Department, United States Army, *Preventive Medicine In World War II (Office Of The Surgeon General, Department Of The Army, Washington, D.C., 1963)* accessed on November 29, 2018, https://history.amedd.army.mil/booksdocs/wwii/internalmedicinevolIII/chapter20.htm

[7] Feifer, *Tennozan*, 185.

U.S. air raids targeted Japanese merchant ships carrying food, water, ammunition, and additional military supplies. As this strategic air campaign continued in the months leading up to the Okinawa invasion, food and water consumption dwindled. The lack of food merely added strain to the immune systems of the Japanese soldiers, weakening their bodies as they tried to fight off multiple infections.[8] Meager rations meant Japanese soldiers scavenged the Okinawa terrain for mulberry and radish leaves, but the main ration served was a thin oily soup filled with pork fat and squash. The rationing left 32nd Army soldiers with little to eat, and the oily pork fat and squash soup was more waste than food. In fact, many soldiers refused to eat the soup. One Japanese artilleryman recalled: "Why so much waste? [From the tossed-out soup] Because soldiers couldn't bear their hunger and secretly bought tapioca buns and steamed sweet potatoes from civilians."[9] Unfortunately, the Okinawa sweet potato contained Salmonella Typhi, the bacterial cause of typhoid. Lewis Thomas, an acclaimed American physician, noted in 1945, while with a Naval Research Unit: "Okinawa's earth was made of sweet potatoes. Everywhere we dug was cultivated, also generously fertilized with topsoil - a rich source, we later discovered, of typhoid and paratyphoid bacilli."[10] This spread to unknown numbers of Japanese troops within the caves, leading to a high fever, headache, stomach pains, vomiting, and diarrhea.

Sickness and disease grew of more pressing concern when the American bombing campaign increased over the island, depleting 32nd Army access to clean water wells and natural resources. The soldiers in the 32nd Army increasingly became isolated, and the caves

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[8] Feifer, *Tennozan,* 88-89.

[9] Feifer, *Tennozan,* 104.

[10] Lewis Thomas, *The Youngest Science: Notes of a Medicine-Watcher* (New York: Viking Press, 1983), 94.

and tombs in which they lived and breathed undoubtedly filled with the stench of rotting food, excrement, and death. American naval, air and artillery activity during the day restricted Japanese movements to nighttime when they secured the protection of darkness. Many soldiers resorted to drinking dirty water, leading to a rise in disease among Japanese ranks - mainly amoebic dysentery.[11]

The Japanese officers stressed to their soldiers how to live off the land because they lacked sufficient supplies to maintain a well-funded military effort. However, the U.S. strategic bombing campaign over Okinawa that began in October 1944 laid waste to the natural world which supplied the 32nd Army. These preliminary air operations continued until April 1945. Even when supplies could be gathered, some food sources carried diseases, and the relentless bombing and combat eroded the cognitive abilities of each solder as they faced pervasive sleeplessness. A study by the Committee on Military Nutrition Research concluded that "Sleep deprivation impairs alertness, cognitive performance, and mood. The ability to do useful mental work declines by 25 percent for every successive 24 hr. that an individual is awake."[12] Since the Japanese forces had been living on the island with few supplies and little sleep since October 1944, their mental and physical abilities continued to rapidly deteriorate.

U.S. strategic bombing also contaminated wells with dead animals and humans. Data from a U.S. planning report claimed: "all water should be considered polluted." Further studies by the Tenth Army following the Okinawa campaign likewise revealed that the

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[11] Feifer, *Tennozan*, 184-85.

[12] Bernadette M. Marriott, and Institute of Medicine (U.S.), *Food Components to Enhance Performance: An Evaluation of Potential Performance-Enhancing Food Components for Operational Rations* (Washington D.C.: National Academies Press, 1994), 128.

Japanese used the "simplest treatments" before drinking water and in some cases "untreated water was used" by certain units.[13] Drinking untreated water exposed soldiers to amoebic dysentery. Additionally, chemicals from U.S. bombs such as napalm destroyed plants that could be used for human consumption, and the cold and wet conditions within the caves and tombs caused molding of food and misery for the combatants they housed.[14]

The crippling environmental conditions caused a shift in Japanese strategy. By May 1945, they abandoned their defensive strategy and went on the offensive. The lack of water was a major reason. Soldiers lamented that they could no longer swallow food, and others became sick from drinking polluted water. Historian George Feifer pinpointed how forced scavenging of mulberry leaves for consumption in rice made it "hard to swallow and stuck in men's throats," and this only worsened as access to food and clean water supplies dissipated throughout the 82-day battle.[15] One 32nd Army soldier complained, "we were on the verge of losing our sanity from suffering inside" and underground like animals.[16] Weaponizing the landscape added benefits to the defending force, but it also brought hardships. The environment constantly participated in ecological warfare against Japanese soldiers attempting to manipulate the natural world in their favor.

The prolonged suffering brought on by the Okinawa campaign also leads to the consideration that the uptick in Kamikazes and other suicide tactics were possibly resource

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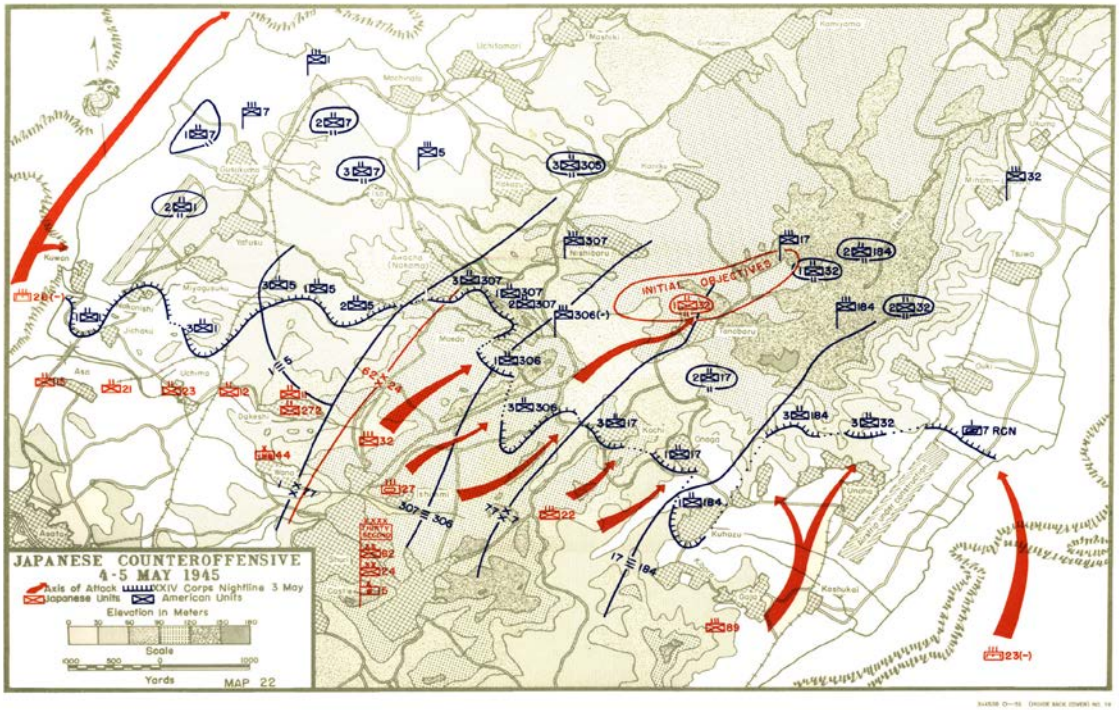
[13] U.S. Tenth Army, Tenth U.S. Army Ryukyus campaign intelligence monograph, 1945, Box 1, USAHEC.

[14] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1, Geographic Files, RG 127; Okinawa Planning Study, p. 15, World War II Command Files, RG 38.

[15] Feiffer, *Tennozan*, 103.

[16] Feiffer, *Tennozan*, 370-71.

related. As Captain Tadashi Kojo of the Japanese 24th Division reflected on life in the caves and underground during the onset of May combat operations, he believed that "three more years in their dungeon seemed worse than the mass slaughter they would face when sent on an all-out assault."[17] This sentiment did not go unnoticed by the 32nd Army headquarters. Irritated by his army's physical condition, General Cho convinced Ushijima to begin an offensive. The kamikazes emerged in droves as part of a coordinated attack on May 4-5 and was supported by a 1,000 man counter attack and landing operation on the east and west coast (Map 2).



(Map 2)[18]

The attack was set to begin at 0500 on May 4. The Japanese 89th Regiment assaulted the east coast hoping to surprise the U.S. 7th Division and secure the Minami-Uebaru

[17] Feiffer, *Tennozan*, 365.

[18] Major Chas. S. Nichols Jr. USMC, Henry I. Shaw Jr., *Marines In World War II - Okinawa: Victory In The Pacific* (United States: Pickle Partners Publishing, 2014), 143.

foothills, several miles northeast of Shuri. From there, the 89th Regiment was to move west to seize an east-west line at Tanabaru within the Nishihara district. Providing fire support to the 89th's attack was the 22nd Regiment located at the center of the Shuri line near Kochi and Onaga. Once the 89th successfully gained the 1st phase objective, the 22nd moved out behind the 32nd Regiment, toward the forward center portion of the Shuri line to support the main effort of the 24th Division. If all went according to plan, the 32nd Army would overwhelm the 77th Infantry Division and its positions southeast of Maeda, eventually capturing the commanding heights west of Tanabaru.[19]

The Americans anticipated an attack on May 3 due to increased Japanese fire directed at the 7th and 77th Divisions.[20] The failure to maintain deception forced the counter-attack to disintegrate into mass "banzai charges." A Japanese survivor remembered that "The 'all-out' offensive evaporated like a brief dream."[21] The failed attack left the 24th Infantry Division of the 32nd Army depleted in manpower--forcing Ushijima to return to his defensive war of attrition. The Japanese believed the casualty ratio would be 1 to 1 in the assault. The final result was a 5 to 1 casualty ratio, and the assaults concluded with an estimated two thousand Japanese casualties compared to 379 for the Americans.[22]

The environmental conditions, as much as the warrior culture, led to this suicidal nature of combat. Men became animals when living in an environment surrounded by death,

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[19] Frank, *Okinawa*, 96.

[20] Frank, *Okinawa*, 99.

[21] Feifer, *Tennozan*, 376.

[22] G-2 Report - Headquarters Tenth Army, p. 1, April - May 1945, Geographic Files, RG 127; Feifer, *Tennozan*, 365-76; Appleman. *Okinawa: The Last Battle*, 302.

disease, starvation, dehydration, and sleeplessness. U.S. Marine Eugene Sledge described how men lost themselves in an environment of absolute attrition and depravity. Sledge stated that combat "eroded the veneer of civilization and made savages of us all."[23] The natural world conducted itself as both a natural enemy and ally to the Japanese; and the United States learned the same lesson during its fight.

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The U.S. Army began its drive to the south immediately following the landings, but the main thrust would not take place until the U.S. declared the north secure. The advance slowed by April 7 when the 96th Division started their engagement against Kakazu Ridge along the central point of the southern line, 9.8 kilometers in front of Shuri Castle (Map 3). The primary push towards the ridge gained headway on April 8-9 in the midst of torrential rain storms. The slow and tedious advance increased the likelihood of sustaining heavy casualties.[24] By April 8th, the Americans suffered 1,510 battle casualties and accounted for 4,489 Japanese killed and 13 captured.[25] Forward movements against Kakazu fed into the Japanese military strategy of "trapping." By using the terrain and weather as a weapon, Ushijima claimed that they could "lure the enemy into a condition of immobility and surround him."[26] This proved particularly useful in halting tank operations and flamethrowers from successfully destroying cave positions. The advance of U.S. forces continued at a slow pace and by mid-April, it became apparent that a maximum effort was

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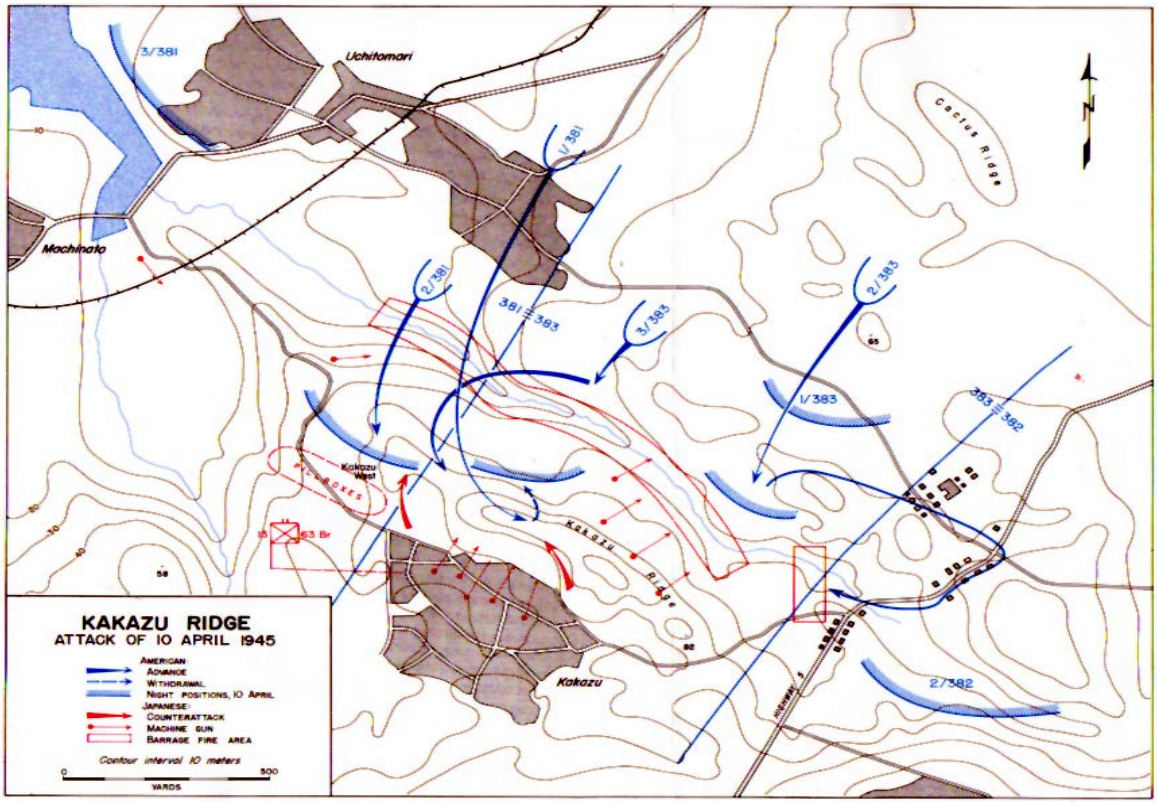
[23] Sledge, *With the Old Breed*, 121.

[24] D-2 Special Study of the Enemy Situation, Okinawa, May-June, p. 8, World War II Command Files RG 38.

[25] Appleman, *Okinawa: The Last Battle*, 113.

[26] 32nd Army Battle Instruction No. 2, February 15, 1945, p.2, Geographic Files, RG 127.

needed by the XXIV Corps and Marine Divisions if the U.S. was to break the Japanese defensive line. The effort needed for the breakthrough required a "two corps" assault by Marine Divisions on the right, and the XXIV Corps on the left.[27]



(Map 3)[28]

The Japanese positions to the south gave them a direct line of sight on Tenth Army movements. By April 19th, assaults against Kakazu Ridge continued not from the 96th Division but the 27th infantry division after the 96th suffered the bulk of American casualties during the Kakazu assaults. A bombardment by American artillery, air, and naval support preceded the first attack waves. The Americans hoped to open a pathway through the use of superior firepower. Nevertheless, the Japanese defenders hid safely from the heavy

[27] Frank, *Okinawa,* 88.

[28] Appleman, *Okinawa: The Last Battle,* "Map X: Kakazu Ridge Attack of 10 April 1945," 119.

bombardment in limestone caves. Similar to the previous attacks, the Japanese positioning of machine guns, anti-tank guns, and anti-aircraft guns on the frontal and reverse slopes prevented troop movement along the Ginowan-Shuri road, a route the 27th Division attempted to utilize to bypass the ridge. The 27th employed tanks for infantry support for bypass maneuvers, but the commanding terrain of Kakazu left the tanks exposed. Technology was no match against the weaponized landscape and skilled defenders. The end result left 22 out of the 30 Sherman Tanks destroyed. The attacks continued until April 24, gaining only a few yards and sustaining heavy losses.[29]

In the meantime, General Buckner repositioned his forces to continue the campaign southward. On April 21 the 1st Marine Division found themselves placed in resting reserve following successful operations to the north and along the Katchin Peninsula. One week later, General Buckner called for a "two-corps" frontal assault against Shuri. The 1st Marines relieved the 27th Infantry Division, placing them in reserve to take the position of the 6th Marines in the north. The 77th Division, which participated in the seizure of Ie Shima off the western coast of Okinawa, moved from Ie Shima to mainland Okinawa in order to replace and reinforce the center of the line held by the battle-worn 96th Division.[30] By the beginning of May, the American line would extend across the entire central portion of the island from Kuhazu in the east, to Kuwan in the west.

A 2nd Marine Journal during the month of April and May highlights the difficulty of conducting the frontal assaults General Buckner ordered. One marine from the 2nd Marine Division recalled, "everywhere on the line in Southern Okinawa the Army advanced with the

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[29] Frank, *Okinawa,* 86.

[30] Frank, *Okinawa,* 85-90.

support of the heavy field artillery, naval gunfire, and air bombardment. Enemy resistance continues to be very bitter."[31] Ideas of conducting a second landing on the east coast for the purpose of relieving pressures on the "two corps" frontal assaults circulated around the Tenth Army HQ, but General Buckner stuck with his initial assault plans.

The mutually supported and well-concealed 32nd Army caves, tombs, pillboxes, and emplacements made life miserable for attacking forces. To make matters worse, as May arrived and the 1st Marines continued their movements across the Asa Kawa River, rain and fog picked up, limiting visibility. The Japanese only began firing on U.S. Marines as they were crossing the river. The Japanese defenders knew that this was when U.S. forces were most vulnerable. Marine platoon leader, Paul Dunfrey recalled the situation as "sheer hell."[32]

As the baiu rains covered Okinawa with storms, the U.S. 9th General Hospital documented that "average rainfall on Okinawa is sixty inches and a great deal of it fell in May."[33] Poor weather and dominating hills to the south characterized the daily combat for American forces. The rainfall picked up and hampered the initial assaults led by the 1st Marines against the well-guarded Dakeshi Ridge and the Wana Ridge, roughly 2.1 kilometers northwest of Shuri Castle. These positions were strategically located to the south of the Awacha pocket, and U.S. forces believed it held the strongest and most well-fortified Japanese defenses. Air, artillery, and rocket bombardment did little to ease the Japanese threat awaiting the approaching marines. The dense rain, scarred earth from the intense

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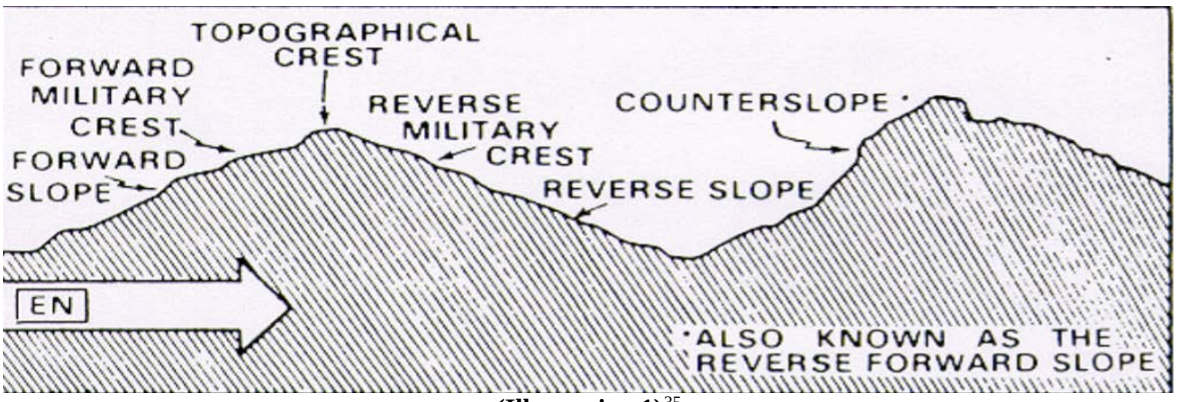
[31] 2nd Marine Journal, April 29, 1945 - June 22, 1945, Geographic Files, RG 127.

[32] Feifer, *Tennozan*, 231.

[33] "History of nursing activities on Okinawa," 3 May 1945-15 January 1946, Box 8, Folder 115, Papers of Catherine E. Breisacher, USAHEC.

bombardment, and man-made weaponized landscape of the 32nd Army halted the attack in its tracks.[34]



(Illustration 1)[35]

The southern operation continued on May 8 at noon with the 7th Marine Regiment. The regiment had a respected reputation prior to Okinawa. Medal of Honor recipient John Basilone and Marine legend Chesty Puller served with the 7th during their time on Guadalcanal. Their experience on Guadalcanal, New Guinea, New Britain, and Peleliu made them a battle-hardened and reliable regiment to lead the May 8 assaults against Dakeshi and eventually Wana. Colonel Edward W. Snedeker of the 7th Marines remembered Dakeshi and Wana Ridge as “our most difficult mission." The reason for the difficulty was the intricate reverse slope positions (Illustration 1). This defensive approach allowed Japanese defenders to slip to their rear and counter positions on hills for a successful counter strike against the approaching U.S. forces.[36]

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[34] U.S. Army Report: Jap Combat Methods on Okinawa, p. 1; Geographic Files, RG 127.

[35] Dr. David Rogers, “Japanese Defenses and Fortifications Tarawa, Iwo Jima and Okinawa 1943 - 1945,” University of Missouri-Rolla, accessed on January 3, 2019, https://web.mst.edu/~rogersda/umrcourses/ge]342/Japanese%20Island%20Defenses%201943-45.pdf.

[36] Joseph Alexander, “The Final Campaign: Marines in the Victory on Okinawa,” Marines in World War II Commemorative Series 1996, accessed on December 6, 2018, https://www.nps.gov/parkhistory/online_books/npswapa/extcontent/usmc/pcn-190-003135-00/sec5a.htm.

During the 7th's attempt, they employed what General Buckner referred to as "blowtorch and corkscrew" (Map 4).[37] This tactic required a marine donning a flamethrower (blowtorch) to shoot a liquid flame into the cave, while another marine tossed explosives (corkscrew) into the cave causing it to collapse - either exploding, crushing, or burning the enemy alive.[38] The tactic seemed promising, but it required a soldier to reach a well-defended position while carrying a flamethrower with a tank of explosive gasoline on his back. Additionally, the red-clay of Okinawa served either as a slippery slide or suction cup for attacking troops. The "rugged and jagged" terrain on Dakeshi Ridge and the thick mud around the Wana Draw offered little prospect of establishing suitable footing for soldiers or marines operating the flamethrower.[39] Marine Major Chas S. Nichols, Jr. and Henry I. Shaw, Jr. highlighted in their research on Marines on Okinawa that "the floor of every draw and gulley became a sticky morass of knee - and thigh - deep mud while the precipitous slopes of the hills and ridges, treacherous footing under the best conditions, were virtually unassailable."[40]

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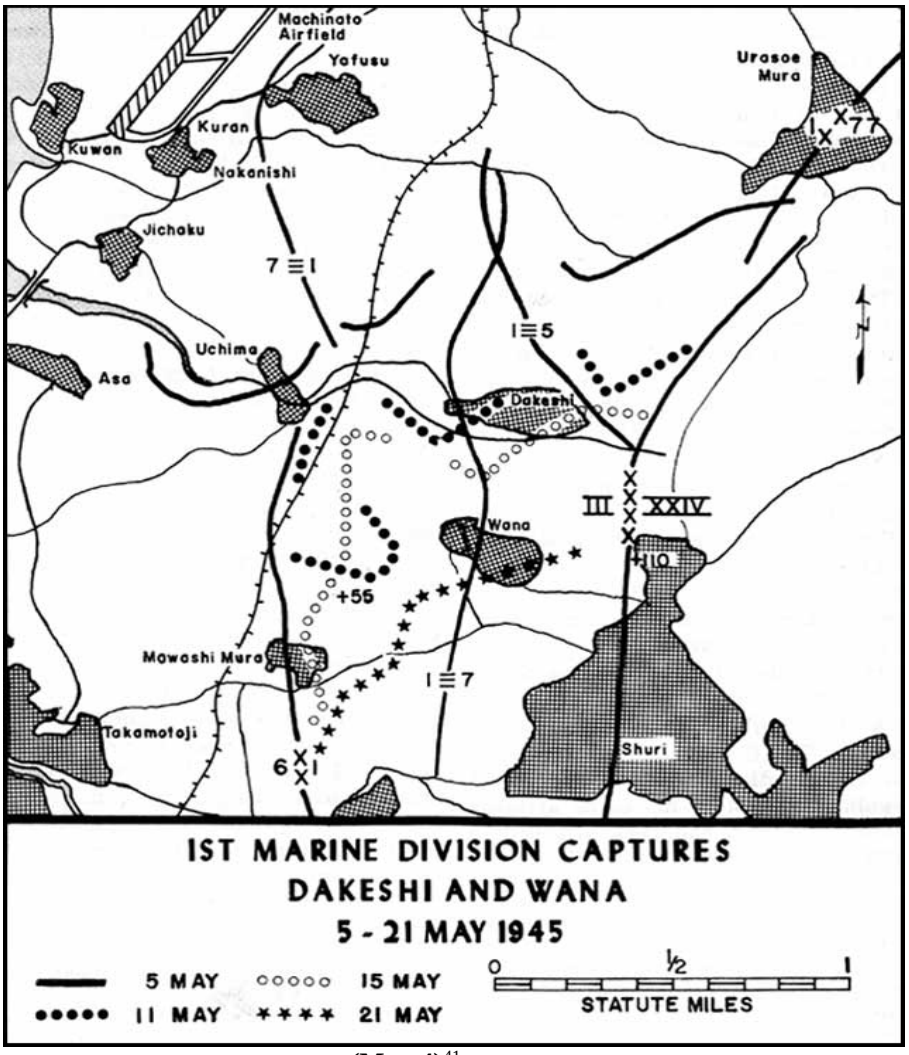
[37] Frank, *Okinawa*, 104.

[38] Appleman, *Okinawa: The Last Battle*, 256.

[39] Sledge, *With The Old Breed*, 235.

[40] Nichols Jr., Shaw Jr., *Marines In World War II*, 197-98.



(Map 4)[41]

An Army Ground Forces HQ report reinforced the difficulty of the "blowtorch and corkscrew" tactic. In their assessment, "portable flamethrowers were of no use to clean out deep caves and tunnels."[42] Stable footing was nearly impossible to come by on ridges like Dakeshi, scarred with tree stumps, unstable rubble, mud, and mutually supporting fire. The Okinawa practice of terrace farming also made the approach difficult. The mass U.S.

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[41] Benis M. Frank and Henry I. Shaw Jr., V*ictory and Occupation: U.S. Marine Corps Operations in World War II* (Washington, D.C.: Historical Branch, G-3 Division, Headquarters, U.S. Marine Corps, 1968), 215.

[42] HQ Army Ground Forces, May 1, 1945, p. 38, Geographic Files, RG 127.

bombardment and baiu rains only served to scar and morph the Okinawan landscape into a quagmire of mud. The reverse slopes and numerous escape routes to the rear of ridges and hills added to the difficulty of neutralizing that cave's defenders.[43] The battlefield landscape did not easily yield ground to American troops and it continued to operate more as an active enemy combatant rather than a backdrop of the battle.

The final push to drive out the last of the Japanese defenders on Dakeshi Ridge began on May 11. Front-line riflemen led the assault. The 2nd battalion attacked the western edge and the 1st Battalion attacked the east. The 1st Battalion launched their attack with tank-infantry teams along the eastern slope, reaching the ridge by late afternoon despite confronting relentless enemy fire. The 2nd Battalion experienced intense fire from Wana Ridge to the south as they moved up Dakeshi Ridge. The artillery, machine gun, and rifle fire were so horrendous from both Dakeshi and Wana that the 2nd Battalion assault was called off. During the assault, sergeant Neil Van Riper of the 1st Marines recalled, "I'd be flat on the ground and notice an ant or a bug and think, 'I wish I was that small.' There was never a time when you weren't afraid." The 7th Marine Regiment, mounted on the ridge, repelled countless infiltration attempts during the nights of May 11-12.[44] The 7th Marine Regiment lost 700 men by the time Dakeshi Ridge was declared secure on May 13. The battle at Wana Ridge and Wana Draw, however, continued until the end of May.[45]

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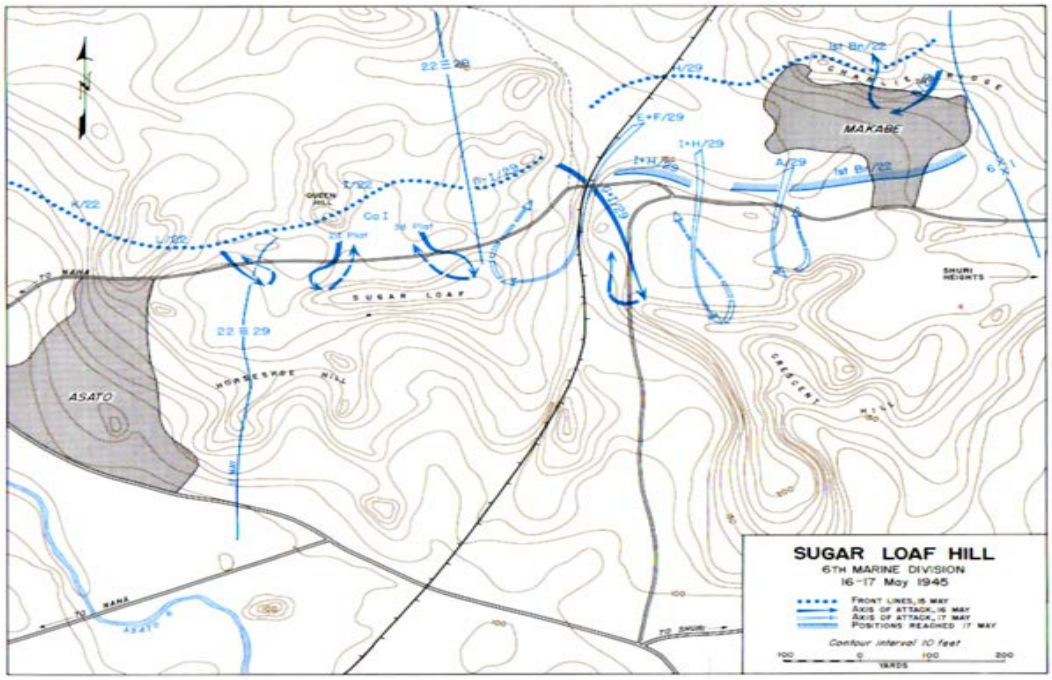
[43] 32nd Battle Instruction no. 10, March 6, 1945, p. 8, Geographic Files, RG 127; 32nd Army Combat Directive, May 5, 1945, p. 5, Geographic Files, RG 127.

[44] Appleman, *Okinawa: The Last Battle*, 325.

[45] Joseph Alexander, "*The Final Campaign: Marines In The Victory On Okinawa,* World War II Commemorative Series 1996, accessed on February 3, 2019, https://www.marines.mil.

The final two weeks of battle for the capture and breakthrough at the Shuri barrier witnessed the bloodiest and costliest fighting of the Okinawa campaign. With rain and mud slowing down U.S. troops, the assaults against Conical Hill, Central Shuri, Wana Draw, and Sugar Loaf Hill began. Conical Hill and Sugar Loaf Hill formed the eastern and western anchors of the Shuri Line. Conical Hill was positioned on the eastern coast and to the right of Shuri. The 96th Division would assault this position. Central Shuri was the main center of the line and location of the towering Shuri Castle. This portion was attacked by the 77th Division. The Wana Draw, located slightly to the left of Shuri and south of Dakeshi and Wana Ridge, was the focus of the 1st Marines. Lastly, Sugarloaf Hill was positioned on the western coast, and attacked by the 6th Marines. These key geographic points each provided the other positions with supporting fire; they needed to be secured.



(Map 5)[46]

[46] Appleman, *Okinawa: The Last Battle*, "Map XXXVII: Sugar Loaf Hill: 6th Marine Division, 16-17 May 1945," 319.

The ground beneath Sugar Loaf earned the nickname, “Hell’s half acre” (Map 5).[47] The engagement along this portion of the Tenth Army line witnessed a plethora of below ground counterattacks by the Japanese, one of which threw the marines off the hill’s summit on May 13. These attacks were sudden and without warning as Japanese soldiers emerged from underground burrows in a fanatical banzai charge. William Manchester, “scared” and “puzzled” by a Japanese counterattack at Sugar Loaf and the death of his fellow Marines, referred to the situation as “satanic madness.” Poor weather also turned the killing fields around Sugar Loaf into a swampy marsh, which only restricted a rapid push forward and prohibited tanks from dislodging dug-in enemies. When thinking back on the moments of combat at Sugar Loaf, Manchester wrote: “I wanted to return to sanity: I couldn't.”[48] The muddy terrain and various tank traps such as minefields, hidden anti-tank guns within caves, and concealed holes large enough to swallow a tank also worked as a weapon against mechanized forward movements. The First Marine Division After Action Report noted: “Enemy mining was extensive and effective. Engineer mine detectors and clearance agencies were generally unable to cope with the situation.” One battalion of the 6th Marines began their attack with 60 tanks and lost 54.[49]

The interlocking hills near Sugar Loaf proved to be immensely difficult as well. Horseshoe Hill and Half Moon Hill were strategically positioned to cover all lanes of an American advance. Luckily, the rain and fog on May 18 turned out to be an American ally, handicapping Japanese observation from Horseshoe and Half Moon just enough for tanks and

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[47] Feifer, *Tennozan*, 266.

[48] Manchester, *Goodbye Darkness*, 374.

[49] Feifer, *Tennozan*, 262.

infantry to flank both the right and left. Simultaneous attacks from elements of the 4th and 6th Marines also made the hills' capture feasible.[50] Sugar Loaf was secured on May 18, but with immense losses (1,656 Marines killed and another 7,429 wounded). The heavy losses as Sugar Loaf infuriated the Marines and fueled a deeper hatred towards the Japanese. Manchester stated that during the clean-up operations, an orderly for Bob Fowler, an F Company commander killed in "Hell's half acre," snatched up a machine gun and "unforgivingly massacred a line of unarmed Japanese soldiers."[51] The battle for the hills along the Shuri-line, specifically Sugar Loaf, was grisly beyond human imagination, and with Sugar Loaf now in friendly hands, the Marines directed their attention towards Horseshoe and Half Moon hill which fell by the end of the day on May 20.[52]

After the fall of Sugar Loaf, victory at the Wana Draw and Conical Hill swiftly followed. Wana Draw emerged as one of the most difficult tasks for the 1st Marines, and the Japanese reverse-slope positions merely added to the difficulties for the Marines in this sector. The beginning of a winning strategy emerged in the form of napalm. Marines trudged through the mud along the north side of the ridge and dumped the napalm barrels down the reverse slopes before setting them ablaze with phosphorous grenades. Such destruction led one Japanese infantryman to assert: "Who thought that the whole of this fairy island would be burnt down in the flame of an inferno and turned into a pile of blackened rocks?" [53]The 96th responded by seizing Conical Hill after weeks of backbreaking combat against

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[50] Frank, *Okinawa*, 117-118.

[51] Manchester, *Goodbye Darkness*, 381.

[52] Feifer, *Tennozan*, 265.

[53] George Feifer, "The Rape of Okinawa." *World Policy Journal* 17, no. 3. Fall (2000): 33.

unforgiving natural and man-made elements.[54] The destruction of human life and the environment went hand in hand. The island's beauty was gone, and only the scars of death remained.

Despite the use of napalm to neutralize the reverse slopes, the battle continued to be waged southward against the Wana Draw and the exhausted U.S. forces mirrored the scarred, decaying environment. Death and destruction abounded, and in late May the combat conditions to the south worsened. Eugene Sledge recalled:

> The weather turned cloudy on 21 May, and the rains began. By midnight the drizzle became a deluge. It was the beginning of a ten-day period of torrential rains. The weather was chilly and mud, mud, mud was everywhere. We slipped and slid along the trails with every step we took.[55]

With the rain, came a steady decline in air reconnaissance and support missions for Tenth Army forces. It also limited the effectiveness of artillery and mortar support. Sledge, a mortar crew member throughout the Peleliu and Okinawa campaigns, vividly recounted the frustrations that arose as a result of poor weather. When attempting to provide cover for assaulting infantry troops, Sledge and his fellow mortar crew members complained that "the recoil pushed the mortar's base plate against the soft soil in the gun pit." This caused their mortar crew to fire short rounds on their own men, or fire non-explosive rounds due to wet charges. Additionally, Sledge recounted how the rain was so severe that the "Wana Draw turned into a sea of mud and water." As conditions worsened, Sledge and his fellow Marines

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[54] Joseph Alexander, *The Final Campaign*, accessed on February 3, 2019, https://www.marines.mil.

[55] Sledge, *With The Old Breed*, 248.

lamented: “Sleep was nearly impossible. The mental and physical strain took a mounting toll on the Marines.” In Sledge’s estimation, “living conditions on front lines were pitiful.”[56]

A total of fourteen or more inches of rain fell, making the roads virtually impassable. This exceeded Tenth Army estimates of 10 or less inches rainfall. Flash floods began on May 25-26, only compounding the issues with the Okinawa road networks. Most roads became so diluted that they were impassable, and engineers had to work around the clock to ensure the Machinato route running north-south stayed clear and passable. This route ran through the Machinato line, a formerly well-armed and manned defensive system. It needed to remain secure in order to maintain a steady flow of supplies and troops to the Shuri line. More issues arose when flash floods destroyed bailey bridges constructed across various rivers such as the Asa Kawa River. The delay for road and bridge repairs exacerbated the supply problems and only added to the misery and frustration.[57]

Catherine E. Breisacher, an Army nurse on Okinawa, wrote that heavy rains destroyed medical tents, slowed the import of much needed medical supplies, and made conditions worse for the struggling patients and hospital personnel. She lamented, “the roads were practically impassable; even the Jeeps were rendered powerless.” The floods resulted in a lack of medical supplies and “k” rations. Catherine also noted that aside from the roads, medical tents became “bogs in which cots sank.” The poor conditions within tents and the continuous rainfall delayed the transportation of medical supplies and led to the death or

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[56] Sledge, *With The Old Breed*, 229, 253.

[57] Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 25, 1945, p. 10, Geographic Files, RG 127.

worsening illness among the sick and wounded. Some U.S. forces passed away not from human enemies, but from the natural world.[58]

The heavy rains in May also made transportation from the front and back to hospitals a nightmare. A journal from the First Reconnaissance company offered an example about the difficulty of removing the sick and wounded from the frontline. The journal describes how four privates were stuck at the Divisional Observation Post (O.P.) and unable to be removed to the rear "due to conditions" ranging from rains, poor roads, and the threat of deadly Japanese fire.[59] Men wanting to help the wounded by providing plasma also found their attempts at help to be insufficient. The rains turned the ground into such muck that no rifled bayonet could stably be stuck into the ground to support a plasma bottle on the rifle's stock. Medics and Corpsman in the field adopted this as a way to flow plasma into the vein.[60] Fear of getting sick and becoming too weak to defend against enemy attacks became a true concern. It also became heartbreaking for soldiers and marines witnessing their brothers in arms struggle.

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As attacks against the Shuri barrier continued, the XXIV Army Corps front-line divisions, the 77th and 96th, penetrated deeper into the heart of the Shuri defenses and into the areas of central Shuri and Conical Hill. On May 19 the 77th Division began to eliminate Japanese positions on Meter Hill, Ishimi Ridge, and on the reverse slopes called Flat Top and

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[58] "History of nursing activities on Okinawa," 3 May 1945-15 January 1946, Box 8, Folder 115, Papers of Catherine E. Breisacher, USAHEC.

[59] 1st Reconnaissance Company: Records of Events, April-June, 1945, (May 21, 1945), Geographic Files, RG 127.

[60] Manchester, *Goodbye Darkness*, 361.

Dick Hills. These central positions were key to the Shuri defenses and gave the enemy clear fields of fire over the terrain American forces had to cross. Most importantly, Dick and Flat Top Hills, were high priority because they composed the perimeters of Shuri's inner defenses. The Japanese had mastered the art of blending in with the landscape. To confront this, American forces employed mass destructive firepower on enemy emplacements with naval guns, medium tanks, armored amtracs mounted with 75mm howitzers, and artillery and infantry supported weapons. The U.S. storm of steel not only ensured the destruction of Japanese defenders but also of the surrounding vegetation.[61]

On May 20 the 1st Marine Division, in coordination with the 77th Division on their left flank, advanced south of Ishimi Ridge and 200 yards to the outskirts of Shuri. Rain began intermittently on May 21, but picked up heavily on May 22 and turned the entire southern front into a mud pit that bogged down both men and machines. Colonel John Munn, commander of Marine Aircraft Group 31 at the Yontan and Kadena Airfields near the Hagushi landing beaches, remembered having to "borrow tractors from the ground forces to pull the planes from one spot to another...because if they were left in one position for as long as twelve hours, they would be right down the hubs." These issues downed both supply planes that were meant to deliver cargo to the front and Tactical Air Force planes meant to bomb Japanese positions. Both of these developments gave the Japanese a brief respite from bombings and slowed supplies to the front, as the Americans now relied on foot troops to work as "carrying parties" for supplies. Capitalizing on the pause in combat operations, General Ushijima assessed the line at Shuri and concluded that the 32nd army would be "unable to maintain their Shuri front if the American spearhead into the Naha-Yonabaru

[61] Appleman, *Okinawa: The Last Battle*, 344; Frank, *Okinawa*, 122.

valley was not blunted." Thus, Ushijima committed every available Japanese soldier into the Shuri defensive line.[62]

Despite weather setbacks, U.S. forces continued their push forward. However, the reinforced Shuri defenses made the prospects of its capture gloomy among U.S. troops. Highlighting this sentiment was a comment made by a 96th Division officer: "Those on forward slopes slid down. Those on reverse slopes slid back. Otherwise, no change."[63] The battlefield landscape altered into one that mimicked the western front during the Great War: mud, death, and stagnation.

A change in outlook came on May 26 as forward observers from the 1st and 5th Marines detected enemy movement southward away from Shuri. The beginning of the final collapse of the Shuri Line came on May 28 as elements of the 1st Marine Division and 77th Infantry Division captured the high ground to the north and east of the city. Finally, on May 29, a key day in the Okinawa campaign, the 1st Marine Division seized Shuri and Shuri Castle. Although the castle was in the 77th Division combat zone, the 1st Marine Division Commander claimed they had to seize the position, justifying the action by asserting, "at the time the position of the 77th Division was such that it would have taken several hard days' fighting through enemy resistance."[64] With Shuri secure, the final combat and clean-up operations would continue south onto the Kiyamu peninsula - the location of the final outpost line of the 32nd Army - and southeast towards the Oroku Peninsula (Map 6).

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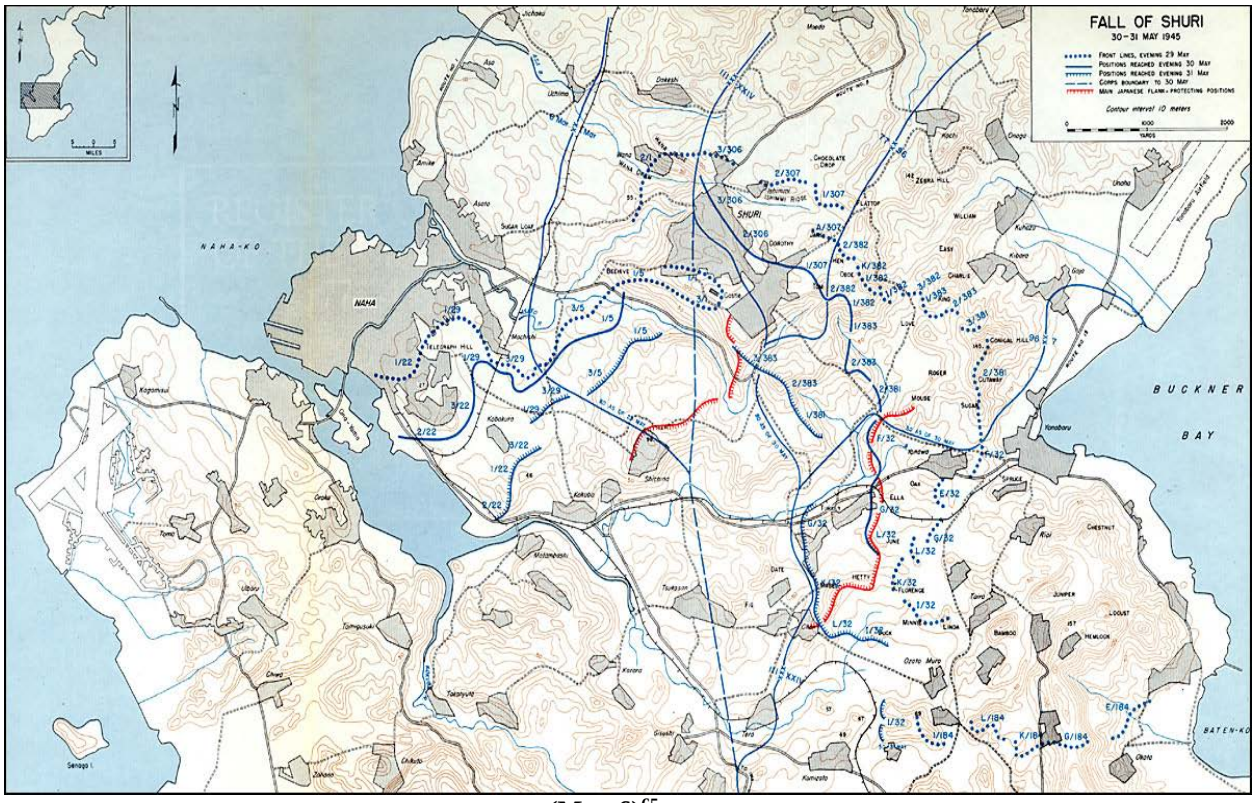
[62] Frank, *Okinawa,* 124-26.

[63] Appleman, *Okinawa: The Last Battle,* 371.

[64] Frank, *Okinawa,* 129-130.



(Map 6)[65]

American infantry units reached a breaking point by early June. Supplies became so bogged down that reports show that infantry troops lacked ponchos to protect them from the continual rain.[66] Even more of a concern was the lack of ammunition. During the final push south of Shuri into the Kiyamu and Oroku Peninsulas, hand grenades were in short supply or nonexistent. In addition, only 20 percent of the heavy machine guns owned by the U.S. Army remained.[67] The unending exposure to the natural elements throughout the campaign wore down U.S. troops about as much as the 32nd Army. Based on Tenth Army reports from

[65] Appleman, *Okinawa: The Last Battle*, "Map XLV: Fall of Shuri, 30-31 May 1945," 423.

[66] Action Report, Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 22 - June 30, 1945, p. 10, Geographic Files, RG 127.

[67] Frank, *Okinawa*, 155.

April-May 1945, by the end of May, the physical deterioration caused by weather and terrain had led to an increase in combat fatigue.[68]

During the planning stages of ICEBERG, American strategists recognized the complications weather might bring. However, recognition did not equate to strategists accurately perceiving the environment as a natural enemy. According to American planners, reconnaissance and photo missions "are best after June, when cloudiness is least."[69] If this was the case, why did the invasion plans become fixated on starting in April? Historian, Steven Ross argues that American planners mistakenly expected a rapid overrun of the southern portion before moving north to flush out remaining Japanese forces.[70] Instead, American forces experienced rapid success in the north and an inch by inch struggle in the south. American planners also failed to calculate the strength of the environmental and human enemy hiding among the Okinawan landscape. Reconnaissance before the invasion failed to pinpoint the exact numbers of the Japanese or the location of their main defensive line. Reconnaissance identified a number of honeycombed ridges of caves and tombs, but the extent to which these fortifications existed and the problems of clearing them out in the midst of turbulent rains and flash flood eluded U.S. thought. American military personnel believed any issue could be solved with blunt force, and no amount of environmental struggle could alter that view.

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[68] G-2 Report - Headquarters Tenth Army, p. 5, April - May 1945, Geographic Files, RG 127.

[69] Okinawa Planning Study, p. 20; World War II Command Files, RG 38.

[70] Steven T. Ross, *American War Planes 1941-1945* (London: Frank Cass, 1997), 154.

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The struggle in the south between American and Japanese forces was characterized by unforgiving terrain, fierce defenders, and a burgeoning insect life brought on by the abounding death and destruction. Early American estimates calculated that ticks, lice, flies, and mosquitoes might be a concern on Okinawa. By mid-May, the rains, death, and unimaginable environmental destruction witnessed a massive rise in lice, tick, fly, rat, and mosquito activity. For the flies specifically, the abundance of moist cavities allowed them to plant their eggs in corpses, leading to the emergence of maggots.

Maggots thrived by eating dead flesh. A study in the *Journal of Clinical Dermatology* detailed how the purpose of maggots on a wound was to "separate the necrotic tissue from the living tissue." Dead flesh was easy to come by during the 82-day Okinawa campaign. The decaying human and animal flesh accelerated the flesh fly's growth cycle and population numbers. Most females lay between 20-40 larvae, but they have been known to lay up to 325 at once. The growth cycle into adulthood takes 10-14 days.[71] According to Eugene Sledge, "in the mud and driving rain...we were surrounded by maggots and decay. Men struggled and fought and bled in an environment so degrading I believed we had been flung into hell's own cesspool."[72]

The flesh fly, with its large red eyes, emerged in droves during the battle. Some members of the U.S. forces claimed the flies were as large as horseflies, "with redheads and fierce, glaring eyes." Dick Whitaker, a member of the 6th Marines remembered: "if you put

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[71] KZN Department of Health, "Public Health Vectors and Pests: Flesh Fly," accessed on January 15, 2019. http://www.kznhealth.gov.za/environ/vector/fleshfly.htm.

[72] Sledge, *With The Old Breed*, 253.

down a cup for one second, you could hardly see it when you looked again. The surface of the coffee was covered solid by huge black insects."[73] Although the death and rotting corpses ushered in large numbers, the flies usually emerged in the spring for mating, which partially explains their abundance. The natural world and its vegetation were systematically annihilated, but the war brought about a new environment where the flesh fly could thrive. Corpses were ideal environments for their eggs, and this explains the maggots that Eugene Sledge and other soldiers and marines experienced. According to a national study, flesh flies "breed in excrement, decaying vegetable matter and animal flesh or meat." Furthermore, "most larvae infest wounds, carrion or excrement."[74] Torment from flies was not unique to the American experience on Okinawa; the Japanese army shared similar experiences. One 32nd Army soldier recalled that at night the flies, ticks, and lice persistently stayed such an issue "that I couldn't sleep a wink."[75]

Sleeplessness from combat and insect pests raised another concern for combat personnel. Restlessness and physical exhaustion depleted combat performance, and a study by the U.S. Army Research Institute for Behavioral and Social Sciences', reiterated that sleep loss literature "clearly indicates that the most serious performance decrements are to be expected with cognitively demanding tasks, those requiring vigilance, and some tasks requiring psychomotor precision."[76] Swarms of flies and enemy attacks diminished rest

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[73] Feifer, *Tennozan*, 304-305.

[74] KZN, "Public Health Vectors."

[75] Feifer, *Tennozan*, 304-305.

[76] U.S. Army Research Institute for Behavioral and Social Sciences, *Fatigue Effects on Human Performance in Combat: A Literature Review* (Natick: U.S. Army Research Institute, 1991), 17, accessed on January 3, 2019, https://apps.dtic.mil/dtic/tr/fulltext/u2/a242887.pdf.

opportunities for combat troops. Dr. James Vogel, U.S. Army Research Institute of Environmental Medicine, asserted that physical performance was not exempt from psychological processes. In Vogel's conclusion, "the physical task of firing a rifle is predominantly determined by neuromotor control factors." In other words, the neuromotor sends signals or "neuromotor impulses" to a soldier to fire his rifle. The neuromotor system that sends signals to muscles for physical movement was diminished when experiencing sleep deprivation. Aside from simply firing a rifle, the slowed transmission of impulses decreases reactionary abilities, leaving combat troops at a disadvantage when reacting to potential danger.[77]

It was not uncommon for American personnel to live in their own feces. Japanese night attacks and night shelling turned most foxholes into latrines. While writing about his experience on Okinawa, Sledge remarked how field sanitation was practically "nonexistent" because of the regular shelling. If a man was to remove waste from his foxhole, he simply used a grenade canister or ammo box and tossed it into the earth around his hole that was sure to get shelled, spreading the fecal matter throughout the field.[78] In the case of the Japanese, inside the caves or at the openings of caves provided the best locations to relieve oneself. The flies swarmed to these areas and carried with them one of the bacterial causes of dysentery most common in Pacific and tropical environments: shigella bacilli. Dysentery spread as clean sources of water and food became contaminated. Consumption of the bacteria infected the intestines of the host, resulting in fever, stomach cramps, vomiting, diarrhea, and

[77] Marriott and Institute of Medicine (U.S.), *Food Components,* 9.

[78] Sledge, *With The Old Breed*, 268.

in some cases death. Japanese and American troops fell victim to the sickness as the flies made their way onto food and drinks.[79]

Malaria posed another serious threat to combat forces on Okinawa. The contraction of malaria occurs when a female Anopheles mosquito bites an animal or human host. Additionally, according to the Center for Disease Control and Prevention, the mosquito must be infected through a previous "blood meal" taken from an infected person. Upon being bitten, the individual will experience fever and flu-like symptoms, including chills, headache and muscle aches, and exhaustion. Nausea, vomiting, and diarrhea may also occur. These symptoms emerge as malaria travels through the bloodstream, infecting red blood cells. The blood cells will eventually burst, further spreading the illness and resulting in the manifestation of malaria's physical symptoms.[80]

Soldiers dealt with malaria throughout the Pacific war; thus, it became imperative to combat the disease. U.S. forces organized specific units to fight the non-human combatants on Okinawa. Medical advancements by 1945 provided American and Allied forces with the antimalarial drugs, quinine and atabrine.[81] The U.S. also deployed "Sanitation squads" equipped with Dichlorodiphenyltrichloroethane (DDT) spray guns to combat insects, as well as rodents and snakes. DDT became their primary weapon of choice.[82] Synthesized in 1874, this insecticide received its first uses for the military in August 1943 after it was discovered

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[79] National Health Service, "Dysentery," NHS, U.K., accessed on March 24, 2019, https://www.nhs.uk/conditions/dysentery/.

[80] Center for Disease Control and Prevention, "Malaria," CDC, accessed on February 3, 2019, https://www.cdc.gov/malaria/about/faqs.html.

[81] Marcus Hall, "World War II and the Axis of Disease," in *War and the Environment: Military Destruction in the Modern Age*, ed. Charles E. Closmann (College Station: Texas A&M University Press), 119.

[82] XXIV Corps Administration order 10, 1945, p. 3, Box 80, Folder 13, USAHEC.

that it could be used against mosquitoes and within buildings to prevent insect infestations.[83] Despite its main use as an insecticide, DDT was useful in preventing vermin and snakes from interacting with and possibly infecting or killing U.S. personnel. A giant rat population already existed on Okinawa, and the corpses offered them a seemingly unending food supply. DDT was regularly administered in order to keep vermin away from American foxholes and camps. Likewise, snakes, such as the Habu needed to be dealt with in order to keep them away from foxholes at night. The environment in which the Habu thrived had faced systematic destruction since the beginning of Japanese building efforts on Okinawa. As the battle on the island escalated, so too did the destruction of their habitat.

Even before the Second World War, malaria was a real threat as global trade became more feasible through the interwar development of faster naval ships. It was regularly discovered that ships coming from ports such as Rabaul in New Britain carried anopheles' mosquitoes. This was such a concern that in January 1942, Patrick Buxton from the London School of Hygiene and Tropical Medicine and chairman of a military committee on entomological matters warned the British Colonial Office about the dangerous spread of malaria with ships and aircraft. The British Office conveyed this warning to the rest of the allies, but no significant changes came. However, by September 1942, Australia's malaria specialist, Colonel Neil Hamilton Fairley traveled to London and Washington D.C. where he detailed malaria's threat to Pacific operations.[84]

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[83] Cristobal S. Cerry-Caban, "DDT and Silent Spring: Fifty years after," J*ournal of Military and Veterans' Health* vol. 19, no. 4 (2011), accessed on February 9, 2019, https://jmvh.org/article/ddt-and-silent-spring-fifty-years-after/.

[84] Judith A. Bennett, "Pests and Disease in the Pacific War: Crossing the Line," in *Natural Enemy, Natural Ally: Toward an Environmental History of War,* ed. Richard P. Tucker and Edmund Russell (Corvallis: Oregon State University Press, 2004), 220-223.

Despite Fairley's visit, military leaders such as U.S. Admiral William Halsey believed that malaria could not spread beyond Buxton's Line which encompassed the southwest Pacific area (New Guinea, Solomon Islands, New Caledonia, etc.). Admiral Halsey and others continued to believe the Buxton Line theory regardless of planning documents outlining instances of the illness among locals.[85] This led many officials to not see malaria as a major threat on Okinawa. After the first month of combat, however, U.S. medical survey teams discovered that malaria was endemic to the region. Based on a U.S. Army Medical Department report, combat operations against malaria-carrying mosquitoes led to an epidemic "among natives quartered in and near [anti-malaria operations] camps."[86] When the Americans directed their war of attrition against the natural world, it fought back, forcing U.S. personnel to intensify their DDT campaign against the threat of insect diseases.

The 214 Malaria unit emerged as one of the most notable combat units engaged against environmental enemies such as insects, rats, and snakes. As outlined in the XXIV Corps Engineer Plan, the unit conducted surveys on mosquitoes and other organisms deemed capable of spreading malaria and other diseases. Unbeknownst to them at the time, DDT's chemicals were poisonous to the environment and if washed into waterways, "moved along the food chain, threatening delicate ecosystems for birds, fish and, ultimately, humans." Therefore, with no knowledge of its harm, American personnel in the 214th Malaria unit sprayed the chemical liberally throughout the natural and cultural landscapes on Okinawa.

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[85] Bennett, "Pests and Disease in the Pacific War: Crossing the Line," 227.

[86] The Medical Department, United States Army, *Preventive Medicine In World War II*. 482.

Eventually, the Environmental Protection Act banned its use in 1972, though some exemptions for its use still exist today.[87]

Though the U.S Tenth Army regularly sprayed DDT, medical authorities noted that 15-30 percent of personnel experienced malaria during the campaign.[88] The U.S. Army Medical Department concluded that cases of malaria among U.S. troops were due to exposure to Anopheles mosquitoes in places such as the Philippines, New Guinea, and the Solomon Islands. Fifteen to thirty percent may appear to be a minimal amount compared to the overall troop levels on the island, but the constant threat of mosquitoes passing on a debilitating sickness sometimes meant life and death in regards to combat performance. If a soldier contracted the disease, side effects like physical and mental exhaustion limited his combat effectiveness in the same way sleeplessness impaired cognitive abilities during combat operations.

Just as malaria remained a pressing concern for American and Japanese troops, typhus and typhoid also contributed to the assault against troop health. These illnesses commonly emerged from ticks and lice.[89] Typhoid fever is caused by Salmonella typhi bacteria and is spread through contaminated food and water or through lice and ticks that have fed on a host containing the bacteria. Symptoms associated with the sickness are physical weakness, stomach pain, diarrhea, severe coughing spouts, and loss of appetite.[90]

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[87] Clyde Haberman, "Rachel Carson, DDT and the Fight Against Malaria," *The New York Times* (Jan. 22, 2017), accessed on February 16, 2019, https://www.nytimes.com/2017/01/22/us/rachel-carson-ddt-malaria-retro-report.html.

[88] Action Report, Medical Department, First Separate Engineer Battalion, Third Amphibious Corps, April 22 - June 30, 1945, p. 3, Geographic Files, RG 127.

[89] Feifer, *Tennozan*, 304-305.

[90] Mayo Clinic, "Typhoid Fever," *mayoclinic.org*, accessed on February 6, 2019, https://www.mayoclinic.org/diseases-conditions/typhoid-fever/symptoms-causes/syc-20378661

Typhus, sometimes called louse-borne typhus, is contracted through lice, but can also be contracted via ticks. Similar to typhoid, typhus symptoms include weakness, coughing, vomiting, diarrhea, fever, confusion, body and muscle aches, and headaches.[91] The proliferation of human waste, death, and unsanitary conditions provided these diseases with pristine environments to grow and spread. Historian George Feifer classified the outbreaks of such diseases as "mild" among American forces, citing no specific numbers. Although lacking specifics for the Japanese, Feifer noted that typhoid and typhus were part of "the principal infectious diseases" among Japanese troops.[92] Statistics of U.S. and Japanese troops with typhus still remains unknown. However, the lack of exact figures was common due to the disease's two-week incubation period. This makes it difficult to pinpoint the initial source of infection, but once pinpointed, the recovery is slow and leaves an individual incapable of working for six to eight weeks, a possible death sentence in combat.

The history of typhus in wartime earned it the nicknames, "war fever" and "camp fever." From 1812-1813, during the Napoleonic War, Napoleon's army was composed of 500,000 men for the invasion of Russia but returned with 30,000 as a result of combat casualties and typhus. During Finland's great famine years of 1866-68, 100,000 died of typhus, as well as typhoid. The typhus outbreak in the midst of the Russian Civil War in 1919 resulted in the death of millions. Vladimir Lenin, witnessing the outbreak, stated: "all attention to this problem, comrades. Either lice will conquer socialism, or socialism will conquer lice." From 1917 to the end of 1925, twenty-five million Russians contracted typhus,

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[91] CDC, "Typhoid Fever and Paratyphoid Fever," Centers for Disease Control and Prevention, https://www.cdc.gov/typhoid-fever/symptoms.html; CDC, "Typhus Fevers," Centers for Disease Control and Prevention, accessed February 6, 2019, https://www.cdc.gov/typhus/epidemic/index.html.

[92] Feifer, *Battle of Okinawa*, 140; Feifer, *Tennozan*, 305.

resulting in the death of roughly 3 million people. Luckily for American forces, the spraying of DDT succeeded in targeting some of the lice possibly carrying the disease.[93]

The threat of malaria, typhus, and typhoid spurred research and cautionary decisions to properly vet vehicles, cattle, horses, and dogs traveling from infected zones within Buxton's Line and to combat operation areas in the Pacific. Dr. Jean Verges, the Chief of the Veterinary Service of New Caledonia, discovered that cattle, horses, and dogs might carry typhus and typhoid if they are infested with ticks or lice. Dr. Verges regularly stressed to allied officials that the United States continued to neglect quarantine regulations and imported animals infested with ticks and diseases. Frustrated by the U.S. failure to adopt precautionary measures, Dr. Verges complained, "we cannot take the necessary steps to examine them and to prohibit the entrance of animals coming from contaminated areas."[94]

Perhaps the worse sickness came in the form of Japanese B encephalitis. Like malaria, typhus, and typhoid, Japanese B encephalitis accompanied mosquitoes, ticks, lice, and even horses which existed in abundance in northern Okinawa. During Lewis Thomas's tenure researching diseases with a Naval Unit on the island, he pinpointed the horses on Okinawa as the source of the virus. Thomas's serological studies on horses concluded that the virus "transmitted from horse to man by mosquitoes."[95] According to the Medical Department of the U.S. Army, "160 cases of Japanese B encephalitis...occurred among natives and troops on northern Okinawa." 38 out of 160 cases were among U.S. military

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[93] Helene Laurent, "The Great Louse War: Control of Typhus Fever," in *Long Shadows: A Global Environmental History of the Second World War*, ed. Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo (Corvallis: Oregon State University Press, 2017), 157-58, 168.

[94] Bennett, "Pests and Disease in the Pacific War: Crossing the Line," 228-234.

[95] Thomas, *The Youngest Science*, 96.

personnel.[96] The terror inflicted by the disease was due to the unpredictable nature of the symptoms. The infection usually manifested through inflammation of the brain, inducing fatigue, head pain, seizures, hallucinations, and vomiting. However, the most severe symptoms are confusion, hallucinations, and hearing loss.[97] Each of these symptoms placed soldiers at a disadvantage. Hearing loss, in particular, could leave combat troops defenseless. As historian Outa Ampuja pointed out, "sounds are signals of events in the environment."[98] Recognizing the coming sound of danger, whether it be an infantry attack or artillery bombardment, could save a soldier's life.

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The Second World War was the first war where more men died in combat than of disease, and the environment was a catalyst to the atrocities that took place in the combat of the Pacific theater.[99] Environmental factors such as disease added to the misery of combat, in turn fueling the unimaginable violence or "kill all" attitude that is associated with the Pacific theater of World War II. John Keegan illustrated that life for combat participants "has increasingly become an intolerable experience for the majority" and warfare has altered "the very environment of the battlefield into one almost wholly - and indiscriminately - hostile to

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[96] The Medical Department, United States Army, *Preventive Medicine*, 475, 484.

[97] Mayo Clinic, "Encephalitis," *mayoclinic.org*, accessed on February 6, 2019, https://www.mayoclinic.org/diseases-conditions/encephalitis/symptoms-causes/syc-20356136.

[98] Outi Ampuji, "Perspectives on the Acoustic Ecology of War," in *Long Shadows: A Global Environmental History of the Second World War*, ed. Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo (Corvallis: Oregon State University Press, 2017), 177.

[99] Richard P. Tucker, "The Impact of Warfare on the Natural World: A Historical Survey," in *Natural Enemy, Natural Ally: Toward an Environmental History of War*, ed. Richard P. Tucker and Edmund Russell (Corvallis: Oregon State University Press, 2017), 31.

man."[100] When describing the Okinawan rains, Eugene Sledge stated, "Okinawa's mud...drove us to a state of frustration and exasperation bordering on rage."[101]

The three-month campaign turned into a series of horrifying frontal assaults against a well-dug-in, and at times, unseen Japanese enemy scouring the island's hills and rises. Japanese military doctrine at the time described Westerners (American forces) as "very effeminate and very cowardly-have an intense dislike of fighting in the rain or the mist, or darkness. Although fine for dancing, they can't conceive of night as a proper time for war. In this, if we seize upon it, lies our great opportunity."[102] To the Americans, the Japanese skill with the natural world reaffirmed their racial animus that they were animal or ape-like; however, the Japanese saw the American inability to fully master combat in the midst of environmental forces as a weakness that needed to be exploited. The Japanese view, predicated on American stereotypes, was right to an extent. The United States had yet to refine their ability to conduct night operations. The U.S. naval guns maintained deadly accuracy during the day but presented no real threat at night. As a result, Japanese forces began utilizing Okinawa's bad weather to infiltrate, harass, and engage U.S. forces. This adoption of night tactics allowed 32nd Army forces to deplete American combat effectiveness by inducing paranoia and sleeplessness.[103]

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[100] John Keegan, *The Face of Battle* (London: Penguin Books, 1976), 313-314.

[101] Sledge, *With the Old Breed*, 234.

[102] Tsuji, *Read This Alone*, "Chapter IX," December 1941.

[103] Sledge, *With the Old Breed*, 254; 32nd Army Battle Instruction No. 2, February 15, 1945, p.2, Geographic Files, RG 127.

John Dower's acclaimed look into Pacific combat, *War Without Mercy: Race and Power in the Pacific War*, claimed that the nature of warfare associated with the Pacific theater was a result of racial propaganda. Propaganda messages and cartoons portrayed the Japanese as a people embodying the form an insect or animal, a form directly connected to the natural world. In the Marine Magazine, *Leatherneck*, a cartoon showed a creature labeled "Louscious Japonicas" and it further stated, "its breeding grounds are around the Tokyo area...must be completely annihilated." Other depictions in both *Leatherneck* and *The New York Times* portrayed Japanese troops as "apes."[104] The racial view that the enemy was animal-like resonated in the minds of American servicemen. The nature of fighting, the utilization of the environment's terrain, fighting an enemy who spent their time underground before launching surprise offensives from hidden caves, tombs, and tunnels affirmed the racial propaganda to many combat personnel and led them to act on their animalistic instincts of unadulterated violence.

Moving further south from Shuri, Eugene Sledge recalled coming across Japanese prisoners. As several Marines harassed the Japanese soldiers, Sledge remembered an Army officer, "realizing he might soon have one less prisoner," demand to the Marines that "you can't mistreat these men…According to the Geneva Convention, POWs must be treated humanely." Although the officer was correct, several of the Marines shouted, "Screw the Geneva convention." In Sledge's estimation, the two opposing views towards Japanese prisoners was because he, his fellow Marines, and other soldiers grinning at the dispute, "obviously had been in the meat grinder long enough to have no more love for the

[104] Dower, *War Without Mercy*, 185-187; Edmund Russell, "Speaking of annihilation: Mobilizing for War Against Human and Insect Enemies, 1914-1945," in Tucker and Russell, eds., *Natural Enemy Natural Ally*, 142.

Japanese."[105] Marines and soldiers also highlighted that escorting a prisoner to the rear for processing was a "gamble" because of the dangerous hike "through land dotted with unknown caves and spider holes." So common was this fear that one Marine, Norris Butcher, learned that "they were simply capable of too much, too many devious ways and tricks," and it was best to execute the surrendered soldier on the spot.[106] The Japanese knew the terrain and masterfully utilized the landscape. Environmental conditions not only motivated U.S. troops to inflict inhumane abuse and violence toward prisoners, but it also made it difficult to transport prisoners to safety at headquarters.

The Japanese ability to utilize the landscape and the weather was a source of frustration to American forces. The bad weather aided Japan in weaponizing the battleground and made it increasingly more difficult for U.S. forces to dislodge enemies with technology such as tanks, flamethrowers, naval guns, and air assaults. A marine reflecting on the burdensome combat conditions exacerbated by 32nd Army's use of the terrain and weather stated: "It got to the point -- I shouldn't say this -- that Japs wouldn't surrender to Marines. If they wanted to surrender, they'd go to the Army, Ninety-nine percent of Marines would shoot them, and that includes me."[107]

This was a common occurrence throughout the service branches in the Pacific. Both sides committed acts of violence against defenseless combatants - living and dead. Some soldiers remembered how officers, attempting to at least appear as if they are following protocol, ordered them to take Japanese prisoners back to the Regimental Headquarters and

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[105] Sledge, *With the Old Breed*, 282.

[106] Feifer, *Tennozan*, 489-90.

[107] Feifer, *Tennozan*, 483.

be back within five minutes. Soldiers new to the killing fields many times believed the officer meant to honor the enemy surrender but hardened veterans quickly reminded them that Regimental HQ was thirty miles away, and the officer slyly ordered them to dispose of the prisoners within five minutes. Peter Milo of the 22nd Marines' Headquarters and Supply Company, asserted:

> Okinawa was a killing field. In the 82 days of battle on that island, an average of about 2500 people died every day. Under those conditions, with death everywhere, I seemed to have gone into a sort of a trance. It was as if I had left my body and was looking at myself in a movie. I just did not feel anything.[108]

Milo's reflection illuminates the mental and physical exhaustion that precipitated the killings of unarmed combatants. On another occasion, Eugene Sledge noted how a fellow Marine asked that the other Marines halt their fire on a wounded, unarmed Japanese soldier. Rather than heeding the man's compassionate pleas, one Marine responded, "You stupid jerk; he's a god damn Nip ain't he?"[109] Here, it is apparent that racial hatred served as a justifier due to the calculated environmental propaganda that dehumanized the Japanese individual to animal status.

Psychological strain at the hands of weather, terrain, wildlife, sickness, and human combatants was clearly another factor behind the motivation for excessive violence and brutality. Several studies argued that prolonged exposure to natural elements and combat affects a soldier's mental state. A U.S. Army study on combat fatigue, stress, and sleeplessness concluded: "high-level cognitive functions (memory, reasoning, arithmetic

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[108] Feifer, *Tennozan*, 485-86.

[109] Sledge, *With The Old Breed*, 258-59.

computations, concept attainment, communications, decision making) are adversely affected by fatigue and sleep loss." Another Confidential Army Report, "Principal lessons learned in the Okinawa Operation" reached a similar conclusion: "troops should not remain in the front lines for more than two weeks. Constant alertness, coupled with the strain of continuous shell fire, causes physical and mental fatigue which greatly decreases the soldier's effectiveness." Historian Michael C.C. Adams drew on this point and found that breakdown rates for soldiers and marines in combat for 28 days reached as high as ninety percent.[110]

The Japanese more or less expected to utilize the terrain and natural world as best they could against the American invaders, while simultaneously accepting the difficulties it presented. Americans, on the other hand, tended to miscalculate the environment's ability to act as an enemy combatant. The difficult terrain not only made movements dangerous, but it also left many combat units disoriented. By the end of the campaign in June, a report by the Army Ground Force Headquarters reached the conclusion that training with map reading must be improved. U.S. Forces struggled to accurately decipher maps throughout the campaign, and this only added to the fear, anxiety, frustration, and exhaustion that accompanied cave clearing assaults against well-hidden and reinforced defensive positions. This was in part due to the fact that weather restricted air reconnaissance, as a Photo Support System Study concluded on June 22, 1945. The Army Ground Forces report also recommended that Infantry Schools improve and teach new techniques for clearing out defensive positions in mountainous and hilly terrain.[111] The fact that U.S. infantry troops

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[110] U.S. Army Research Institute for Behavioral and Social Sciences, *Fatigue Effects on Human Performance in Combat: A Literature Review* (U.S. Army Research Institute 1991), 20; Feiffer, Tennozan, 322, Michael C.C. Adams, *The Best War Ever* (Johns Hopkins University Press, 1993), 7.

[111] Army Ground Forces Headquarters, Division of Plans and Policies, p. 6, HQ Army Ground Forces, p. 38, Aerial Photo Support System Study, May 17-June 22, 1945, p. 12, Geographic Files, RG 127.

received insufficient training in conquering a foreboding landscape, both natural and man-made, revealed a disturbing aspect of U.S. planning and presents useful insights into how this affected American morale.

Stress and anger undoubtedly built up among combat troops facing hills, ridges, and escarpments they did not know how to properly handle. If a soldier was hoping to blow off steam created by combat stress - surrendered soldiers offered an easy outlet. In addition, continual assaults against commanding Japanese terrain positions continued to be a grueling and bloody affair. For instance, attacks against the Wana Draw to the south began on May 14, but the last of Japanese resistance could not be flushed out until the end of May. Backbreaking work against a landscape filled with sharp ridges and rises and ground denuded by rain added to the sheer physical and mental exhaustion. According to a U.S. Army study on combat fatigue, "various environmental, system characteristics, operational mode, and task conditions impacting human performance" include not just biological and weather elements but also terrain.[112] If these natural variables play a role in diminishing mental effectiveness of troops, it is plausible to conclude that the natural world served as the catalyst for human barbarity and atrocity. The exposure to the natural and man-made environment on the battlefield served as a motivator, and the environmental application used in racial propaganda emerged as a justifier for inhuman barbarity. U.S. troops were taught, through careful propaganda campaigns, that the Japanese enemy was non-human and animal or insect-like. Once the natural world and the environment wore down a troop's "veneer of civilization," unnecessary violence became almost inevitable.

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[112] U.S. Army Research Institute for Behavioral and Social Sciences, *Fatigue Effects*, 8.

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The final push continued to the south after the fall of Shuri on May 29. The seizure of the Oroku Peninsula presented minor problems - mainly the fact that limited sun exposure slowed the drying process of the muddy terrain, prolonging the inability to use tractors and bulldozers to remove vehicles entirely stuck in the mud. However, the biggest problem rested at Kunishi Ridge, the final fallback line for Japanese forces. Similar to the hills and ridges throughout Okinawa, Kunishi was riddled with well-hidden caves and defensive positions. However, with Japanese morale dwindling, these positions on Kunishi Ridge fell by nightfall on June 16th. The next day, the XXIV Army Corps secured their objective at the Yuza-Dake-Yaeju-Dake escarpment. Finally, the decisive thrust came on June 18th against the Mezado Ridge. At 1305 on June 21, after 82 days, General Roy S. Geiger of the Third Amphibious Marine Corps announced that Okinawa was secure.[113]

Operation ICEBERG proved to be a hard campaign, and its costly nature spurred the use of atomic weapons. The two leading commanders, General Simon B. Buckner and General Mitsuru Ushijima never witnessed the campaign's end. General Buckner desired to see the action first hand and met an unexpected death at Mezado Ridge on June 18th. In the case of General Ushijima, he had the opportunity to prepare for the moment he met death. On June 21, prior to the American announcement of the success in securing Okinawa, Ushijima laid down a quilt and bowed in reverence one last time to the eastern sky before committing the honored rites of hara-kiri.[114]

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[113] Frank, *Okinawa*, 144-165.

[114] Frank, *Okinawa*, 158, 2-3.

Modern warfare on Okinawa made humans subordinate to nature. The combat experienced all the horrors associated with the Pacific War. The environment as a whole - terrain, weather, mud, insects, vermin, and bacterial diseases - participated in the war of attrition as the existing landscape of the island became altered into a weaponized landscape. The natural world never ceased to fight back. Although the Japanese cultivated it into an environment that fit their particular military strategy, it still caused a plethora of issues that, in turn, unleashed an onslaught of diseases and other health problems on both sides. Nevertheless, the altered landscape on Okinawa proved successful in slowing U.S. movements and inflicting casualties on troops assaulting superior terrain positions.

In all, the successes of creating a weaponized landscape, and the environment's ability to fight back against both armies fueled the combat exhaustion that precipitated atrocities during the campaign. What Okinawa revealed was that the physical and mental toll placed on soldiers and marines facing natural elements and continual assaults against seemingly impenetrable terrain immensely depleted combat effectiveness through frustration, lack of sleep, and exhaustion. As a result, the larger Pacific War, its unique island hopping strategy, the various ecosystems within each island, and the Japanese ability and desire to utilize the natural world helps answer the question of why barbarity became commonplace throughout the Pacific. Additionally, the environmental influence throughout racial propaganda highlights how an individual soldier could justify killing an unarmed prisoner of war. The environment of the natural world and the battlefield acted as the motivator for atrocities. However, in the case of the Pacific war and Okinawa, racial animus and the animal-like characterizations in propaganda served as the underlying justification for executions and barbaric violence. The Battle of Okinawa not only turned men into savages,

leading them to acts of inhumane violence, but it also horrifically scarred and reshaped a beautiful island ecosystem.

III

Weaponized Landscapes and the Post-War Shadow

` Masahide Ota, governor of Okinawa from 1991 to 1999, stated that the military occupation of the island was "dominated by officers who felt little sympathy for scourged Okinawa's ‘moonscape' or for her ruined people.”[1] For the people of Okinawa, the war and the subsequent military occupation did just that. Following the end of the Second World War, a U.S. Naval Officer said: “Of the many places on this globe that were touched by the withering blast of war, I doubt, if the life of any people has been more completely changed than on Okinawa.”[2] The horrors of battle not only scarred humans but also the natural environment, casting a long shadow on Okinawa’s history and environment.

The end of the war left Okinawa under the jurisdiction of the United States. The American occupation lasted until 1972 when the island returned to Japanese control. Since the transfer, both the America military and the Japanese Self-Defense Force make up just under 50% of the island. In fact, the United States bases alone compose 20% of the island, and according to locals and research conducted by Dr. John Taylor, “mile after mile of base fences flank the major roads; vast housing estates and runways cover the most fertile soil,” and the best agricultural lands so integral to the formerly dominant agrarian economy of Okinawa.[3] To make matters worse, post-war recovery experienced the same environmental weaponization witnessed at the hands of the 32nd Army, and the storage of chemicals such as

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[1] George Feifer, “The Rape of Okinawa,” 35.

[2] Dr. John Taylor, “Anti-Military and Environmental Movements in Okinawa,” (Geography Department California State University, Fullerton, 2008), 2, accessed on February 27, 2019. http://www.uky.edu/~ppkaran/conference/Anti-Military%20and%20Environmental%20Movements%20in%20Okinawa.pdf.

[3] Taylor, “Anti-Military and Environmental Movements,” 3; Feifer, *Tennozan*, 561

DDT, PCBs, sarin gas, and Agent Orange only served to exacerbate pollution and toxicity of the land and water. Although the Second World War ended, militarization and weaponization of the landscape continued.

The battle of Okinawa displayed the power of modern warfare, revealing the technological capabilities of total war in the twentieth century. The environment of the island was laid to total waste and faced with the task of recovering in the midst of a tense post-war period. In the cleanup efforts to wipe out the last remnants of Japanese resistance, Americans lit grass fires throughout the island to chase the 32nd Army "desperados" into a wall of machine gun fire. This conduct allowed flames to devour large swaths of land, resulting in additional devastation. With much of the arable land destroyed by combat, large developments of defensive landscapes, and movements of troops, Okinawa natives found themselves facing an unfamiliar environment. The destruction of vegetation was so severe that the locals began scavenging for food and supplies in blown out, Japanese caves. Many locals resorted to eating "almost anything in 1946 and 1947, including dogs."[4]

Peace ushered in continued suffering for natives and the natural world. The Americans usually appropriated any farm land in the central and southern lowlands without due compensation to locals. Since the early days of occupation, the United States acquired good land at the expense of the local populace. Based on a report in 1957 produced by the Intelligence Division, Office of the Engineer Headquarters, United States Army: "Southern Okinawa was the most suitable part of the island for large scale military or civilian

[4] Feifer, *Tennozan,* 541, 552.

development because the terrain is generally open and accessible."[5] As a result of combat and base construction on arable land, the village environments that were once flourishing agrarian communities became virtually deserted.[6] George Feifer published a study on post-war Okinawa in 2000 and concluded that "15 percent of the most fertile farmland is buried under the concrete of U.S. runways."[7] However, this was not uncommon of the U.S. bases in the Pacific. Herman Wouk, an American sailor on a Destroyer Minesweeper (DMS), remembered, "With the coming of the Americans, the once-tropic islands had taken on the look of vacant lots in Los Angeles."[8]

The post-war Okinawan saying, "Okinawa lies in the midst of military bases," accurately described the new environment emerging on Okinawa. The weaponization of the island started when the 32nd Army began construction and it continued after 1945 with American defense building. Throughout the Cold War era, as the United States engaged in wars with Korea and Vietnam, Okinawa served as a major staging area for military operations.[9] Despite making up only 1% of Japan's population, the island played host to the largest percentage of U.S. troops. This influx in U.S. personnel and bases introduced new environmental challenges to the already shell-shocked island. Sometimes accessible land was unusable. Unexploded ordnance littered the terrain around and in Camp Hansen, a base built

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[5] Intelligence Division, Office of the Engineer Headquarters, United States Army, "Military Geology of Okinawa-Jima, Ryukyu-Retto," 1957, 4, accessed on December 1, 2018, https://pubs.usgs.gov/fedgov/70039235/report.pdf.

[6] Feifer, *Tennozan*, 553.

[7] George Feifer, "The Rape of Okinawa," 36.

[8] Adams, *Best War Ever*, 92.

[9] Feifer, *Tennozan*, 558-559.

in 1956 near Kin Bay in southern Okinawa. In an effort to calm local concerns and foster better relations between the military and locals, the Special Action Committee on Okinawa (SACO), proposed to remove all "unexploded ordnance" in a 1996 report. However, "no-go" zones still exist today.[10]

Live fire training areas commonly caused brush fires, and bullets ricocheted from ranges into adjoining civilian areas. Reports revealed that when live-firing exercises at Camp Hansen caused fire breakouts, "fire-fighting can only be performed from the air by helicopters due to the danger of unexploded shells on the ground surface."[11] Random events, such as B-52 emergency landings and misplaced parachute drops also scarred the landscape. According to U.S. Army documents, "Parachute training for Army and Air Force Special Forces personnel was relocated from the main island of Okinawa to an adjacent island called "Ie Jima" in order to eliminate mis drops and soil compaction.[12]

Soil compaction is a process in which the volume of soil is reduced due to external factors leading to reduced air permeability and water infiltration. Vegetation struggles and, in some cases, fails to grow once this occurs.[13] Soil compaction was widespread on military installations due to the presence of tanks, tractors, and amtracs. In military vehicle and soil

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[10] Japanese Minister for Foreign Affairs Ikeda, Japanese Minister of State for Defense Kyuma, U.S. Secretary of Defense Perry, and U.S. Ambassador to Japan Mondale, "SACO Final Report," December 2, 1996, Released by the Bureau of East Asian and Pacific Affairs, U.S. Department of State, August 5, 1997, accessed on January 2, 2019, https://1997-2001.state.gov/www/regions/eap/japan/rpt-saco_final_961202.html.

[11] Toni M. Bugni, "The Continued Invasion: Assessing the United States Military Presence on Okinawa through 1996," *Suffolk Transnational Law Review* 21, no. 85 (1997): 95-96

[12] Lieutenant Colonel John C. Wilhelm, "U. S. Military Forward Presence In Okinawa, Japan," U.S. Army War College Carlisle, Pennsylvania, July 4, 2003, 9, accessed on February 16, 2019, https://apps.dtic.mil/dtic/tr/fulltext/u2/a415741.pdf.

[13] Sjoerd W. Duiker, "Effects of Soil Compaction," Penn State University Extension, March 8, 2005, accessed on February 26, 2019, https://extension.psu.edu/effects-of-soil-compaction.

studies conducted by the U.S. Department of Agriculture, results showed that "repeated use of military vehicles on training maneuvers can damage vegetation, destroy the vegetative cover, and compact the soil, thus making the land more susceptible to soil erosion."[14] The military presence and construction of military sites and public works accelerated this process. Since 1972, soil erosion has occurred extensively on hillside slopes on Okinawa. Studies on land development and erosion on Okinawa recognized the human and natural factors at play. The heavy rain and typhoon season experienced in Okinawa leave the island susceptible to erosion. Similarly, government authorities protect only 7% of Okinawa's forests. Failure to protect subtropical forests allowed for rampant and "uncontrolled cutting of trees" for development projects, an act which speeds the process of soil erosion. [15]

Continued construction of bases and public works on the island also damaged the forests and water ecosystems. Various dams constructed from 1974-1997 provided water to the growing population of U.S. troops and civilians. Engineers built dams on the eastern and western sides of the mountainous Yanbaru forest, and the bulk of the mountain water traveled from Benoki, via Fungawa, Aha, Shinkawa, and Fukuji Dams. From Fukuji, the water moved along various pipes and tunnels to the densely populated, central and southern regions of Okinawa. According to East Asia researcher Gavan McCormack, the water funneled to the south "constitutes the life-blood of the Yanbaru."[16] Construction in the

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[14] Amare Retta, Larry E. Wagner, John Tatarko, "Military Vehicle Trafficking Impacts on Vegetation and Soil Bulk Density at Fort Benning, Georgia," *American Society of Agricultural and Biological Engineers* 57, no. 4 (2014), DOI 10.13031/trans.57.10327.

[15] Teruo Higashi, Tadao C. Katayama, Shinagawa Akio, "Land Development Works and Soil Erosion in Okinawa Prefecture," Nanhai Research Journal 6, no. 1, (1985), 26, accessed on February 26, 2019, https://core.ac.uk/download/pdf/144563596.pdf

[16] Gavan McCormack, "Okinawan Dilemmas: Coral Islands or Concrete Islands," *Japan Policy Institute* (April 1998), accessed on February 27, 2019. http://www.jpri.org/publications/workingpapers/wp45.html.

forested Yanbaru region accelerated the soil erosion and damaged the long-term viability of the dams. A research study spearheaded by Teruo Higashi, Vice President of the University of Tsukuba in Japan, concluded:

> Due to the transportation of soils into dams, water sources have become polluted. The functions of dams have also decreased because the excess sediments that flow to the reservoir shorten their designed utilization time. Furthermore, the functions of rivers, such as carrying runoff into the ocean, supplying drinking and industrial water, and production of fresh-water fisheries, have been reduced. The functions of rivers in controlling discharge and in the cleaning of the natural environments have also decreased. Rock and mudslides onto roads, resulting in blockage and other damages, interfere with vehicular traffic.[17]

For decades, McCormack writes, “agricultural chemicals and red-soil run-off from the road and agricultural 'modernization' works” funneled into waterways. To present, Okinawa’s rivers display a “three-colored red, white, or black” tint depending on the chemical composition of the soil running off into the rivers.[18]

As access to arable land dwindled, Okinawans turned toward ecotourism which merely compounded environmental problems. Construction of the Okuni Forest Road, a project traversing west to east in northern Okinawa, aimed to promote ecotourism on Okinawa but also posed a danger to the Yanbaru ecosystem. Yanbaru is home to various endangered species such as the Pryer's woodpecker, the Okinawan rail, the Okinawan spinous rat, and the Ryukyu long-tailed giant rat. The development of the Okuni Forest Road deforested roughly 22 miles through the heart of the forest, destroying miles of natural ecosystems. Furthermore, the development of the Jungle Warfare Training Center, although

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[17] Higashi, Katayama, Akio, “Land Development Works,” 30.

[18] McCormack, “Okinawan Dilemmas.”

housing minimal structures, threatened the ecosystems of the resident endangered species. To remedy the fear of local outcry, U.S. Military training demanded restrictions on live firing exercises and vehicle use. This move was in recognition of the Yanbaru forest as the "de facto largest semi-wilderness area in Okinawa."[19] Nevertheless, McCormack reveals that development in the area has proven to be "unsustainable," posing threats to the growth and life of the Yanbaru forest.[20]

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Other weapons used on the island during the war, such as DDT, caused unseen problems for decades. DDT was a synthetic organic compound used as an insecticide. DDT's common usage and success with managing disease-ridden insects during and after the war led many, such as Brigadier General James S. Simmons, to believe that "DDT is one of the most wonderful things, medically speaking, to come out of the war."[21] However, studies of the organic compound revealed that it persisted in the environment after use and concentrated in animals, leading to its transfer throughout the food chain. This, in turn, allowed the harmful chemicals to spread throughout various levels of the natural world, affecting sea and land organisms, including humans.[22]

In 1946, a physician from St. Louis, Michigan, and former president of the local Conservation Club in St. Louis, Dr. Bradbury Robinson, cited Michigan State University

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[19] Taylor, "Anti-Military and Environmental Movements," 6.

[20] McCormack, "Okinawan Dilemmas"

[21] James C. Leary, William I. Fishbein, and Lawrence C. Satler, *DDT and the Insect Problem* (New York: Mcgraw-Hill Book Company, Inc., 1946), v.

[22] Jon Mitchell, "Okinawa: The Junk Heap of the Pacific," *Japan Times*, November 11, 2013, accessed on January 17, 2019, https://www.japantimes.co.jp/community/2013/11/11/issues/okinawa-the-junk-heap-of-the-pacific/#.XEkDyezYqzz.

research which claimed: “Perhaps the greatest danger from DDT is that its extensive use in farm areas is most likely to upset the natural balances, not only killing beneficial insects in great number but by bringing about the death of fish, birds, and other forms of wildlife either by their feeding on insects killed by DDT or directly by ingesting the poison.”[23] Dr. Robinson and many others foresaw the dangers of the chemicals even before its ban by the Environmental Protection Agency in 1972. Unfortunately, the eventual ban was too little, too late. In 1975, locals discovered large fish kills on the coasts of Okinawa. Fish kills are caused by pollution from agricultural runoff. Studies of the coastal areas of central Okinawa and north Okinawa, determined that “productivity of fishes and seaweed decreased considerably as a result of runoff, contamination and subsequent sedimentation of fish foods such as plankton.”[24]

A 1993 U.S. Forces report revealed that runoffs near Camp Kinser in southwest Okinawa resulted in “three fish kills” in December 1974, January 1975, and October 1986.[25] This prompted concerns from the U.S. Army Pacific Environmental Health Engineering Agency. Aware of the continued spraying of DDT via hand-held spray guns and planes in the years after the war, the agency directed their efforts towards sea and soil contamination surveys. The survey results indicated “high concentration of chlordane, DDT, malathion,

[23] Dr. Bradbury Robinson, “A Nutritionist Ponders the D.D.T. Problem,” Personal Publication (St. Louis, Michigan, 1947).

[24] Higashi, Katayama, Akio, “Land Development Works,” 31-32.

[25] Jon Mitchell, “FOIA documents reveal hot spots, fish kills, and toxic dumps on Okinawa military base,” *Japan Times* (September 19, 2015), accessed on January 17, 2019, https://www.japantimes.co.jp/news/2015/09/29/national/foia-documents-reveal-hot-spots-fish-kills-toxic-dumps-okinawa-military-base/.

dioxin, and polychlorinated biphenyl." In 1991, the clean-up was estimated to cost $500,000, equivalent to $967,008 in 2019.[26]

The fishing industry suffered at the hands of toxic dumping, water pollution and soil erosion leaking into the sea and rivers. The fishing village of Henoko on the eastern shore of Okinawa is another example. In 1999, the United States Marine Corps planned to build seven new helicopter pads at various locations, one of which was directly offshore Henoko.[27] According to locals, the development of bases for live firing exercises and construction of helicopter landing pads "continue to send the Okinawan red silt into the sea."[28] Construction destroys the irreplaceable topsoil, which along with toxic pollutants, subsequently seeps into flourishing coral reefs. In the case of Henoko, the landing pad is designed to sit directly on top of the Henoko coral reef. Henoko was traditionally a fishing village; however, the loss of the bay and toxic dumping has drastically affected the local fishing economy.[29]

The Henoko base also endangered the dugong population off the coast of Okinawa. The Okinawa dugong, a distant member of the manatee, is considered one of the most endangered marine animals on Earth. For centuries, the dugongs fooled Okinawan sailors into believing that they were mermaids residing in the clear water in Oura Bay. When news broke that a new offshore military base was being built in the center of the dugong breeding ground, a leading environmental group, Save the Dugong Foundation (SDF), protested. By

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[26] Jon Mitchell, "FOIA documents"; Official Data Foundation, "inflation calculator," officialdata.org, accessed on March 16, 2019, https://www.officialdata.org/us/inflation/1990?amount=500000.

[27] Taylor, "Anti-Military and Environmental Movements," 11-13.

[28] Feifer, *Tennozan*, 560.

[29] Taylor, "Anti-Military and Environmental Movements," 8.

April 2002, SDF was able to raise enough awareness to partner with Save the Dugong Campaign Center (SDCC), a group from mainland Japan. The two organizations rallied behind three core measures:

> 1. To establish conservation areas for the protection of the dugong under the Law for the Conservation of Endangered Species of Wild Fauna and Flora. Protected species status would also help protect dugong's natural habitat, which in Japan is only around the Northeastern section of Okinawa's main island.
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> 2. Perform an Environmental Impact Assessment using internationally accepted standards for the Henoko heliport construction project. SDCC argues that in Japan EIAs are conducted under the assumption that the plan will go forward despite some environmental damage. They call for the possibility of a "zero option" – that the plan itself be shelved should the environmental damage be considered too great. They also call for public input into the EIA process.
>
> 3. Measures to control fishing nets by the Japanese government.[30]

Issuing the three measures was successful in rallying additional support. The Turtle Island Restoration Network (TIRN), an environmental protection group based in California, emerged as another ally eager to raise awareness for the Okinawa Dugong. The groups received 200,00 signatures to ensure dugong safety.[31]

Despite these group efforts, the United States and Japan released an environmental study conducted by the Japanese Government which promised, "the proposed base construction would not do significant damage to the dugong's natural environment."[32] The claim in the report surprised many because of the already established practice of dumping

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[30] Taylor, "Anti-Military and Environmental Movements," 12.

[31] Taylor, "Anti-Military and Environmental Movements," 12.

[32] Emma Chanlett-Avery and Ian E. Rinehart, "The U.S. Military Presence in Okinawa and the Futenma Base Controversy," *Congressional Research Service*, January 20, 2016, 8, accessed on February 1, 2019, https://fas.org/sgp/crs/row/R42645.pdf.

toxic waste and topsoil into Oura Bay. Okinawa Universities, under the leadership of Dr. Jun Ui of Okinawa University, banded together and publicly denounced the report, and in 2003 the Center for Biological Diversity filed lawsuits against the Department of Defense to stop construction. In 2005, the lawsuit was allowed to proceed under the National Historic Preservation Act. However, U.S. District Court Judge Edward Chen of San Francisco dismissed the suit in 2015, and the construction for the project continued moving forward as of December 14, 2018.[33]

In addition to the large supply of DDT polluting arable land, water, and other organisms, polychlorinated biphenyl (PCBs) was found in large supply throughout the island and near U.S. installations. Banned in 1979 by the EPA, PCBs are industrial products or chemicals that have unintended impacts on environmental and human health.[34] Studies from the Agency for Toxic Substances and Disease Registry at the Center of Disease Control and Prevention determined, "some animal studies suggest that exposure to PCBs causes an increased incidence of prenatal death and changes in the immune system, thyroid, and reproductive organs."[35] Other studies by the EPA discovered that PCBs caused "immune effects, reproductive effects, neurologic effects, and endocrine effects to humans."[36] By the

[33] Taylor, "Anti-Military and Environmental Movements," 12-13; Sudhin Thanawala, "Federal judge dismisses lawsuit over U.S. base in Japan," *Military Times* (February 14, 2015), accessed on March 16, 2019, https://www.militarytimes.com/news/your-military/2015/02/14/federal-judge-dismisses-lawsuit-over-u-s-base-in-japan/.

[34] National Oceanic and Atmospheric Administration, Department of Commerce, "What Are PCBs?," Accessed March 1, 2019, https://oceanservice.noaa.gov/facts/pcbs.html.

[35] Agency for Toxic Substances and Disease Registry, CDC, "Toxic Substances Portal - Polychlorinated Biphenyls (PCBs)," CDC.gov, July 2014, accessed on March 2, 2019, https://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=140&tid=26.

[36] Berkshire Environmental Action Team (BEAT), "How Dangerous are PCBs," *thebeatnews.org*, accessed on March 2, 2019, http://www.thebeatnews.org/BeatTeam/dangerous-pcbs/.

late 1980s, U.S. Military personnel identified toxic levels of PCBs at the Kadena Air Base in central Okinawa, the Pentagon's largest installation in the Pacific region. According to Jon Mitchell of the *Japan Times*, an obtained "in-house report" suggested that the PCBs levels "exceeded safe standards by many orders of magnitude." Although no specific levels were given, a 20-gallon oil spill in November 1986 from an electrical transformer at the Kadena Air Base storage facility prompted a series of environmental tests that discovered harmful levels of PCBs in the oil. The contamination levels, based on military reports and local news, was "214 parts per million (ppm)" and "the soil was contaminated at 2,290 ppm."[37] A final round of examination in October 1987 found the soil contamination levels at 5,535 ppm, more than enough to cause substantial environmental degradation and even death.

Like DDT, PCBs are easily absorbed by organisms, including humans. PCBs are stored in the fatty tissue of organisms and often seep into the soil. As a result, the consumption of contaminated animals and plants allowed the chemical to easily pass down ecological food chains. Fears grew that PCBs and DDT contaminated an unknown number of animals, plants, and humans on the island. Komichi Ikeda, an adviser at the Environmental Research Institute in Tokyo claimed that because of the prolonged exposure to PCBs and DDT during and after the war, "the soil needs to be investigated to see what other dangerous substances - such as dioxins - may be present...With this in mind, groundwater samples need to be taken to assess whether any contamination has spread."[38] Ikeda's observations and calls

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[37] Jon Mitchell, "U.S. military report suggests cover-up over toxic pollution in Okinawa: Documents showing sky-high PCB levels in soil raise questions about the state of other U.S. bases," *Japan Times* (March 17, 2014), accessed on March 5, 2019, https://www.japantimes.co.jp/community/2014/03/17/issues/u-s-military-report-suggests-cover-up-over-toxic-pollution-in-okinawa/#.XFCaeezYqzx

[38] Jon Mitchell, "Military Contamination on Okinawa: PCBs and Agent Orange at Kadena Air Base," *The Asian Pacific Journal* 12, no. 1 (March 18, 2014): 4, accessed on March 2, 2019, https://apjjf.org/-Jon-Mitchell/4097/article.pdf.

for further testing were warranted. Since the 2000s, academic researchers at the Universities of Ehime and Meio, led by Dr. Yutaka Tashiro of Meio, documented harmful traces of DDT and PCBs in the bodies of Okinawa's most precious species, the mongoose.[39]

The Habu snake and the Okinawan mongoose became the focus of the studies around the southwestern U.S. Base, Camp Kinser. The research group examined twelve adult male Habu snakes in the area and found that all twelve had PCBs and DDT present, and five out of the twelve had "especially high" concentrations.[40] This discovery prompted an investigation into the mongoose population, a species that preyed on the habu snake. The research yielded similar results, revealing that the mongoose population did indeed carry the harmful pollutants. The results confirmed fears that the chemicals spread and poisoned an unknown number of species through the consumption hierarchy of ecological food chains. This fear gained wider attention when Okinawan and Pentagon officials noted more "dangerous levels of contamination" around the wild and man-made environments near the U.S. base at Okinawa City. Since the discovery of the environmental and chemical pollution around these areas, city officials from Urasoe asked national leaders to further investigate the extent of environmental damage.[41]

Postwar development on Okinawa continued to reshape the island into a weaponized landscape as the Cold War occupied American consciousness. While most countries

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[39] Yutaka Tashiro, Akitoshi Goto, Tatsuya Kunisue, Takuya Kurahashi, And Shinsuke Tanabe, "Contamination Status of PCBs and Organochlorine Pesticides in the Okinawa Island, Japan: Utilization of Small Indian Mongoose (Herpestes auropunctatus) as a Bioindicator," *Journal of Environmental Chemistry* 26, no. 3 (2016): 116, accessed on March 17, 2019, https://www.jstage.jst.go.jp/article/jec/26/3/26_115/_pdf.

[40] Japan Update, "Urasoe Habu Have High Concentrations of PCB and DDT," *Japan Update*: *Classifieds* (September 8, 2015), accessed on January 24, 2019, http://www.japanupdate.com/2015/09/urasoe-habu-have-high-concentrations-of-pcb-and-ddt/.

[41] Jon Mitchell, "Okinawa: the Junk Heap of the Pacific."

renounced the use of chemical weapons following the 1925 Geneva Protocol, the fears of Communism and Soviet power convinced U.S. officials to unofficially produce and store chemical and toxic weapons on U.S. Military bases. The first chemical weapons arrived on Okinawa between 1950-53 and the shipments increased from 1962-63. The main storage site on Okinawa was an arsenal at the Chibana Ammunition Depot, located on a hilltop near the Kadena Air Base. The Chibana Depot was housing the chemical weapon most synonymous with the Vietnam war, Agent Orange.[42] The chemical was a combination of butoxyethanol esters of dichlorophenoxyacetic acid and trichlorophenoxyacetic acid. The purpose of the chemical weapon was to defoliate forests and mangroves in order to deny North Vietnamese troops adequate cover and to make U.S. bombing targets more visible.[43]

Okinawa was a pristine location for stockpiles of chemical weapons. The 1952 Treaty of San Francisco gave the Pentagon full control of the island and several other Japanese territories such as the Bonin islands. Article 3 of the treaty stated, "the United States will have the right to exercise all and any powers of administration, legislation, and jurisdiction over the territory and inhabitants of these islands, including their territorial waters."[44] Article 3 placed Okinawa in what *Japan Times* correspondent Jon Mitchell called the "geopolitical

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[42] Bureau of International Security and Nonproliferation, "Geneva Protocol," June 17, 1925, U.S. Department of State, accessed on March 1, 2019, https://www.state.gov/t/isn/4784.htm; Jon Mitchell, "Exclusive: Red Hat's lethal Okinawa smokescreen," *Japan Times* (July 27, 2013), accessed February 15, 2019, https://www.japantimes.co.jp/life/2013/07/27/general/exclusive-red-hats-lethal-okinawa-smokescreen/#.XJjr-uzYqzw.

[43] Jeanne M. Stellman and Steven D. Stellman, "Agent Orange During the Vietnam War: The Lingering Issue of Its Civilian and Military Health Impact," *American Public Health Association* 108, no. 6 (June 2018), accessed on March 20, 2019, https://ajph.aphapublications.org/doi/10.2105/AJPH.2018.304426.

[44] United Nations - Treaty Series, "Treaty of Peace with Japan," San Francisco, CA, September 8, 1952, 50, accessed February 26, 2019, https://treaties.un.org/doc/publication/unts/volume%20136/volume-136-i-1832-english.pdf.

gray zone."[45] From 1945-1972, the treaty effectively gave the U.S. installations on Okinawa protection from U.S. law and the Japanese Constitution. Furthermore, the environmental movement and laws in the United States had yet to make headway at this point in time. Such an atmosphere allowed the Pentagon to store stockpiles of atomic and chemical weapons without repercussions.

As the bases expanded, fuel leaks and industrial grade detergents spilled into streams and saturated the ground, and many solvents were simply flushed as means of disposal without the slightest regard for where they might end up. Arsenic contamination emerged as a concern as development progressed. In 1947, an arsenic leak from a nearby U.S. compound in Iheya village, located just off the northern tip of the Okinawa proper mainland, led to the death of eight locals. The Iheya incident generated negative attention towards the U.S. Military, but the U.S. consulate and Pentagon continually deflected from the issue, often times stating that these failures merely added to the "leftist catalog of evils of the U.S. Base system." However, arsenic pollution continued and in 2008, Yomitan Village, a community nestled on the west coast on the Yomitan peninsula, experienced arsenic levels 120 times over the safe, legal limit.[46]

On July 8, 1969, local officials learned that the Pentagon was storing Agent Orange on Okinawa. The U.S. Army Chemical Corps devised what they believed to be an infallible system for the storage site at the Chibana Ammunition Depot. The Chemical Corps used goats and rabbits in order to observe signs of contamination leaks before it reached the public. A herd of goats roamed outside the base, while rabbits were housed in cages within

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[45] Mitchell, "Okinawa: the Junk Heap of the Pacific."

[46] Mitchell, "Okinawa: the Junk Heap of the Pacific."

the facility. If a leak occurred, the animals displayed symptoms of contamination, mainly "pinpricked pupils." However, this supposed "fool-proof" animal warning system failed in July 1969.[47] A leak resulted in 20 sick service members and sparked outrage and fear among locals about further contamination. Second Lieutenant Lindsey Peterson was the head of the Hamby Storage Area in central Okinawa, and in an interview with *Japan Times*, confessed to having knowledge of leaking barrels in 1969. According to Lt. Peterson, "most of them were leaking, so we had to empty them into new 55-gallon [209 liters] drums."[48]

The discovery of the storage of Agent Orange came at a time when the U.S. was attempting to win the moral high ground in Vietnam through limited intervention. Under the direction of the recently elected administration of President Richard Nixon, U.S. troop levels in the region slowly decreased and more control was granted to the south Vietnamese forces. The hope of attaining a moral high ground, however, dissipated when it became known that the U.S. was actively using and storing chemical weapons on island territories, a move in direct violation of the 1925 Geneva Protocol. In attempts to salvage the American image, military personnel worked quickly to dispose of the chemicals. In a shocking decision, military personnel dumped the toxins in the Haebaru and Gushikami districts of Okinawa, according to Peterson and other veterans working on Okinawa at the time. Subsequently, Agent Orange seeped into the Kokuba Rover, polluting the river and the water supply of over 30,000 residents. Discovery of this action was so embarrassing to President Richard Nixon's

[47] Mitchell, "Exclusive: Red Hat's lethal Okinawa Smokescreen."

[48] Mitchell, "Okinawa: the Junk Heap of the Pacific."

administration that Henry Kissinger, the National Security Adviser at the time, blamed the situation on an unnamed Major, claiming "his aesthetic sense exceeded his judgment."[49]

On July 18, 1969, ten days after the chemical leak at the Chibana Ammunition Depot, the *Wall Street Journal* ran the story on the front page, forcing the United States to transfer the chemicals from the island.[50] The transfer of this material resulted in the hospitalization of twenty-four American service members after exposure to "VX Nerve Gas." In fact, the U.S. Military newspaper, *Stars and Stripes*, published a news story that claimed two unnamed veterans working on the island at that time suffered health problems as a result of exposure. According to one veteran, he was exposed to toxic chemicals "15 to 16 times a day for 18 months."[51] Knowledge of past leaks demanded that the Department of Defense (DoD) act swiftly to avoid the spread of chemical pollutants. U.S. officials claimed that "Japanese Leftists" posed a threat by possibly rallying behind this news in order to embarrass President Nixon during his Asian Tour later in July. However, the greater issue was the damaged American image on the international stage. The ongoing conflict in Vietnam was unpopular and chemical warfare negligence exasperated the issue of international image.

Operation Red Hat was the U.S. military plan of action for removing the chemical agents on Okinawa. The military planned to transfer the pollutants to John Island in the North Pacific. The island was under military jurisdiction and located 750 miles southwest of

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[49] Henry Kissinger, *White House Years* (Boston: Little, Brown, 1979), 331.

[50] Central Intelligence Agency, "Nerve Gas Incident on Okinawa," MEMORANDUM FOR Director of Current Intelligence, July 18, 1969, 1, accessed on February 23, 2019, https://www.cia.gov/library/readingroom/docs/CIA-RDP80B01439R000500090021-7.pdf.

[51] Matthew M. Burke and Chiemi Sumida, "2 vets win Agent Orange exposure cases from Okinawa," March 5, 2017, accessed on February 24, 2019, https://www.stripes.com/news/2-vets-win-agent-orange-exposure-cases-from-okinawa-1.457227.

Hawai'i. Operation Red Hat was an 18-month undertaking and according to the Pentagon, the last chemical weapons left Okinawa on September 10, 1971. In 1971, to coincide with the cleanup process, the Pentagon launched a Propaganda film titled, *Operation Red Hat: Men and a Mission.* The film claimed the clean-up was handled safely and responsibly, but the evidence presented by veterans of the operation claimed the contrary.[52] Many veteran sources asserted that toxic dumping into the sea and ocean was common practice. James Spencer, U.S. Army stevedore with the 412th Transportation company, told the *Japan Times* in 2013*:* "We used a winch to lift the containers [of chemicals] out of the hold and then a large forklift to push them overboard. I am not sure how many we dumped — it was a lot. The entire operation took 48 hours." Tom Westfall, serving with the 895th Military Police Company, also noted that "there were discussions about the stuff being dumped offshore and whether or not that was safe."[53] The extent of the damage caused by the dumping remained undocumented and Pentagon-based U.S. Army spokesman, Dave Foster expressed that the army discovered "no record of any disposal of chemical or conventional munitions in the autumn of 1969 off the east coast of Okinawa, nor on any other date."[54]

Toxic leaks persisted, however. In August 1975 a chemical leak occurred at the Machinato Service Center. Rather than accept responsibility for the pollution, the U.S. State Department merely recognized that this would be used to hurt public image and dismissed the fears. The State Department concluded, as they had done in the past during pollution

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[52] NARA. *Operation Red Hat: Men and a Mission*, National Archives and Records Administration, January 1, 1971, Video, accessed on February 1, 2019, https://archive.org/details/gov.archives.arc.3033306.

[53] Jon Mitchell, "Exclusive: Red Hat's lethal Okinawa Smokescreen."

[54] Jon Mitchell, "Exclusive: Red Hat's lethal Okinawa Smokescreen."

issues, that "newspapers and the leftists will certainly make good use of this issue against us." Okinawa, as it was during the Japanese occupation in the Second World War, was a political tool for the purpose of military weaponization of the island in defense of the homeland. Little regard was given to the native population and the natural environment. Military bases continued to grow and develop, and the loss of cultural and natural landscapes laid the foundation for the beginnings of a new environment, the Okinawa cityscape.

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In the early stages of U.S. occupation, locals started to rebuild their destroyed villages, but many lacked sufficient supplies of wood and paper to complete the process. This was partly due to the enormity of battle destruction, but it was also because of deforestation (primarily in the upland) and U.S. military efforts to remove limestone, dominant clays, and topsoil for the construction of military installations.[55] The majority of usable resources not destroyed in the battle were utilized by the U.S. Military to construct roads, bases, runways, and ammunition and weapon arsenals. The U.S. Military gave little consideration to the previous land patterns which merely exacerbated the suffering of locals. Adding to the credibility of Okinawa's post-war name, "Junk Heap of the Pacific," was the waste and rubble outside military bases following construction.[56] The wreckage was so immense that in 1947 a U.S. soldier in the Army Corps of Engineers noticed that the area around Naha, Okinawa was "just piles and mounds of stone and concrete fragments...dividing into large sections by what appeared to be roadways that had been bulldozed through the ruins." A

[55] Intelligence Division, Office of the Engineer Headquarters, United States Army, "Military Geology of Okinawa-Jima, Ryukyu-Retto," 1957, 4, https://pubs.usgs.gov/fedgov/70039235/report.pdf.

[56] Mitchell, "Okinawa: the Junk Heap of the Pacific."

witness during the inspection visit of the Assistant Secretary of the Army noted that he was utterly "flabbergasted with what he saw."[57]

Base construction reshaped the cultural ecology of Okinawa. The island's economic wealth and way of life no longer depended on a strong fishing and farming industry. The military used the immense resources of limestone and coral to construct a plethora of concrete bases ranging from Camp Kinser in the south to Camp Gonsalves in the north. As John Taylor notes, the structural effects of U.S. installations on the culture of Okinawa created an increased dependence on "construction and public works and the damming on all of the island's rivers."[58] Because the presence of large U.S. bases caused these effects, the Japanese government, after obtaining jurisdiction of the island in 1972, decided to compensate the Okinawan government. However, because the Japanese government maintained political power over the island, much of the financial compensation went towards development funding. Specifically, Taylor reveals funding went into the construction of "large bridges, land reclamation, the construction of largely superfluous sea walls which ring the island, roads, large under-utilized conference centers, theme parks, and a whole host of other projects."[59]

The shift towards public works and construction altered the way in which Okinawans made their income and built their towns and cities. As base construction caused deforestation and made the use of concrete the primary building resource, Okinawans reoriented building

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[57] Feifer, *Tennozan*, 555.

[58] Taylor, "Anti-Military and Environmental Movements," 5.

[59] Dr. John Taylor, "Environment and Security Conflicts: The U.S. Military in Okinawa" (California State University, Fullerton), 2006, 7. accessed March 3, 2019, https://www.academia.edu/7116447/Environment_and_Security_Conflicts_The_US_Military_in_Okinawa.

practices away from wood. George Feifer noted how Okinawa became a "proliferation of stark concrete squares...some of the world's most graceful architecture was filled with some of the most depressing, a sprawl of garages, cheap shops, junkyards, and instant slums." This introduced a striking cultural change in how locals built their communities. Communities in Okinawa no longer embodied an open agrarian culture. Villages and towns began to adopt western ideas of how to construct cities and towns. When American veterans returned to the island in 1987, many were surprised to see "skyscrapers, choking traffic, and a crazy quilt of stores and shops."[60]

Much of the shift towards a modern, western cityscape can be attributed to the destruction of land and traditional ways of life. As John Taylor highlights, at the Central Training Area in Northern Okinawa, the extensive firing of artillery shells led to "deforestation, frequent fires, vegetation denudation, and soil erosion." Although farmland was more limited in the north, the majority of arable land in the south faced construction, making any useful land in the north even more limited. In fact, Dr. Alan Ramo of Golden Gate University Law revealed that U.S. bases "physically displaced agricultural land and absorbed agricultural laborers." The small village of Henoko most noticeably exhibited this trend. Henoko was once an agricultural fishing village, but since military development, the primary source of income for the area has resided in land rentals, construction projects, and family stores.[61] Perhaps most astonishing is the fact that the U.S. military, even after the island returned to Japanese control, was not legally required by U.S., Japanese, or

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[60] Feifer, *Tennozan*, 552-553.

[61] Alan Ramo, "U.S. Military Accountability for Extraterritorial Environmental Impacts: An Examination of Okinawa, Environmental Justice, and Judicial Militarism," *Tulane Environmental Law Journal* 28, no. 1 (2014): 59, 62.

international law to clean and maintain the land near and around the Central Training area in Northern Okinawa. With arable land at a minimum due to base development, agriculture business plummeted, continuing the shift towards construction and public works.[62]

The war destroyed the existing cultural landscape on Okinawa. Aside from the loss of traditional building methods and style, the destruction of tens of thousands of tombs and burial sites proved to be one of the hardest losses within the cultural environment of the island. Throughout the battle, Japanese defenders utilized tombs and burial sites for the purpose of conducting their defensive war of attrition. The burial tombs fit into the Japanese plan of weaponizing the terrain against the Americans. Once the Americans learned of this, U.S. forces received direct orders to "demolish as many as possible."[63] Countless tombs and ancestral burial sites fell victims to the battle's fury. By the end of the campaign, the new Tenth army commander, General Joseph Stilwell stated: "The poor Okinawans...have had even their ancestors blown to pieces."[64]

Many native islanders were determined to move forward from the battle's horrors, while others faced psychological struggles. Seizan Nakasone, an Okinawa schoolteacher, was so disappointed by this loss of cultural identity that he wrote: "Let no trees grow, no grass sprout on that [the site of Shuri Castle] until all the peoples of the world have seen this ruin wrought by the Battle of Okinawa." The loss of what was known and familiar to Okinawans created a sense of uncertainty. As a result, psychiatric illnesses, such as depression, skyrocketed higher than anywhere else in the Pacific. Many observers in the immediate post-

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[62] Taylor, "Anti-Military and Environmental Movements," 5-6.

[63] Feifer, *Tennozan*, 554.

[64] Feifer, *Tennozan*, 554.

war period attribute this to the loss of ancestral tombs and burial sites.[65] The people of Okinawa were directly connected to the burial sites of ancestors. In the Okinawa worldview, burial sites provided them with knowledge of their eventual destination and completion of the life cycle - man is born into Earth and in the end, into the Earth man returns. The security of ancient family roots nourished native Okinawans. When their sacred tradition that composed their cultural environment evaporated under the steel typhoon of modern war, many saw their absence as a daily reminder of the hell introduced by the battle and larger war. Nevertheless, some of the cultural and natural landscape recovered, offering a source of hope to the Okinawan people.

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Despite pollution and growing construction, the environment has recovered to some degree. The years of famine in the latter part of the 1940s led Okinawans to rely increasingly on culturally important crops for consumption. Stephen Mansfield of *Japan Times* notes how the present day Okinawa diet of pineapples and sweet potatoes stemmed in part "from inherent resourcefulness developed in periods of extreme poverty." Military occupation consumed most of the arable land, however, local Okinawans focused their semi-agrarian practices where possible.[66] As Lewis Thomas noted in his soil and insect studies with U.S. Naval Researchers, Okinawa soil was pristine for its unique purple sweet potatoes. Similarly, the U.S. built fewer bases in the North due to the rugged and mountainous terrain. As a

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[65] Feifer, *Tennozan*, 554.

[66] Stephen Mansfield, "Food for thought: A traditional Okinawan diet may help prolong life," *Japan Times*, December 12, 2015, accessed on February 17, 2019, https://www.japantimes.co.jp/life/2015/12/12/lifestyle/food-thought-traditional-okinawan-diet-may-help-prolong-life/#.XGxr3uzYqzz.

result, locals gained access to pockets of arable land with acidic soil perfect for the fickle pineapple. To present, Okinawa is one of the main pineapple exporters to mainland Japan.[67]

These developments may appear minor; however, they display the resilience of Okinawans and their landscape to persevere in spite of pollution and construction. The coral reefs still face degradation. Okinawa fishermen engaged in aquaculture of mozuku seaweed and sea grapes noticed red silt runoff from pineapple farms, sugar cane farms, and construction sites. The fishermen noted how the runoff clouded the water and prevented sunlight from nourishing plants, thus stunting growth. This destroyed photosynthesis of zooxanthellae, an important sea algae which resides in the endoderm of tropical cnidarians such as coral and sea anemones.[68] Runoff similarly depleted coral development as it settled on the seafloor. In response to these discoveries, the local government established the Okinawa Prefecture Red Soil Erosion Prevention Ordinance. Since enforcement began in October 1995, studies indicated that the reefs have recovered 40 percent. This enabled steady growth for Okinawa's tourism economy. As of 2018, snorkeling and diving are the two leading tourist activities on the island, and the tourist industry proudly brags about the regrowth in sea biodiversity, claiming "200 species out of the world's 800 species of coral inhabit the waters around Okinawa."[69]

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[67] U.S. Department of Agriculture Foreign Agricultural Service, Japanese Fresh Fruit Market Overview 2018, Global Agricultural Information Network, October 30, 2018, https://gain.fas.usda.gov/.

[68] Shinichiro Kakuma and Masahito Kamimura, "Satoumi in an Okinawan Coral Reef System," *Ourworld.unu.edu*, August 15, 2012, accessed on March 5, 2019, https://ourworld.unu.edu/en/satoumi-in-an-okinawan-coral-reef-system.

[69] Visit Okinawa, Japan, Diving and Snorkeling, accessed on February 18, 2019, https://www.visitokinawa.jp/information/diving-and-snorkeling.

Other areas scarred by war also recovered and boosted the tourist economy. Bios no Oka, a nature park in Uruma City in southeast Okinawa, houses various animals, including the Okinawa water buffalo, orchids and subtropical plants such as the Barringtonia, a plant native to Okinawa's swamps and wetlands. Uruma faced significant activity during the battle and became the location of one of the earliest military camps for civilians.[70] The Yohena Hydrangea Garden was another site that appeared untouched by the battle. Located in the town of Izumi of Motobu-cho on the Motobu Peninsula, the garden, yet to exist at the time, was situated in the midst of the battle for Yae-dake Mountain. The site of the Yohena Hydrangea Garden is now home to over 300,000 hydrangeas, including 30 different hydrangea species. The garden is just over two acres and also displays tangerine trees littered throughout the hydrangeas.[71]

Yae-dake Mountain was the site of General Takesiko Udo's defensive stronghold. The area was riddled with well-hidden field guns. Marines assaulting the position recalled numerous "artillery emplacements dug into the mountainsides." The fiercest combat took place from April 10-14. U.S. ships and planes hammered the heights with artillery and aerial bombardment. After seizing the mountain on April 14, one Marine remembered: "tremendous devastation all around."[72] Today Yae-dake is home to not just the Yohena Hydrangea Garden, but also the earliest cherry blossom blooming in the world. The flower tunnel on Mt. Yae-dake displays over 4,000 Kanhizakura (Taiwan cherry) trees along the

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[70] Visit Okinawa, Japan, "Experience the Nature of Okinawa at Bios no Oka," *Nature* (blog), accessed on February 18, 2019, https://www.visitokinawa.jp/information/bios-no-oka.

[71] Visit Okinawa, Japan, "Yohena Hydrangea Garden is Fun even in the Rain!," *Nature* (blog), accessed on February 18, 2019, https://www.visitokinawa.jp/information/yohena-hydrangea-garden-is-fun-even-in-the-rain.

[72] Feifer, *Tennozan*, 119-20.

mountain. The bloom is best witnessed during mid-January to mid-February and stands as a symbol of nature's ability to recover from the scars of war. Mt. Yae-dake is the tallest mountain on Motobu, and as such, stands as a noble reminder of the resiliency of the natural world of Okinawa.

In the same light, the whole story of the battle of Okinawa, both human and environmental, ends with attempts to heal the scars left from the war. Similar to the reconciliation at the Gettysburg Battlefield in 1913, Japanese and American veterans convened for the erection of a monument to all sides in 1987. The monument honored veterans from Japan, the United States, and Okinawan civilians. Located one kilometer north of Sugar Loaf Hill, the monument was placed within a Garden of Remembrance. Edward Buzzy Fox, the campaign's organizer stated, "I should have done this years ago...I have lived a life full of needless hate. It is gone now and I feel at peace with myself." Another U.S. veteran who lost his right leg during the battle now sat and drank with fellow amputee veterans from the 32nd Army. Looking back on the event, the American veteran said, "This is a wonderful event and I am so happy I could be there."[73]

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The Battle of Okinawa dramatically reshaped the environment. It eroded the "veneer of civilization" and made savages of all men involved. Many veterans continued to face residual mental and physical scars as a result of the battle's destructive and barbaric nature. Marine veteran William Manchester refused to partake in the reconciliation event due to his own reservations about forgiving the Japanese. Nevertheless, the reconciliation between all sides represented a clear reminder of how warfare scars both nature and man. As U.S.

[73] Feifer, *Tennozan*, 556-559.

corporal James Day noted in his memorial speech: "It [Okinawa] is a stark documentary to the folly of mankind. It is a stark documentary to the foolishness of war."[74]

Anyone who has seen the HBO miniseries, *The Pacific*, recalls the concluding episode depicting Eugene Sledge's struggle to transition into the peaceful civilian world. He and his father go on a hunting trip, an activity they had partaken in prior to the war. However, the activity of taking the life of another creature proved no longer feasible for Sledge. The scene is vivid. His father holds him as he breaks down, overwhelmed with emotions. Sledge can no longer kill. He can no longer bring destruction.[75] While the scene references the fact that Sledge can no longer stomach killing, a skill he mastered while fighting on Peleliu and Okinawa, it also carries another meaning. The war brought the death of human life, but it also brought the death of the natural world. Sledge knows he is out hunting birds and not man, but the death of all creatures within nature, human and nonhuman, adds to the universal devastation of war. War is a hellish, uninhabitable world, and its destructive nature turns humans against each other and the natural world. The Battle of Okinawa was simply "brutish, inglorious, and a terrible waste," and it left an indelible mark on humans and nature alike.[76]

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[74] Feifer, *Tennozan*, 557.

[75] *The Pacific*, episode 10, "Part 10," directed by Tom Hanks & Steven Spielberg (aired March 14, 2010 on HBO), accessed Nov. 11, 2018, DVD.

[76] Sledge, *With the Old Breed*, 315.

“I am the harvest of man’s stupidity. I am the fruit of the holocaust. I prayed like you to survive, but look at me now. It is over for us who are dead, but you must struggle, and will carry the memories all your life. People back home will wonder why you can’t forget.”

— *Eugene B. Sledge, With the Old Breed: At Peleliu and Okinawa*

Bibliography

Secondary:

Adams, Michael C.C. *The Best War Ever*. Johns Hopkins University Press, 1993.

Agency for Toxic Substances and Disease Registry, CDC. "Toxic Substances Portal - Polychlorinated Biphenyls (PCBs)." *CDC*. July 2014. Accessed March 2, 2019. https://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=140&tid=26.

Alexander, Joseph. *Storm Landings.* Annapolis*:* Naval Institute Press, 2013.

Alexander, Joseph. "The Final Campaign: Marines in the Victory on Okinawa." Marines in World War II Commemorative Series 1996. https://www.nps.gov/parkhistory/online_books/npswapa/extcontent/usmc/pcn-190-003135-00/sec5a.htm.

Ampuji, Outi. "Perspectives on the Acoustic Ecology of War." in *Long Shadows: A Global Environmental History of the Second World War*. Ed. Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo. Corvallis: Oregon State University Press, 2017.

Allen, David. "On Okinawa, Families Show Respect for the Dead with Tradition." *Stars and Stripes*. April 15, 2006. Accessed November 11, 2018. https://www.stripes.com/lifestyle/on-okinawa-families-show-respect-for-the-dead-with-tradition-1.49217.

Appleman, Roy E. *Okinawa: The Last Battle*, United States Army in World War II. Washington, D.C.: Center of Military History, United States Army, 1993.

Bennett, Judith. "Pests and Disease in the Pacific War: Crossing the Line." in *Natural Enemy, Natural Ally: Toward an Environmental History of War.* ed. Richard P. Tucker and Edmund Russell. Corvallis: Oregon State University Press, 2004.

Berkshire Environmental Action Team (BEAT). "How Dangerous are PCBs." *Thebeatnews.org*. Accessed March 2, 2019. http://www.thebeatnews.org/BeatTeam/dangerous-pcbs/.

Blacker, Carmen. "Shinto and the Sacred Dimension of Nature. "Excerpted from the International symposium: 'Shinto and Japanese Culture.'" Accessed March 19, 2019. https://web.archive.org/web/20071222193053/http://www.shinto.org/isri/eng/dr.carmen-e.html.

Bohart, Richard M. *Mosquitoes of Okinawa and Islands in the Central Pacific.* Washington, D.C.: Navy Department, Bureau of Medicine and Surgery, 1946.

Bugni, Toni M. “The Continued Invasion: Assessing the United States Military Presence on Okinawa through 1996,” *Suffolk Transnational Law Review* 21, no. 85. (1997): 85-112.

Burke, Matthew M. and Sumida, Chijomi. “2 vets win Agent Orange exposure cases from Okinawa.” March 5, 2017. Accessed February 24, 2019. https://www.stripes.com/news/2-vets-win-agent-orange-exposure-cases-from-okinawa-1.457227.

Center for Disease Control and Prevention. “Typhoid Fever and Paratyphoid Fever.” Centers for Disease Control and Prevention Accessed February 22, 2019. https://www.cdc.gov/typhoid-fever/symptoms.html.

Center for Disease Control and Prevention. “Typhus Fevers.” Centers for Disease Control and Prevention. Accessed Feb 22, 2019. https://www.cdc.gov/typhus/epidemic/index.html.

Center for Disease Control and Prevention. “Malaria.” CDC. Accessed February 3, 2019. https://www.cdc.gov/malaria/about/faqs.html.

Cerry-Caban, Cristobal S. “DDT and Silent Spring: Fifty years after.” J*ournal of Military and Veterans' Health* 19. no. 4 (2011): 19-24.

Chanlett-Avery Emma and Rinehart, Ian E. “The U.S. Military Presence in Okinawa and the Futenma Base Controversy.” *Congressional Research Service*. (January 20, 2016): 1-21. Accessed February 1, 2019. https://fas.org/sgp/crs/row/R42645.pdf.

Corliss, Mick. "Fears for Okinawa's Unique Ecosystem." *The Japan Times*. July 20, 2000, Accessed November 7, 2018. https://www.japantimes.co.jp/life/2000/07/20/environment/fears-for-okinawas-unique-ecosystem

Costello, John, *The Pacific War 1941-1945*. Quill: New York, 1982.

Dower, John. *War Without Mercy: Race and Power in the Pacific War*. New York: Pantheon Books, 1986.

Duiker, Sjoerd W. “Effects of Soil Compaction.” Penn State University Extension. March 8, 2005. Accessed February 26, 2019. https://extension.psu.edu/effects-of-soil-compaction.

Feifer, George. *Tennozan: The Battle of Okinawa and the Atomic Bomb*. New York: Ticknor & Fields, 1992.

Feifer, George. *Battle of Okinawa: The Blood and the Bomb.* Guilford, CT: Globe Pequot Press, 2011.

Feifer, George. “The Rape of Okinawa.” *World Policy Journal* 17, no. 3. Fall (2000): 33-40.

Frank, Benis. *Okinawa The Great Island Battle.* New York: Elsevier-Dutton, 1978.

Frank, Benis M. and Shaw Jr., Henry I. V*ictory and Occupation: U.S. Marine Corps Operations in World War II*. Washington, D.C.: Historical Branch, G-3 Division, Headquarters, U.S. Marine Corps, 1968.

Frank, Richard B. *Downfall.* New York: Random House, 1999.

Giangreco, D. M. "Casualty Projections for the U.S. Invasions of Japan, 1945-1946: Planning and Policy Implications." *The Journal of Military History* 61, no. 3 (1997): 521-81. doi:10.2307/2954035.

Goguen, Claude and Tennis, Paul D. “Portland-Limestone Cement.” June 02, 2014. Accessed November 27, 2018. https://precast.org/2014/06/portland-limestone-cement/.

Haberman, Clyde. “Rachel Carson, DDT, and the Fight Against Malaria.” *The New York Times*. Jan. 22, 2017. https://www.nytimes.com/2017/01/22/us/rachel-carson-ddt-malaria-retro-report.html.

Hall, Marcus. “World War II and the Axis of Disease.” in *War and the Environment: Military Destruction in the Modern Age*. ed. Charles E. Closmann. College Station: Texas A&M University Press.

Hideo, Kubotera. “The Factors and Assumed Mechanisms of the Hardening of Red Soils and Yellow Soils in Subtropical Okinawa Island, Japan.” *Japan International Research Center for Agricultural Sciences 40. no. 3 (2006):* 197-203.

Higashi, Teruro, Katayama, Tadao C., Akio, Shinagawa. “Land Development Works and Soil Erosion in Okinawa Prefecture.” *Nanhai Research Journal* 6. no. 1. (1985): 26-36.

Hoffman, Michael, “Land of the Sun Goddess.” *Japan Times*. July 12, 2009. Accessed March 18, 2019.https://www.japantimes.co.jp/life/2009/07/12/general/land-of-the-sun-goddess/#.XJgNT-zYqzw.

Hoffman, Michael. “Okinawa: a long history of hardship.” *Japan Times*. June 10, 2012. Accessed November 27, 2018. https://www.japantimes.co.jp/culture/2012/06/10/books/book-reviews/okinawa-a-long-history-of-hardship/#.XAcpzKhKizw

Japan Update. "Urasoe Habu Have High Concentrations of PCB and DDT." *Japan Update*: *Classifieds* (September 8, 2015). Accessed January 24, 2019.

http://www.japanupdate.com/2015/09/urasoe-habu-have-high-concentrations-of-pcb-and-ddt/.

Kakuma, Shinichiro and Kamimura, Masahito. “Satoumi in an Okinawan Coral Reef System.” *Ourworld.unu.edu. (*August 15, 2012), Accessed March 5, 2019. https://ourworld.unu.edu/en/satoumi-in-an-okinawan-coral-reef-system.

Keegan, John. *The Face of Battle*. London: Penguin Books, 1976.

KZN Department of Health, Publish Health Vectors and Pests: Flesh Fly. Accessed January 15, 2019. http://www.kznhealth.gov.za/environ/vector/fleshfly.htm.

Lang, M.C. "Let the Records Bark!" Personal Stories of Some Special Marines in World War II. December 15, 2017. Accessed November 7, 2018. https://www.archives.gov/publications/prologue/2011/winter/marine-dogs.html.

Laurent, Helene. “The Great Louse War: Control of Typhus Fever.” in *Long Shadows: A Global Environmental History of the Second World War*. Ed. Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo. Oregon State University Press, 2017.

Leary, James C., Fishbein, William I., and Satler, Lawrence C. *DDT and the Insect Problem.* New York: Mcgraw-hill Book Company, INC, 1946.

Mansfield, Stephen. “Food for thought: A traditional Okinawan diet may help prolong life,” *Japan Times* (December 12, 2015). Accessed February 17, 2019. https://www.japantimes.co.jp/life/2015/12/12/lifestyle/food-thought-traditional-okinawan-diet-may-help-prolong-life/#.XGxr3uzYqzz.

Marriott, Bernadette M. and Institute of Medicine (U.S.). *Food Components to Enhance Performance: An Evaluation of Potential Performance-Enhancing Food Components for Operational Rations.* Washington D.D.: National Academies Press, 1994.

Mayo Clinic. “Encephalitis.” Accessed February 6, 2019. https://www.mayoclinic.org/diseases-conditions/encephalitis/symptoms-causes/syc-20356136

Mayo Clinic. “Typhoid Fever.” *mayoclinic.org*. Accessed February 6, 2019. https://www.mayoclinic.org/diseases-conditions/typhoid-fever/symptoms-causes/syc-20378661.

McCormack, Gavan. “Okinawan Dilemmas: Coral Islands or Concrete Islands.” *Japan Policy Institute* (April 1998). Accessed February 27, 2019. http://www.jpri.org/publications/workingpapers/wp45.html.

Mitchell, Jon. “FOIA documents reveal hot spots, fish kills, and toxic dumps on Okinawa military base.” *Japan Times.* (September 19, 2015). Accessed January 17, 2019.

https://www.japantimes.co.jp/news/2015/09/29/national/foia-documents-reveal-hot-spots-fish-kills-toxic-dumps-okinawa-military-base/.

Mitchell, Jon. “Okinawa: The Junk Heap of the Pacific.” *Japan Times. (*November 11, 2013). Accessed January 17, 2019. https://www.japantimes.co.jp/community/2013/11/11/issues/okinawa-the-junk-heap-of-the-pacific/#.XEkDyezYqzz.

Mitchell, Jon. “U.S. military report suggests cover-up over toxic pollution in Okinawa: Documents showing sky-high PCB levels in soil raise questions about the state of other U.S. bases.” *Japan Times* (March 17, 2014). Accessed March 5, 2019. https://www.japantimes.co.jp/community/2014/03/17/issues/u-s-military-report-suggests-cover-up-over-toxic-pollution-in-okinawa/#.XFCaeezYqzx

Mitchell, Jon. “Exclusive: Red Hat's lethal Okinawa smokescreen.” *Japan Times* (July 27, 2013). Accessed February 15, 2019. https://www.japantimes.co.jp/life/2013/07/27/general/exclusive-red-hats-lethal-okinawa-smokescreen/#.XJjr-uzYqzw.

Mitchell, Jon. “Military Contamination on Okinawa: PCBs and Agent Orange at Kadena Air Base.” *The Asian Pacific Journal* 12, no. 1 (March 18, 2014): 1-7.

National Health Service. “Dysentery.” NHS, U.K. Accessed on March 24, 2019. https://www.nhs.uk/conditions/dysentery/.

National Oceanic and Atmospheric Administration, Department of Commerce, “What Are PCBs?,” Accessed March 1, 2019. https://oceanservice.noaa.gov/facts/pcbs.html.

Nichols Jr., Chas S., Shaw Jr., Henry I. *Marines In World War II - Okinawa: Victory In The Pacific.* United States: Pickle Partners Publishing, 2014.

Official Data Foundation. “Inflation Calculator.” *Official Data.* Accessed March 16, 2019. https://www.officialdata.org/us/inflation/1990?amount=500000.

Okada, Yasuko and Yamazaki, Koji. “Climatological Evolution of the Okinawa Baiu and Differences in Large-Scale Features during May and June.” *Journal of Climate*. (September 2012): 6287-6303. https://doi.org/10.1175/JCLI-D-11-00631.1.

Paltzer, Seth. "The Dogs of War: The U.S. Army's Use of Canines in WWII." National Museum of the United States Army. June 2, 2016. Accessed November 7, 2018. https://armyhistory.org/the-dogs-of-war-the-u-s-armys-use-of-canines-in-wwii/.

Pearson, Richard. *Ancient Ryukyu: An Archaeological Study of Island Communities*. Honolulu: University of Hawai'i Press, 2013.

Price, John D. “Review of *The Dominion and the Rising Sun: Canada Encounters Japan.” The International History Review* 28, no. 3 (2006): 625-627

Prince, Dana. "War Dog Background." University of Tennessee College of Veterinary Medicine. Accessed November 7, 2018, https://vetmed.tennessee.edu/home/Pages/war_dog_background.aspx.

Ramo, Alan. “U.S. Military Accountability for Extraterritorial Environmental Impacts: An Examination of Okinawa, Environmental Justice, and Judicial Militarism.” *Tulane Environmental Law Journal* 28. no. 1. (2014): 53-94.

Record, Jeffrey. “Japan’s Decision for War in 1941: Some Enduring Lessons,” *Strategic Studies Institute (SSI).* (February 2009): 1-70. Accessed November 12, 2018. https://ssi.armywarcollege.edu/pdffiles/pub905.pdf.

Retta, Amare, Wagner, Larry E., and Tatarko, John. “Military Vehicle Trafficking Impacts On Vegetation And Soil Bulk Density At Fort Benning, Georgia.” *American Society of Agricultural and Biological Engineers*, 57. No. 4. (2014): 1043-1055. DOI 10.13031/trans.57.10327.

Rogers, David. “Japanese Defenses and Fortifications Tarawa, Iwo Jima and Okinawa 1943 - 1945.” The University of Missouri-Rolla. https://web.mst.edu/~rogersda/umrcourses/ge]342/Japanese%20Island%20Defenses%201943-45.pdf

Ross, Steven T. *American War Plans 1941-1945*. London: Frank Cass, 1997.

Rottman, Gordan. *Okinawa 1945: The Last Battle*. Oxford: Osprey Publishing, 2002.

Russell, Edmund. “Speaking of annihilation: Mobilizing for War Against Human and Insect Enemies, 1914-1945.” in *Natural Enemy Natural Ally: Toward and Environmental History of War.* Ed. Richard P. Tucker and Edmund Russell. Corvallis: Oregon State University Press, 2004.

The Ryukyu Islands, “Okinawa Prefecture,” October 17, 2016. Accessed November 11, 2018. https://www.japan-guide.com/list/e1247.html.

Simmons, Samuel and Uphold, William. “Disease Control With Insecticides A Review Of The Literature.” *World Health Organization,* 3 no. 4 (1957). Accessed October 15, 2018. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2554026/.

Stellman, Jeanne M. and Stellman, Steven D. “Agent Orange During the Vietnam War: The Lingering Issue of Its Civilian and Military Health Impact.” *American Public Health Association* 108. No. 6. (June 2018): 726-728. doi/10.2105/AJPH.2018.304426.

Tanji, Miyumi. *Myth, Protest and Struggle in Okinawa.* Routledge, 2007.

Tashiro, Yutaka, Goto, Akitoshi, Kunisue, Tatsuya, Kurahashi, Takuya, and Tanabe, Shinsuke. “Contamination Status of PCBs and Organochlorine Pesticides in the Okinawa Island, Japan: Utilization of Small Indian Mongoose (Herpestes auropunctatus) as a Bioindicator.” *Journal of Environmental Chemistry* 26, no. 3. (2016): 115-122.

Taylor, John. “Anti-Military and Environmental Movements in Okinawa.” Geography Department California State University, Fullerton (2008). Accessed February 27, 2019. http://www.uky.edu/~ppkaran/conference/Anti-Military%20and%20Environmental%20Movements%20in%20Okinawa.pdf.

Taylor, John. “Environment and Security Conflicts: The U.S. Military in Okinawa.” California State University, Fullerton. (2006): 3-14. Accessed March 3, 2019. https://www.academia.edu/7116447/Environment_and_Security_Conflicts_The_US_Military_in_Okinawa.

Thanawala, Sudhin. “Federal judge dismisses lawsuit over U.S. base in Japan.” *Military Times.* (February 14, 2015). Accessed March 16, 2019, https://www.militarytimes.com/news/your-military/2015/02/14/federal-judge-dismisses-lawsuit-over-u-s-base-in-japan/.

The Medical Department, United States Army, *Preventive Medicine In World War II.* Office of The Surgeon General, Department of The Army, Washington, D.C., *1963.* Accessed November 29, 2018. https://history.amedd.army.mil/booksdocs/wwii/internalmedicinevolIII/chapter20.htm

The Pacific. Episode 10. “Part 10.” Directed by Tom Hanks & Steven Spielberg. Aired March 14, 2010 on HBO. Accessed Nov. 11, 2018. DVD.

Thomas, Lewis. *The Youngest Science: Notes of a Medicine-Watcher.* New York: Viking Press, 1983.

Tsutsui, William. “Landscapes in the Dark Valley: Toward an Environmental History of Wartime Japan,” Environmental History, Oxford University Press 8, no. 2. 294-311. DOI: 10.2307/3985713.

Tucker, Richard P. “The Impact of Warfare on the Natural World: A Historical Survey.” in *Natural Enemy, Natural Ally: Toward an Environmental History of War*. Ed. Richard P. Tucker and Edmund Russell. Corvallis: Oregon State University Press, 2017.

U.S. Army Research Institute for Behavioral and Social Sciences, *Fatigue Effects on Human Performance in Combat: A Literature Review.* U.S. Army Research Institute 1991. Accessed December 3, 2018. https://apps.dtic.mil/dtic/tr/fulltext/u2/a242887.pdf.

USGS, “EarthWord–Subduction,” *USGS.gov*. September 12, 2016. Accessed Dec. 2, 2018. https://www.usgs.gov/news/earthword-subduction.

US Navy Medicine. "Malaria Control Units at Okinawa." Accessed December 03, 2018. https://www.med.navy.mil/bumed/nmhistory/Pages/showcase/Innovations/Malaria/main.aspx

Visit Okinawa, Japan. Diving and Snorkeling. Accessed February 18, 2019. https://www.visitokinawa.jp/information/diving-and-snorkeling

Visit Okinawa, Japan. "Experience the Nature of Okinawa at Bios no Oka." *Nature* (blog). Accessed February 18, 2019. https://www.visitokinawa.jp/information/bios-no-oka.

Visit Okinawa, Japan, "Yohena Hydrangea Garden is Fun even in the Rain!," *Nature* (blog), accessed February 18, 2019, https://www.visitokinawa.jp/information/yohena-hydrangea-garden-is-fun-even-in-the-ran.

Weatherspark. "Average Weather in Okinawa." Accessed November 25, 2018. https://weatherspark.com/y/142278/Average-Weather-in-Okinawa-Japan-Year-Round.

Weigley, Russell F. *The American Way of War: a History of United States Military Strategy and Policy*, Wars of the United States. New York: Macmillan, 1973.

Wilhelm, John C. "U. S. Military Forward Presence In Okinawa, Japan." U.S. Army War College in Carlisle, Pennsylvania. (July 4, 2003): 1-24. Accessed February 26, 2019. https://apps.dtic.mil/dtic/tr/fulltext/u2/a415741.pdf.

Primary:

1st Reconnaissance Company: Records of Events, April-June, 1945, (May 21, 1945). Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives, College Park, MD.

2nd Marine Journal, April 29, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 1. Feb. 15, 1945. Geographic Files. Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 2. February 1945. Geographic Files. Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 3. Feb. 15, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 4. Feb. 15, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 7. March 2, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 10, March 6, 1945, p. 8. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No. 11. March 6, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Battle Instruction No.13. April 5, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

32nd Army Combat Directive. May 5, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Action Report, Medical Department. First Separate Engineer Battalion. Third Amphibious Corps. April 22 - June 30, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Aerial Photo Support System Study. May 17-June 22, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Army Ground Forces Headquarters. Division of Plans and Policies. June 20, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Breisacher, Catherine E. “History of nursing activities on Okinawa.” 3 May 1945-15 January 1946. Box 8. Folder 115. Papers of Catherine E. Breisacher. U.S. Army Heritage Education Center, Carlisle, PA.

Bureau of International Security and Nonproliferation. “Geneva Protocol.” (June 17, 1925). U.S. Department of State. Accessed February 28, 2019. https://www.state.gov/t/isn/4784.htm.

Carleton, 6th Marine Division History, pp. 15-18; Tenth Army Actn Rpt, 7-III-3. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Central Intelligence Agency. “Nerve Gas Incident on Okinawa.” MEMORANDUM FOR Director of Current Intelligence. July 18, 1969. Accessed February 23, 2019. https://www.cia.gov/library/readingroom/docs/CIA-RDP80B01439R000500090021-7.pdf.

D-2 Special Study of the Enemy Situation. Okinawa, May-June. World War II Command Files. Record Group 38, records of the office of the Chief of Naval Operations. National Archives Building, College Park, MD.

D-3 Journal: First Marine Division. F.M.F. March 27-June 28, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Ed Bearss. Interview with Ed Bearss, recorded July 9, 2018. Audio.

G-2 Report - Headquarters Tenth Army, p. 1, April - May 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

HQ Army Ground Forces, May 1, 1945, p. 38. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

Intelligence Division. Office of The Engineer Headquarters United States Army Japan with Personnel of The United States Geological Survey. “Military Geology Of Okinawa-Jima, Ryukyu-Retto.” Introduction And Engineering Aspects 1. 1957. Accessed December 1, 2018. https://pubs.usgs.gov/fedgov/70039235/report.pdf.

Japanese Minister for Foreign Affairs Ikeda, Japanese Minister of State for Defense Kyuma, U.S. Secretary of Defense Perry, and U.S. Ambassador to Japan Mondale. “SACO Final Report.” (December 2, 1996). Released by the Bureau of East Asian and Pacific Affairs, U.S. Department of State. (August 5, 1997). https://1997-2001.state.gov/www/regions/eap/japan/rpt-saco_final_961202.html.

John D. Flemming Papers. “Ie Shima Diary;” Box 34. Folder 4. U.S. Army Heritage Education Center, Carlisle, PA.

Kissinger, Henry. *White House Years.* Boston: Little, Brown, 1979.

MacArthur, Douglas. *Reports of General MacArthur: Volume II, Part I: Japanese Operations in the Southwest Pacific Area.* Washington, DC: Center of Military History, U.S. Army. 1994. Accessed November 11, 2019. https://archive.org/details/ReportsOfGeneralMacarthurJapaneseOperations/page/n61.

Manchester, William. *Goodbye Darkness: A Memoir of the Pacific War.* Boston: Little, Brown, 1980.

Medical Department Report. First Separate Engineer Battalion. Third Amphibious Corps. April 25, 1945. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

National Archives Records and Administration (NARA). *Operation Red Hat: Men and a Mission.* National Archives and Records Administration (January 1, 1971). Video. Accessed February 1, 2019. https://archive.org/details/gov.archives.arc.3033306.

Okinawa Planning Study. World War II Command Files. Record Group 38, records of the office of the Chief of Naval Operations. National Archives Building, College Park, MD.

Robinson, Bradbury. "A Nutritionist Ponders the D.D.T. Problem," Personal Publication. St. Louis, Michigan, 1947.

Sledge, Eugene. *With the Old Breed on Peleliu and Okinawa*. New York: Presidio Press, 2007.

Tsuji, Masanobu. *Read This Alone - And The War Can Be Won*. "Chapter IX." December 1941.

United States Army 24th Corps. *XXIV Administrative order 10*. February-March 1945; Box 80. Folder 13. U.S. Army Heritage Education Center, Carlisle, PA.

United Nations - Treaty Series. "Treaty of Peace with Japan." San Francisco, CA. September 8, 1952. Accessed March 4, 2019. https://treaties.un.org/doc/publication/unts/volume%20136/volume-136-i-1832-english.pdf.

U.S. Army Report: Jap Combat Methods on Okinawa. Geographic Files, Record Group 127, records of the United States Marine Corps. National Archives Building, College Park, MD.

U.S. Department of Agriculture Foreign Agricultural Service. "Japanese Fresh Fruit Market Overview 2018." *Global Agricultural Information Network.* October 30, 2018. Accessed March 16, 2019. https://gain.fas.usda.gov/.

U.S. Tenth Army. Tenth U.S. Army Ryukyus Campaign Intelligence Monograph, 1945. Box 1. U.S. Army Heritage Education Center, Carlisle, PA.

XXIV Corps Engineer Plan, February 15, 1945, p. 7; Box 80, Folder 13. U.S. Army Heritage Education Center, Carlisle, PA.

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