

STEPHEN BRAIN

the great
STALIN PLAN

FOR THE TRANSFORMATION OF NATURE

ABSTRACT

On October 20, 1948, the Soviet government announced the world's first state-centered program to reverse human-induced climate change, a grandiose plan to construct 5.7 million hectares of forest in the Russian south. However, the plan collapsed upon Stalin's death in 1953 because of a fundamental contradiction at the plan's heart. At first, the Stalin Plan advanced a basically conservative vision of restoring the steppes to an imagined prehistoric state, but soon a group of radical scientists advancing untested silvicultural theories managed to take control. The resulting struggle between the old approach and the new brought about the plan's collapse.

TWENTIETH-CENTURY DICTATORS liked trees. Although the environmental record of authoritarianism offers a dismal list of failures, including the nuclear accidents at Chernobyl and Chelyabinsk-65, the fouled air of Beijing and Shanghai, the vanished fisheries of the Aral and Caspian Seas, and the acidified industrial wastelands of Bitterfeld and Katowice, afforestation projects represent a notable exception. Indeed, afforestation on a massive scale was the environmental panacea of choice for dictators in the twentieth century.¹ The Nazis and their *Reichforstmeister*, Hermann Göring, in addition to making the conservation-spirited *Dauerwald* the preferred forestry method for the German Reich, initiated a sweeping National Afforestation Program in 1934, focused on creating ecologically sound mixed forests, a program which

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Figure 1. And We Shall Conquer Drought

This poster reads “And We Shall Conquer Drought” and shows Stalin with a green pencil, remaking the landscape as he draws in the new forests that would change the Russian climate. Credit: Viktor Ivanovich Govorkov, 1949.

succeeded in increasing the overall forest cover of Germany despite aggressive industrialization and the rigors of war.² Benito Mussolini created a “National Forest Militia,” a black-shirted paramilitary group under the direction of the General Command of the Voluntary Militia for Natural Security, to assist in “technical work, reforestation ... and propaganda in the field of silviculture.”³ Mao Zedong devoted little attention to forestry matters, and his Great Leap Forward (1958–1960) and Cultural Revolution (1966–1969) resulted in widespread forest destruction, but his followers have taken afforestation very seriously, embarking in 1978 on the construction of a “Great Green Wall” more than four thousand kilometers in length, with the aim of doubling the forest cover of the Chinese north.⁴

But older and bolder than any of these was the Soviet effort, which began in the early 1920s and reached its zenith in 1948 with the “Great Stalin Plan for the Transformation of Nature,” the world’s first state-directed effort to reverse human-induced climate change. The Stalin Plan foresaw the creation of nearly six million hectares of new forest—an area greater than that of all the forests of Western Europe—in the form of windbreaks along the rivers of the Russian south and the perimeters of the collective farms. According to Soviet claims, these new forests would halt desiccating Central Asian winds, cool and dampen the climate of southern Russia, and eliminate the periodic droughts that had afflicted the steppe for decades. But despite an enormous propaganda blitz, including a patriotic oratorio composed by Dmitrii Shostakovich, and the allocation of huge sums of money, the plan was abandoned after fewer than five years, the momentum of the thirty-year-old

afforestation project stalled and the climate of the steppe remained unchanged. The unusual longevity of the Soviet program, the hotly contested nature of the debate within the Soviet Union over the best way to establish new forests, and the fact that the Stalin Plan (unlike the German and Italian efforts, which were interrupted by war, or the Chinese campaign, which is still ongoing) was terminated freely by state decree, makes the Soviet example valuable in explaining both the peculiar affinity that authoritarian states have for afforestation and the reasons why these projects rarely meet their own goals.

At first glance, the analysis provided by James C. Scott in *Seeing Like a State* would seem to explain adequately both the authoritarian enthusiasm for afforestation and the generally disappointing results of these projects.⁵ Scott identifies as the distinguishing characteristic of the modern state its relentless drive to rationalize and order reality—its ambition to increase the legibility of the world by imposing a simplified template. For Scott, the archetypal example of this high-modernist impulse comes from the field of environmental history: the development of scientific forestry as pioneered by the cameralist, German-speaking states of Saxony and Prussia in the late eighteenth century. Scott describes how German foresters, faced with timber shortages, first conceptualized the forest, for the sake of easy calculation, as an assemblage of idealized, regularly spaced, commercially valuable trees and then, backed by state power, went about imposing upon the real forest this abstract schema, at the expense of all other considerations. The same high-modernist impulse that motivated scientific forestry, by dint of its success in facilitating state control, subsequently expanded into nearly all manner of statecraft, transformed rambling premodern urban areas into modern cities of orderly street grids and taxation maps into sheets of graph paper, and then reached its apogee in aggressively modernizing authoritarian states such as Hitler's Germany, Pahlavi's Iran, and Stalin's Russia. However, the schemes of the dictators invariably failed in their ambitions, Scott claims, due to the hubris inherent in high-modernism: "When schemes . . . come close to achieving their impossible dreams of ignoring or suppressing [local knowledge] and local variation, they all but guarantee their own practical failure."⁶ Seen through Scott's lens of high-modern optics, then, both the Soviet enthusiasm for afforestation, and the disappointing results of the Stalin Plan, make perfect sense: Stalin's regime planted forests to correct nature's mistakes—to bring the real world into line with an imagined, regimented ideal—but high-modernism's blindness about the dangers of simplification ensured its failure.

Although Scott does not specifically discuss afforestation schemes in *Seeing Like a State*, most evaluations of the Great Stalin Plan similarly point to Enlightenment-era aesthetics as its driving force. Charles Ziegler, in *Environmental Policy in the USSR*, writes that, like many Soviet initiatives that "display a seemingly boundless confidence in the inventive capacities of humankind to overcome inherent limitations of the physical environment," the Great Stalin Plan was a "grandiose attempt to improve on the natural

environment.”⁷ Likewise, Philip Pryde’s *Conservation in the Soviet Union* contends that “the ‘Great Plan’ clearly reflected the view of man as the master and perfecter of his natural environment, rather than as an integral and interdependent component of it” and that the plan “may be considered as indicative of Stalin’s basically domineering attitude towards natural resource exploitation and conservation.”⁸ Douglas Weiner’s *A Little Corner of Freedom* depicts the Stalin Plan in largely the same light, adding to the analysis the role played by Trofim Lysenko’s pseudoscientific claims about forcing nature to conform to the human will: “Here was the renewed offensive on ‘counterrevolutionary,’ anarchic first nature and its replacement by a ‘planned’ second nature ... the triumphal fusion of Stalin’s great political and social vision with the unsurpassed biological ‘know-how’ of Lysenko and Michurinist biology.”⁹ David Joravsky, author of *The Lysenko Affair*, goes farther in identifying Lysenko as “beyond any doubt ... the top specialist responsible for the ‘Great Stalin Plan for the Transformation of Nature’” and uses words very much like Scott’s to describe Lysenko’s ideas: for him, “the world of living things became magic putty in their hands; they effect any transformation they wished by manipulation of the environment.”¹⁰ Thus stands the current consensus about the Stalin Plan: the intensely ideological approach to the world that lay behind the plan, very much like the one that Scott critiques in *Seeing Like a State*, divorced the effort from reality and ensured its failure.

A closer look at the Great Stalin Plan, however, shows that the story is more complicated than mere hyper-rationalism run amok. High-modernists and Lysenkoites did indeed play important roles in the development of the plan, but at all times the simplistic and naive understanding of nature that Scott critiques was recognized as such by the plan’s original designers, who fought mightily against it. Indeed, the plan was, at its outset, a conservative and conservationist enterprise, dedicated to restoring the Russian countryside to an idealized but more diverse earlier state. Only later was it hijacked by Lysenko and his allies and transformed into high-modernist fancy. At all times, but always behind the scenes, two factions struggled over the fate of the plan: on the one side, a group of technocrats, essentially conservative and well grounded in ecological science; and on the other, adherents of prometheanism, those (like Lysenko) who believed that the arrival of the communist era had invalidated all natural limitations of human action.¹¹ The technocrats promoted afforestation work that acknowledged local variation and experimental results, while the prometheans advanced the notion that seedlings could sacrifice themselves for the greater good of the plant community. As the plan unfolded, the technocrats slowly undermined the position of the prometheans and succeeded in convincing party functionaries that Lysenko’s ideas produced poor results—but just as their arguments began to persuade those at the top of the party hierarchy, Stalin died, and his successors chose to tackle other problems. The Great Stalin Plan ultimately reached few of its goals, but not because the Soviet authoritarian state was held in the thrall of high-modernism—“uncritical,

Figure 2. In the Name of Communism

This poster titled “In the Name of Communism” shows Lenin on the left, indicating on a map where the first Soviet hydroelectric plants would be built, and Stalin on the right, showing on another map the location for the construction of a new canal bisecting Turkmenistan. The map on the wall behind Stalin depicts the afforestation efforts of the Great Stalin Plan. Credit: Viktor Ivanovich Govorkov, 1951.

unskeptical, and thus unscientifically optimistic about the possibilities for the comprehensive planning of human settlement and production,” as Scott suggests is true of high-modernist regimes—but rather because the Soviet Union served as a testing ground for a struggle between technocracy and prometheanism. The Great Stalin Plan cast a spotlight on a troubling, perhaps hidden tension between these two impulses, a tension that Stalin’s successors chose to avoid, rather than resolve, by ending the program.

ANTECEDENTS

Although the Great Stalin Plan possessed no small air of fantasy about it, at its core lay an old and essentially conservative (if not reactionary) Russian dream: to make the southern steppe more like old Muscovy. The first efforts to afforest the steppe date to the mid-nineteenth century, when the agronomist Viktor Yegorovich von Graf investigated which woody species were best suited to colonize the dry prairies of southern Russia.¹² The trend evolved further in 1892, when Tsar Alexander III appointed the influential soil scientist V. V. Dokuchaev to determine the causes of a devastating drought the year before. Dokuchaev concluded that human activity was to blame, arguing that the steppes of Russia had been climatically stable in the past but had become damaged after centuries of desultory agricultural development.

Dokuchaev urged a series of water conservation measures, including the construction of forest belts throughout the south, hoping to roll back the clock to a time when southern and central Russia were united under one canopy of trees. The careful application of science—soil science, hydrology, geology, and dendrology—would all be needed to make Dokuchaev’s dream real, but the results would be a restoration of Russian lands, more than a novel redesign.¹³

For reasons that extend beyond purely scientific calculations and more strongly resemble cultural and imperial prerogatives, Dokuchaev’s suggestions gained nearly immediate acceptance. As the environmental historian David Moon has demonstrated, an influential and diverse group in Russian society, including “Russia’s rulers, bands of Cossacks, waves of peasant migrants, expeditions of scientists, government officials, and latterly, writers, artists and composers,” had over the course of the late nineteenth century “constructed images of the steppes as a land of fertile soil, opportunity, prosperity, freedom, beauty, and Russianness” and thus had freighted the environmental condition of the steppe with deep meaning.¹⁴ Perhaps the most famous exponents of this view, as Jane Costlow discusses, were the playwright Anton Chekhov, who gave voice to the meaning of the forest in his play *Uncle Vanya*, and the historian V. O. Kliuchevskii, who claimed that that the history of Russia *was* the history of the struggle between the Russian forest and the Asiatic steppe.¹⁵ In his lectures, Kliuchevskii described how “the forest played a crucial role in our [Russian] history, [how] it was for many centuries the basis of Russian life,” and how “the steppe intruded into this life only during harmful episodes, Tatar incursions and Kazakh raids.”¹⁶ For those adopting this perspective, as Moon puts it, “the hot, dry winds from Asia were the new Mongols,” and any forests that the Russians established on the steppe would become outposts in a cultural war against Asiatic influence. Despite the fact that meteorological records extant at the time did not appear to bear out the assertion that the steppe was in fact growing drier over time, the tsarist government nevertheless financed Dokuchaev’s proposals, albeit on an extremely limited scale, establishing experimental forests in the steppe and promising ever more.¹⁷ Even without radical utopians or technocrats in power, the concept of afforesting the southern borderlands clearly held a powerful appeal for Russian rulers.

After the revolution of 1917 swept more ambitious leaders into power and more ambitious ideologies into currency, steppe afforestation projects only grew in importance, scope, and scientific rigor. Both Lenin and Stalin called for aggressive afforestation at party conferences in the 1920s, and as time went by, Stalin-era legislation creating protective areas and government agencies to oversee them encouraged ever more concerted, empirically based efforts.¹⁸ During the civil war, forest ameliorative work all but came to a halt, but after Stalin’s consolidation of power, a 1931 law created new “forest cultivation zones” and instructed the People’s Commissariat of Agriculture to “battle drought by creating protective belt stands on the territory of the state and collective farms”—forty thousand hectares in 1932 and three hundred and fifty

thousand hectares by 1936.¹⁹ At the same time, the Council of People's Commissars (the highest government authority in the Soviet Union) requested a report about the usefulness of a "screen of forest belts between the Ural and Caspian seas to defend against winds originating in the eastern deserts."²⁰ Institutes dedicated to the propagation of forests and the ecological impacts of afforestation were opened, and scholars paid close attention to the possibilities offered by the steppe, as a 1935 report from the central institute illustrates:

Our research has shown that narrow, wind-permeable belts provide the greatest influence on the microclimate of agricultural fields. Such belts give the most protection from the wind and retain the most snow; they reduce the amplitude of temperature variation more than wider belts. . . . In 1935, fifty-one agricultural crops were studied to determine which respond best to protective afforestation, and with optimal placement of the belts, rye and winter wheat yields were doubled, those of chickpeas and lentils were increased by forty percent.²¹

The institutes developed detailed plans for different planting patterns for different forest types, elaborate grids of pine, yellow acacia, and other species specifically designed to survive in different microclimates.

The earliest Soviet efforts foundered, however, because the plans were implemented by the Commissariat of Agriculture, which was overwhelmed at the time by the chaos of agricultural collectivization and therefore unable to guarantee the assistance of collective farmers. An internal review of afforestation work conducted by Commissariat of Agriculture in April of 1936 showed that the rural population wanted no part of the efforts and offered no help:

At the Seventeenth Party Congress, Stalin pointed to forest planting as one way to combat drought and the [drying winds from Central Asia]. But this work has not developed as it should. In 1935, 114,000 hectares of forests were planted, more than in all previous years combined, but this is still very little. The reason for the weak tempo is that . . . without the help of the collective farmers, this work will not succeed.²²

Although the Commissariat of Agriculture established 301,373 hectares of field-protective forest belts between 1931 and 1936, the poor survival rate of the belts prompted the state to seek another solution. A Main Administration of Forest Protection and Afforestation (*Glavnoe upravlenie lesookhrany i lesonasazhdenii*, or GLO) was created by Stalin's order in 1936.²³

The establishment of GLO, a state bureau dedicated solely to afforestation and forest preservation, provided with its own journal (*Za zashchitu lesa*, or *In Defense of the Forest*) and protected from outside interference by its proximity to the Council of People's Commissars, produced an efflorescence of thought about the possibilities of afforestation and how best to build a

field-protective forest. On October 13, 1937, in a letter that represents the direct precursor to the Great Stalin Plan, an engineer from GLO's Ukrainian branch named Mikhail Vasil'evich Lokot' wrote to the Moscow office recommending the "construction of two to four parallel forest belts of a width of one hundred to two hundred meters around all agricultural fields" near the country's largest rivers.²⁴ For the time being, this proposal gained no traction, but GLO produced in the pages of *In Defense of the Forest* a series of articles exploring the geological, botanical, and hydrological aspects of afforestation, tightly linking the potential success of any effort to the peculiarities of the landscape under consideration. Chemical analyses of fallen leaves, soil acidity during different times of the year, the water-retaining properties of soils found under different species—all these factors were considered and collated to compose charts depicting optimal species composition for any given soil, such as this one for "dark gray forest soils in which the process of podsolization [the leaching of organic matter from the A horizon to the E horizon] is not strongly developed":

#	^	#	°	#	^	#	*	#	^	#	°
#	+	#	°	#	+	#	*	#	+	#	°
#	^	#	°	#	^	#	*	#	^	#	°
#	+	#	°	#	+	#	*	#	+	#	°

(# = oak; ^ = bird cherry; ° = linden; * = sharp-leaved maple; and += any suitable shrub)²⁵

The planting schemes offered in the pages of *Za zashchitu lesa* may or may not have represented the best possible arrangement of seedlings, but the journal nevertheless shows that GLO adopted, especially in light of what came later, a decidedly technocratic and small-scale approach to afforestation work, one based on empirical trials rather than ideological prescriptions.²⁶

GLO's internal documentation reveals that the agency was able to achieve considerable success in its assigned tasks. In the years before the war, the administration was establishing twice as much new forest per annum as did the Commissariat of Agriculture in 1935.²⁷ The survival rate, GLO reports claimed, steadily climbed, assisted by the graduation of fourteen hundred students from its educational programs each year: the mortality rate declined from 31 percent in 1936 to 25 percent in 1939, and then to 17 percent in 1940.²⁸ GLO attributed its successes to increasingly educated cadres, but also to improved, ecologically based planning: the country was divided into fourteen regions, with each region given its own list of suitable trees and shrubs. In zone A, for instance, a strip of territory linking Vinnitsia, Kiev, Zhitomir, and Chernigov districts, workers were allowed to plant Siberian larch, pine, and birch. But in zone B, a region just to the south stretching from Dnieprpetrovsk to Moldavia, they were not, while currant and white mulberry

Figure 3. Let's Remake Nature According to Stalin's Plan!

This poster reads “Let’s Remake Nature According to Stalin’s Plan” and shows Stalin explaining the Great Stalin Plan to a pair of workers. Behind Stalin, the forests described in the plan are already in place, surrounding the collective farm fields. Credit: Viktor Semenovich Ivanov, 1949.

were sanctioned there and not in zone A.²⁹ Significantly, the work was carried out not by collective farmers but by the employees of GLO.

World War II halted GLO’s work almost entirely, but soon after the war’s conclusion, the state renewed its dedication to protective afforestation with a rapid sequence of new legislation.³⁰ As part of a large-scale reorganization of Soviet forestry, a related story conveyed in Stephen Brain’s article “Stalin’s Environmentalism,” GLO became in April 1947 the much more powerful Ministry of Forest Management—its creation was “the most radical of all reforms in the history of Soviet forestry,” according to its deputy minister, Vasilii Iakovlevich Koldanov—with a special bureau dedicated solely to steppe afforestation.³¹ On October 11, 1947, the Council of Ministers approved an ambitious plan, drafted by the Ministry of Forest Management, to establish new forests on the collective farms in the southern provinces of Kursk, Orël, Tambov, and Voronezh:

Province	Forested area in 1947	Forest percentage of province	Forested area projected for 1955	Percentage forest by 1955
Kursk	342,000	6.7	660,000	12.9
Tambov	298,000	8.7	464,000	13.5
Voronezh	488,000	7.1	723,000	10.5
Orël	151,000	4.8	404,000	12.8 ³²

Six months later, on April 24, 1948, a nearly identical but smaller version for the Ukraine received approval. Based on the modest premise that “field-protective belts decrease the speed of the wind across agricultural fields, which in turn decreases the moisture transpired by crops and hence their desiccation,” the April 1948 law decreed 391,000 hectares of forests around Ukrainian collective farms be established by 1955.³³ Together, these two plans foresaw the establishment of more than 1.5 million hectares of new forest, but the grandiosity of the plans was offset by an unhurried pace, a limited scope, and a sober methodological approach. The work would start slowly, with only one-sixth of the plantings conducted during the first three years while the nurseries were being established, and the planting instructions, featuring the species lists and charts developed during the 1930s, were to be provided by the Ministry of Forest Management. The planting of the belts was to be performed only “on freshly cleared ground, plowed to a depth of twenty-five to twenty-seven centimeters just after the spring harrowing of the field stubble, and concluded in six to seven days,” and planting was forbidden on snow-covered or lightly plowed soil.³⁴ And both plans, ambitious though they were, shared relatively unassuming and scientifically grounded objectives: to make landscapes more stable by making them more diverse, which would change the microclimates and the hydrology of relatively small spaces. Never mentioned was changing the climate of the country as a whole.

THE STALIN PLAN EMERGES

As sweeping as the plans of 1947 and early 1948 were, the Soviet government soon decided that more aggressive action was merited. A drought in 1946, coupled with the dislocation caused by the war, brought the worst grain harvest in over a century, and in its train Ukrainian famine, ugly rumors of cannibalism in the countryside, and forced rationing of basic foodstuffs in the cities. The grain harvests of 1947 and 1948, while improvements over the disaster of 1946, nonetheless failed to match prerevolutionary levels.³⁵ Furthermore, the nascent Cold War and the competition with the West made any agricultural failure all the more embarrassing. In order to fashion a response, a national conference of foresters and agricultural experts—but also, crucially, party leaders—convened in Saratov in February, and when that meeting failed to produce suitable proposals, a second conference in the southern city of Velikii Anadol’ was called for the summer.³⁶ Transcripts of this conference have not been preserved, but deputy minister Koldanov later wrote that the Velikii Anadol’ conference of foresters marked “the eve of a new era in steppe afforestation” and that “the materials of the conference were one of the basic sources in the preparation of the decree of 20 October 1948”—the Great Stalin Plan for the Transformation of Nature.³⁷ A comparison of the afforestation plans published before the meeting with those that came after makes clear that the participants at the conference desired something much grander than

the technocratic formulations that Ministry of Forest Management had been producing on its own—something that demonstrated the superiority of communist ideology and its power to compensate for nature’s shortcomings.

The caution that marked the Ministry of Forest Management proposals from the 1930s until the summer of 1948 therefore found little place in the resulting decree of October 20, 1948, heralding the Great Stalin Plan for the Transformation of Nature, theretofore the world’s largest ecological engineering project.³⁸ The programs of October 1947 and April 1948 were expanded tremendously, from 1.5 million hectares to 5.7 million, but repurposed to join a larger effort: changing the climate of the country as a whole. The centerpiece of the Stalin Plan would be the construction of eight enormous shelterbelts, their walls of foliage intended to screen dry winds rushing in from Central Asia, thereby rendering southern Russia as cool and moist as Moscow.³⁹ The new forests would extend across 16 provinces and 204 districts, over an area equal to that of Britain, France, Italy, Belgium, and the Netherlands combined; if they were arranged in a single belt thirty meters across, they would circle the earth fifty times.⁴⁰ In an effort to generate support for the project at a time of worrying agricultural shortages, the Soviet government disseminated newsreels and booklets showing children eating fruits and berries growing in the belts and strolling through desert landscapes turned into oases.

International politics also played a key role in the transformation of Ministry of Forest Management proposals into the Great Stalin Plan. As Nikolai Kremontsov has argued, the Cold War exerted a distorting influence on Soviet science, and the path that Soviet afforestation followed before and after World War II supports this view.⁴¹ Only a country as progressive and rational as the Soviet Union, supporters claimed, with its proven ability to harness collective human action in the service of scientific reason, could address environmental problems in such a coherent manner; certainly bourgeois countries could never accomplish such a feat.⁴² At a 1949 conference dedicated to the eight major shelterbelts, the head of Ministry of Forest Management expounded on this theme: “Which of the capitalist countries could take on a task of such a grandiose scale? None are able to cope with such a task. They are not interested in the people, but in the bags of money they protect. The robbery of their own and other people—this lies at the base of the programs of bourgeois countries.”⁴³ While capitalism sought to spread destruction, the propaganda surrounding the plan asserted, the communists spread gardens; or, as one poster from the time had it, communists plant life, while capitalists sow death (see fig. 4). Thus, as a result of both internal and external political pressures, prometheanism took center stage for the first time in the Soviet afforestation effort, although at the heart of the plan still remained the dream of restoring the Russian landscape to an earlier state.

Beneath the surface of the fantastic claims about transformation of the climate and the cold war rhetoric, however, the influence of the technocrats working in Ministry of Forest Management could still be discerned.

Figure 4. Two Worlds—Two Plans!

This poster's top panel, with the caption "We Are Sowing Life!", shows a Soviet soldier giving instructions to a worker about the planting of new forests. The bottom panel, captioned "They Are Sowing Death!", shows a cigar-smoking capitalist dictating to a general where new military bases should be built. Credit: Mikhail Cheremnykh, 1949.

Newsreels and newspaper articles emphasized the symbolic power of the mighty oak, but afforestation workers were ordered to use the old, prepared lists of species suited to each region. Oak, birch, and ash were recommended for the western half of the Saratov-Astrakhan belt on the right bank of the Volga River, while oak, poplar and ash were recommended for the strips on the left bank. In addition, the decree included recommendations for suitable secondary trees and bushes, and foresters were instructed to observe the soil type when choosing species.⁴⁴ The Ministry of Forest Management brought back into circulation a number of tsarist-era texts, long out of print due to the political unreliability of their authors, emphasizing the importance of the ecology of a plot of ground scheduled for afforestation, and urged workers to read them. Furthermore, although the films and booklets prepared for public consumption emphasized the massive, thousand-kilometer-long forest belts, most of the area to be afforested was located, as before, around the collective farms, in order to

change their microclimates and hydrology. Although the decree of October 20, 1948, was certainly a step in a radical, promethean direction, the methodology of the plan, if not all of the aims, remained traditional during its first months.

The October announcement contained within it, however, a crucial component whose significance was perhaps not recognized at the time but which ultimately served to take the Great Stalin Plan in a new direction: the creation of an independent Main Administration for Field-Protective Afforestation (*Glavnoe upravlenie polezashchitnogo lesorazvedeniia*, or GUPL) directly under the Council of Ministers. It was GUPL's duty to oversee the implementation of the Great Stalin Plan, to provide technical guidance, and to coordinate the efforts of the Ministry of Forest Management and the Ministry of Agriculture. In the plan's first weeks, GUPL and its Scientific-Technical Council favored traditional ecological approaches, but soon the council, and GUPL in general, came under the influence of a newcomer to forestry, the agronomist Trofim Denisovich Lysenko.⁴⁵ After developing a completely new, made-to-order theory of natural selection, Lysenko used his spot on the council to steer the Great Stalin Plan in a doomed but politically charmed direction: toward an expansion of the plan's prometheanism.

The story of Lysenko is too well known and too complex to merit a detailed discussion here, but a brief sketch of Lysenko's rise to prominence helps explain his role in the demise of the Great Stalin Plan. Lysenko, a rudimentarily educated farmer from Ukraine, took off "like a rocket into the firmament of Stalin's empire," as Valeri Soyfer puts it, by promoting a long string of agricultural nostrums whose ineffectiveness was obscured by phony evidence, as well as by Lysenko's uncanny ability to remain one step ahead of his critics.⁴⁶ In essence, Lysenko kept himself in the Soviet leadership's good graces by promising simple and inexpensive solutions to the Soviet Union's chronically low agricultural yields. Before the announcement of the Great Stalin Plan, Lysenko's main contribution to agronomy was the practice of "vernalization," a process of treating seeds in a way that purportedly created new species.⁴⁷ The appeal of Lysenko's promethean promises to remake agricultural crops according to whim, a project broadly in consonance with Bolshevik aims, plus his unassuming peasant affect helped Lysenko maintain a dominant position in Soviet agriculture throughout the Stalin and Khrushchëv periods.⁴⁸ At the time of the announcement of the Great Stalin Plan, Lysenko's influence was never greater: he had just received the personal endorsement of Stalin at the August 1948 meeting of the All-Union Academy of Agricultural Sciences, and thus he possessed enough political capital to populate the GUPL with his allies, he himself earning a spot on its Scientific-Technical Committee.⁴⁹

Although Lysenko's allies tried to claim that it was Lysenko who first proposed the establishment of forests around farms to increase their yields, he played no role whatsoever in the development of field-protective afforestation in the 1930s and 1940s as described above, and indeed had published nothing before 1948 about tree biology. However, the state's sudden interest

in the practice drew his attention and prompted the articulation of a fantastic new theory of forestry: that trees could become collectivists. At the time of the Stalin Plan's announcement, Lysenko told a reporter that he was then giving "considerable thought to the planting of forests in nests," but just a few months later, before experimental trials of this theory had even been properly started, Lysenko began to declare his new scheme, the "nest method," a complete success.⁵⁰ Lysenko claimed that while members of different species did compete for resources, members of the same species actually *helped* one another. By way of proof, Lysenko showed that when certain plants were planted in high densities, their survival rates increased. From this Lysenko concluded that all plants possessed a quality called "self-thinning," which allows them to work together in fighting against weeds during their early years and then to pool their energy for the benefit of one shoot in the nest (the other shoots sacrificing themselves for the main plant) when the appropriate time comes.⁵¹ Thus in Lysenko's scheme, plants could become soldiers in the fight for the survival of communism, if organized properly.

To encourage oak seedlings to act collectively, Lysenko made two recommendations. First, he suggested that acorns be planted in nests, spaced five meters apart. Around each central hole, four auxiliary holes were to be dug, creating a nest in the shape of a plus sign.⁵² Lysenko claimed that this formation would allow the oak seedlings to defend one another from weeds most effectively, although he never provided any explanation as to why this might be so. Second, Lysenko posited, in an apparent self-contradiction, that any favorably inclined plant, even one of a different species, could help trees in struggle against undomesticated interlopers. Accordingly, Lysenko recommended that agriculturally useful crops, including "winter wheat, oats, barley, sunflowers, flax, potatoes, and alfalfa," should be sowed alongside the acorns, so that these useful plants could do battle with weeds.⁵³ One of Lysenko's supporters described the battle in this way, in a jarring juxtaposition of Kliuchevskii's historical theories and Cold War rhetoric:

I want to say a few words about the struggle of the steppe with the forest and the forest with the steppe. Until now, in the majority of cases the steppe has defeated the forest.... But can't we, workers of science, bring together forest plants and agricultural crops against their common enemy, and then win? ... Leaving biological theory aside, it is possible to recognize, purely on a practical level, that the two may be joined, although temporarily, against a common enemy.⁵⁴

Even if biological theory had to be set aside, Lysenko and his supporters wanted nothing less than to harness a hypothetical internal drive of domesticated crops to conquer Russia's historical enemies.

Many authors have understandably stressed the absurdity of Lysenko's ideas regarding self-selection and its implications of plant consciousness, but

the main import of the nest method, practically speaking, was its labor-saving potential. Lysenko himself made this very clear in his 1950 booklet *The Planting of Field-Protective Forest Belts with the Nest Method*: “Until now, the widely accepted method of planting forests in the steppe ... has required working the soil frequently to remove the wild steppe vegetation. But planting oaks with crops to protect them makes this unnecessary. Only three man-days are needed for the hand-planting of one hectare of oak forest using the nest-method.”⁵⁵ The real motivation behind the nest method, then, was not to test a new theory of competition, but to allow workers to accomplish in a matter of hours what ordinarily would require a decade or more: if the acorns were planted in nests and agricultural crops were sown to provide cover, Lysenko argued, the belts would mature on their own with a minimum of additional effort. Yet this aspect of the nest method was its most serious drawback. The recommendation to plant acorns in nests was relatively harmless, aside from the fact that planting so densely is wasteful. The young oaks could be expected to grow normally, the smaller shoots dying off as the competition for resources sharpened, and in the first years of a plot. But Lysenko’s recommendation that the belts could be seeded once with acorns and agricultural crops and then left to develop on their own *was* harmful. Establishing new forests, as the administrators who worked in GLO and the Ministry of Forest Management knew, requires a great deal of effort beyond the initial sowing of seeds. Young forests must be weeded, thinned of underbrush or dead seedlings, and replanted as necessary if they are to reach maturity quickly. Whereas Lysenko claimed that a hectare of forest could be established with the application of three worker-days, the Ministry of Forest Management calculated that the true number was closer to eighty-five; three worker-days was just enough to sow forests that would die within a year or two.⁵⁶

Lysenko used his position on the GUPL Scientific-Technical Committee, and the political appeal of his approach, to transform his labor-saving method from an experimental suggestion into the only legal way to establish forests in the Soviet Union. The lion’s share of the afforestation work fell to the Ministry of Agriculture and its collective farms, and they, on the whole, had very little experience in the matter, so as a result, confusion accruing to Lysenko’s advantage reigned at the local level.⁵⁷ In February of 1949, GUPL held a conference of regional directors, who collectively reported the near-total lack of preparation for the upcoming planting campaign. The GUPL director of Ul’ianovsk province noted that “the collective farms still have not seen the state plan for afforestation work, and the province government does not even know what to tell the collective farms to do.”⁵⁸ At best, collective farms received mystifying decrees instructing them, as a delegate from Kursk province recounted, to plant “five hectares of field protective belts, four hectares of forests on gullies, create a 1.5 hectare forest nursery, build two ponds, grow 50,000 seedlings and prepare ninety kilograms of acorns,” but without any indication about how this should be done.⁵⁹ At worst, collective farmers heard nothing about the

plan at all, as in Tambov province, where the chain of command (from province executive committee to the local executive committee, and then to the rural soviet and finally the collective farm) broke down so often that only one collective farm saw any sort of numerical breakdown of expected tasks.⁶⁰ The numbers that emerged from the 1949 spring planting season were accordingly disheartening: against an established plan of 1,500 hectares, only 645, or 43 percent, were sown.⁶¹ Worse yet, some district executive committees were issuing permits to graze cattle among the newly established seedlings.⁶²

Lysenko recognized this situation as an ideal opportunity to advance his ideas, simplicity and ease being their main strengths, and went to work. Lysenko's ally and head of the GUPL, E. M. Chekmenev, sent a letter to Nikita Khrushchëv (then the secretary of the Ukrainian Communist Party) arguing that the existing instructions were too demanding and too complicated for collective farmers to follow:

In many collective farms, the number of rows and the correct width of belts indicated in the [old] instructions is not observed.... In Khar'kov province, only three percent of the plantings were made on newly plowed land.... Only 4.8 percent of the belts in the Ukrainian republic are found in good condition; 28.8 percent feature weeds and thirty-five percent are strongly infested with weeds.⁶³

The answer to all these problems—the failure to observe the rather complicated instructions delivered by the Ministry of Forest Management, the inadequate care, the infestations of weeds—was the nest method, which offered an elegant planting diagram and required no follow-up attention. Responding favorably to entreaties such as these, the Council of Ministers on August 9, 1949, citing “positive experimentation with the nest method,” decreed the “universal application of the nest method, elaborated by Academician Lysenko.”⁶⁴ Although tested for less than twelve months on plants that live for hundreds of years, Lysenko's method became the obligatory way to create not only oak forests throughout the Soviet Union beginning in 1950, but for pine forests as well.

Lysenko's influence inside GUPL and his victory on August 9, 1949, opened a schism in Soviet forest management, with the prometheans of the GUPL on one side and the technocratic Ministry of Forest Management on the other. Although they at first made a show of endorsing the nest method, the leaders of the Ministry of Forest Management deeply resented Lysenko's intrusion into their affairs as well as his reckless attitude toward their hopes of proper, scientifically grounded ecological management, and soon they fought back. They proved resourceful and formidable critics of Lysenko, experienced in afforestation, unafraid to appeal directly to Stalin or any other member of the high command and willing to interact directly with workers in the field to limit the

influence of Lysenko's prometheanism. Ultimately, though, their protests led not to reform but to the abandonment of the program.

With supporters of ecologically founded afforestation well entrenched in the various forest bureaus and well established in their respective fields, Lysenko's dominance came into question almost immediately, and the questions became more pointed as time passed. Even before Lysenko's prescriptions became official policy, at the first All-Union Conference on the Planting of the State Protective Forest Belts held in February 1949, trained foresters carefully inched towards casting doubt. The head of the forest-planting sector of the Institute of Forest Management told the audience:

As you know, Academician Lysenko denies the existence of antagonistic competition among members of the same type of vegetation. . . . However, we foresters most often encounter antagonistic relationships in natural conditions. If we are to succeed in the struggle, we must provide for the victory of the forest over the steppe by working the soil and physically destroying the weeds.⁶⁵

This was a mild critique, but after the nest method was made obligatory, the critiques grew bolder. In the autumn of 1949, Deputy Minister of Forest Management Koldanov wrote directly to Stalin—a daring move, perhaps, but comprehensible in light of a face-to-face meeting in 1947 which conveyed to Koldanov Stalin's personal interest in forest issues⁶⁶—to complain about the mandated application of Lysenko's scheme:

It would be premature to assert that [Lysenko's] method of planting forests is irreproachable. If, in the spring of 1950, the nest method of cultivating forests is applied everywhere, we will be unable to use two million [nonoak] seedlings prepared for this year's use. . . . Therefore, the Ministry of Forest Management would consider it proper to remove the words "the universal transition to the nest method" from the latest decree about spring 1950 forest planting.⁶⁷

A letter that Koldanov sent to a less intimidating Politburo member, Georgii Malenkov, stated his objections even less cautiously:

Regardless of the fact that Lysenko's proposal has already been ratified by GUPL and therefore my objections have no practical significance, I nevertheless consider it necessary to express my disagreement with his scheme. . . . What serves as the basis for Lysenko's ideas? Nothing in the relevant literature, nor any practice, have promoted such schemes.⁶⁸

Advocates for technocracy did not train their fire solely on high party functionaries; they also took their activism to the field, and again, the veterans of

the afforestation efforts of the 1920s, 1930s, and 1940s played a key role. Undoubtedly the most effective source of resistance was the Comprehensive Scientific Expedition for Problems of Field-Protective Silviculture, a group organized after the October decree to study local conditions and to give technical guidance to workers. The appointment of agronomists to a comprehensive study of the environment made little sense, and so trained geologists, hydrologists, and ecologists, rather than Lysenko's followers, were named to the expedition. The importance of expertise in the physical sciences, as well as the continuing influence of the Ministry of Forest Management and its allies in the Great Stalin Plan, was reflected in the choice of leadership for this expedition: the accomplished ecologist and devoted opponent of Lysenko, the academician Vladimir Nikolaevich Sukachëv.⁶⁹ In 1952, Sukachëv's lieutenant, S. V. Zonn, published an account of the main expedition's work, illustrating Sukachëv's principled efforts to lessen the import of the August 1949 law:

After the first year of the application of the nest method, subsequently accepted as the single most important means of cultivating the stands, its shortcomings were observed, and the leader of the expedition [Sukachëv] issued a series of critical remarks, aimed at the improvement of this method. In subsequent years, the expedition made concrete proposals on its [the nest method's] alteration... Zonn also noted that the expedition set for itself the goal of "enlightening" the public, and especially partisans of the nest method, about the method's scientific underpinnings. Because the expedition featured a great many ecologists who felt, as Zonn remembered, that the "creation of the forest shelterbelts in all geographic conditions by means of a single method—nest planting—ignored the constant interaction of the created stands with their complex environment," it is safe to conclude that Sukachëv almost certainly recommended that workers dispense with the method, at least in some cases.⁷⁰

The activities of Sukachëv's expedition appear to have had the desired effect. Even after the August 1949 law mandating the nest method for the establishment of new forest, government officials, such as the leader of afforestation in Chkalov province, felt comfortable deviating from prescribed norms:

Many *komsomoltsy* [Young Communists] and other young people of the Chkalovskoi [province], led by Obkom secretary Razon, promised to complete by the fall of 1952 the work of planting one hundred kilometers of government forest shelterbelt ... from Chkalov to Ilek. Hardships aside, these youth significantly overfulfilled their obligations. By the tenth of May, 148 hectares had been seeded and planted, rather than the one hundred hectares specified in the plan, of which twelve hectares were planted with the method of Academician T. D. Lysenko.⁷¹

The proud tone of this account shows that even for motivated supporters of the Stalin Plan, the state apparatus was speaking with two tongues, and it was not clear who should be heeded—official documentation that promoted Lysenko’s simple recipe for planting acorns in the shape of a four-pointed star, or temporary visitors from distant agricultural and forestry institutes who talked about complicated plans that took the local conditions into account and entailed years of follow-up work. Both schemes had their problems, and the confusion about proper methodology only aggravated them.

THE OPPOSITION ORGANIZES

Koldanov and Sukachëv pitched their critiques of Lysenko at a theoretical level, and they did not need comprehensive experimental trials to know that the nest method was doomed to failure—but beginning in 1950, they received copious evidence nonetheless. The Ministry of Forest Management held two conferences in 1950 to gauge the success of its work, specifically the nest method, which had been employed for three years and could thus be evaluated. There was little use in denying that Lysenko’s methods did not produce belts that protected themselves, but instead belts that required enormous amounts of additional work. At the first of these conferences, held in August, the director of the Stepnovskii forest planting station contended that

[the experiments with the nest method] prove that the official method must be changed. Across Rostov province, the trees under the cover of agricultural crops developed weakly and then died. Lysenko has said that the agricultural and forest crops will work together to attack weedy vegetation. But in fact the forest and age crops compete for water. Under the cover of wheat and barley, the oaks died completely.⁷²

By the time of the second conference, held in December 1950, the survival rates had grown even worse. The head of the Kursk administration reported that “ninety-five percent of [the Kursk] belts were sown with agricultural crops—oats, vetch, millet, and buckwheat, but of the 1255 hectares [sown], forty-seven hectares were found in good condition, thirty-nine in satisfactory condition, and 1169 [ninety-three percent] in poor condition.”⁷³ The head of the Ministry of Forest Management and a director named Masliannikov danced around the obvious—that to survive, artificial forests need to be cared for, even if the scale of the Stalin Plan made such care difficult or impossible:

Bovin: Planting 660 nests per hectare—this is hellish work. Can you handle ten thousand hectares?

Masliannikov: When we began to see what was happening with the nest method, we saw the danger. We began to provide care for the stands; we cleared them from weeds—then we had to remove the agricultural crops.

Bovin: Were the results better where there was no weeding?

Masliannikov: We found that the nest method gives best results if the covering crops are removed and comprehensive care is given to the seedlings.⁷⁴

Sukachëv and Zonn wrote to Koldanov to inform him that as of September 1951, 100 percent of the nested forests in the Ural territorial administration had died.⁷⁵ By that time, two clear patterns had emerged: first, the nested forests died off as time went by for lack of care, and second, the farther south a forest was sown, the more likely it was to die.⁷⁶

By the summer of 1951, evidence of the nest method's drawbacks gave Koldanov and the Ministry of Forest Management sufficient confidence to criticize the policy publicly, yet Lysenko's popularity still prevented them, for the time being, from effecting meaningful change.⁷⁷ GUPL held its annual conference in March 1951 with Lysenko in attendance, and although a few brave voices dared mention the poor results of the nest method in Russia's southern regions, Lysenko and his allies drowned them out.⁷⁸ His basic theories about cooperation among plants were still correct, Lysenko maintained, but he had discovered that tilled crops, such as potatoes or melons, sometimes provided better cover for baby oaks than did grain crops. If the instructions had produced occasionally poor results, it was due to an excessively legalistic interpretation of his prescriptions:

Chekmenev: We have been talking about the ability of tilled crops to protect the seedlings. It is more difficult to cultivate tilled crops, but it is possible, and it must be done. And in the instructions this must be mentioned.

Lysenko: But where in the instructions were tilled crops forbidden? In the instructions, it was said that *predominantly*...

[Presidium]: That means that they were not forbidden!⁷⁹

Lysenko's original instructions mentioned only rye, wheat, and similar plants, and made no mention of potatoes or tilled crops, so to his way of thinking, he was not to blame if no one had thought to use them. The assembly, reassured

that the theoretical basis of the nest method was sound, resolved that the “nested sowing of oak elaborated by Academician Lysenko, with the corrections noted, fully justifies itself and should be recommended for future planting seasons, with some additions,” rejecting six amendments that would have introduced variations in the instructions for soil and climatic conditions.⁸⁰

It was only after the 1952 planting, after another year of dismal returns, that the nest method was finally nudged aside. GUPL’s internal reports offered increasingly distressing statistics, such as this 1952 report about the survival of the nest method on the eight large state shelterbelts (all figures given in percentages):

Belt	>5,000 seedlings/hectare	2,500-5,000	<2,500
Chapaevsk-Vladimirovka	10.6	7.9	81.5
Vishnevaia-Caspian Sea	9.0	13.9	77.1
Saratov-Astrakhan	18.6	17.9	63.5
Kamyshin-Stalingrad	15.4	37.9	46.7
Voronezh-Rostov	51.0	15.1	33.9
Penza-Kamensk	53.3	28.4	18.3
Belgorod-River Don	72.3	16.4	11.3
Stalingrad-Cherkessk	77.0	11.8	11.2
Total	32.8	19.3	47.9 ⁸¹

Because plots supporting fewer than 2,500 seedlings per hectare were generally recognized by afforestation experts to be dead and in need of complete reconstruction, GUPL’s own numbers indicated that fully half of the nest method forests had died, and the first two belts were near-total losses.⁸² Worse still, GUPL received signs that even their successes might be mirages, that the favorable statistics had been falsified. Chekmenev never repudiated the nest method and refused to acknowledge these failures, but his reports were made available to the Ministry of Forest Management, who used them, beginning in 1952, to openly assault not only Lysenko and his ideas, but GUPL as a whole. At the March 1952 conference, the head of the Saratov territorial administration held nothing back:

The reason for the high death rate of the forest plantations is not the planting of oaks in nests per se, but the covering agricultural crops. The largest die-off was in the state shelterbelt of Chapevsk-Vladimirovka, which has almost completely died. But it is not so much we who are guilty, perhaps as those who defined the tasks.... We and the province organizations warned, requested, objected, but they would not listen to us.⁸³

Koldanov used GUPL reports, as well as his own data, to compose a letter to Georgii Malenkov in February 1952 condemning almost every aspect of GUPL's management. Only 2.2 percent of the new forests in Astrakhan province, he reported, were in satisfactory condition, and Lysenko had "brushed aside all recommendations and advice given to him by foresters, denouncing these experts as reactionaries, denying accepted facts and proposing unheard of ideas, such as the so-called 'friendship' of grain crops with oaks."⁸⁴ Worst of all, Koldanov wrote, millions of rubles would be needed to repair the damage done. Because each hectare of damaged forest cost five hundred rubles to repair, four hundred million rubles were needed.⁸⁵

On March 25, 1952, Koldanov finally received the answer he had petitioned for, providing him with the freedom to create new forests conforming to geography. The Council of Ministers:

judged the application of a formulaic method of creating protective stands inexpedient, and accepted the necessity of a differential technique for the creation of new forests depending on local conditions, with the mandatory use of accumulated local experience and the allowing of wide flexibility in the matter of protective afforestation.⁸⁶

It was already too late to change the 1952 instructions, but the Ministry of Forest Management began excitedly revising its plans in preparation for the 1953 planting season. There arose renewed enthusiasm, according to a pair of forest engineers working near Stalingrad and Astrakhan, and a short period of "creative initiative ... in bringing to life the Stalinist plan for the transformation of nature."⁸⁷ On March 5, 1953, the deputy head of the Ministry of Forest Management proudly announced that "beginning in spring 1953, the sowing of oak without the simultaneous planting of appropriate secondary species will be forbidden," and the plantation types devised by GLO but shelved since 1949 would be resurrected. "The experience of the past four years, comrades, has taught us much," the head of the Saratov territorial administration proclaimed at the same conference, "but the gloomy days of the past are behind us."⁸⁸ That night, Stalin died.

On March 15, six days after Stalin's funeral, the Ministry of Forest Management was liquidated.⁸⁹ In a rejection of Stalin's forest policy, which had tended to favor forest conservation policy rather than the demands of the industrial bureaus, the duties of the Ministry of Forest Management were transferred to the Ministry of Agriculture, the timber cutting bureaus were provided with a freer hand, and all programs related to forest health fell into deep decline. The number of workers assigned to forest management in Moscow fell from 927 to 342 in the space of six months, a drop of 62 percent, and then to 120 workers after a year. From the regional administrations, 701 workers out of 1,458 were let go.⁹⁰ Koldanov sent a series of alternatively angry and despairing

letters to Khrushchëv asking about why the state had chosen to forsake forest conservationism and afforestation:

Since the time that the Ministry of Forest Management of the USSR was eliminated, the administration of forests has not improved, but continues to get worse. I wish to know the true motives for such an incomprehensible reorganization, carried out rudely and spitefully ... and why the capital investment in forest management has fallen from 217 million rubles in 1952 to 40 million in 1955.⁹¹

Despite Koldanov's pleas, Nikita Khrushchëv and Lavrentii Beria (the chief of the secret police and Stalin's most likely successor at the time) threw their hands up when confronted by the looming repair costs and inevitable protests from Lysenko's followers, and issued a joint decree in the spring of 1953 eliminating the GUPL.⁹² The Great Stalin Plan rapidly receded from the public eye.

CONCLUSION

The Great Stalin Plan met almost none of its stated goals. The climate of Russia did not change. The eight great shelterbelts designed to stop Central Asian winds from blowing across Russia were only half completed, as this table shows:

Name of Belt	Planned size (in hectares)	Planted (in hectares)	Percentage complete
Saratov-Astrakhan	13,200	6,400	49
Penza-Kamensk	13,700	9,700	71
Kamyshin-Stalingrad	4,800	4,800	100
Chapaevsk-Vladimirovka	17,400	5,400	31
Stalingrad-Cherkessk	18,500	6,200	33
Vishnevaia-Caspian Sea	27,900	8,000	29
Voronezh-Rostov-on-Don	11,500	6,800	59
Belgorod-River Don	3,100	3,000	98
Total	110,100	50,300	46

Less than half of the area planned for sowing was afforested, but the actual results were worse still. According to a letter Koldanov sent to Malenkov, more than half of the seedlings sown between 1949 and 1953 had died by 1954.⁹³ As a result, the resulting belts took on a patchy appearance. If massive forest belts could block Central Asian winds—and this was always a dubious proposition—then the great gaps allowed the gusts to blow right through. The belts were even spottier in the drier southern regions of Russia: in the 1970s, a German geographer named Peter Rostankowski investigated satellite photos of the shelterbelts created during the Great Stalin Plan and could

see quite clearly that the shelterbelt strips, jagged and zigzagging in the best of conditions, “stop[ped] at the boundary of the semidesert zone.”⁹⁴ The plans for protective forests around the fields of the collective farms fared even worse: originally planned were 5.6 million hectares of new forests, but only one million were planted, of which only about four hundred thousand hectares survived.⁹⁵ As a whole, the collective farms and the Ministry of Forest Management completed only about 20 percent of the original quota, at an expense never calculated.

Yet the Great Stalin Plan was not a complete failure because the underlying rationale for the original decree, before it was twisted into a scheme to change the climate of Russia, had real merit. Four hundred thousand hectares of field-protective forests were successfully established—more in four years than in all the years before—and when researchers investigated 573 fields that had been ringed with forest belts, they found respectable increases in yield:

Less than 1	centner/ hectare	174 cases
1–2	centners/hectare	90 cases
2–3	centners/hectare	45 cases
3–4	centners/hectare	23 cases
4–5	centners/hectare	14 cases
More than 5	centners/hectare	30 cases ⁹⁶

The observed increases in yield, it was demonstrated, were best attributed to better snow retention and increased soil moisture rather than to the forest’s ability to block hostile winds from afar. One study from Novocherkassk indicated that winter wheat harvests equaled twenty-eight centners per hectare near the forest belt but only 20.5 centners at the center of the field, indicating that proximity to the forest itself wrought a salubrious influence.⁹⁷ If it is true, as Koldanov claimed, that every hectare of forest protected thirty-three hectares of field, and the average increase per hectare equalled two centners, then the afforestation work conducted from 1949 to 1952 produced an annual benefit of twenty-six million centners of grain per year for years to come.⁹⁸

If the modest improvements wrought by the plan, however, compare unfavorably to the original goals, this is because inside Soviet state ideology dwelled two impulses that were not entirely compatible, or at least could not both predominate simultaneously. The Great Stalin Plan for the Transformation of Nature, like perhaps all grand afforestation schemes carried out by dictatorial regimes, emerged from the confluence of mutually interdependent, apparently complementary, but actually opposing motivations. Before the Great Stalin Plan’s announcement in 1948, Soviet afforestation efforts reflected a romantic, promethean desire to restore a landscape to a primeval state not yet damaged by human activity, but also a technocratic belief that scientific experts should carry out the restoration. These motivations coexisted in a balance in which,

until 1948, technocracy generally predominated, although always invigorated and sustained by promethean optimism. The result was steady progress in the science of afforestation. However, when prometheanism, in this case represented in a near-pure form by Lysenko, moved from a supporting to a dominant role, irreconcilable differences emerged. (Other episodes in Soviet science reflect the difficulty in serving two masters: the Soviet nuclear weapons program, famously, was shielded by Stalin from ideological interference, while in the Soviet social sciences, prometheanism generally held sway.) After Lysenko took control of the Main Administration for Afforestation, Soviet afforestation gained its second master, one no longer aimed at creating a landscape that accorded with nature's dictates but rather at creating an improved nature.

Put another, more speculative way, the Stalin Plan failed because prometheanism is a necessary ideological component for sweeping afforestation projects, but only in a secondary role. Without promethean impulses, programs for aggressive ecological reconstruction would never emerge, but a surfeit of prometheanism leads to their implosion. When both impulses competed for domination in afforestation, the two ideals, rather than cooperating as congruent forces as James Scott suggests, produced conflict and confusion. And because the Soviet leadership found both the technocratic and the promethean approaches appealing, Stalin's successors were unwilling to choose which force would predominate after it became clear that such a choice would be necessary. Additional research may reveal whether the same is true for the German, Italian, and Chinese afforestation projects, but in the Soviet case, the plan fell far short of expectations, with large-scale afforestation set aside for almost ten years due to a contradiction hidden in the foundation of authoritarian environmentalist endeavors.

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NOTES

1. Afforestation, it perhaps goes without saying, is not solely an authoritarian enthusiasm. Nondictatorial regimes have sometimes championed the merits of wide-scale afforestation as well. The American effort, which lasted from 1935 to 1942, illustrates this. For an excellent review of the dynamics of the American afforestation program, see Wilmon H. Droze's *Trees, Prairies, and People* (Denton: Texas Woman's University, 1977).
2. The *Dauerwald*, a management scheme emphasizing forest health and beauty rather than output, required forest owners to maintain uneven aged stands on the grounds that such plantations were more ecologically and economically stable. In addition,

- Göring's policies prohibited forest owners from clearcutting more than 2.5 percent of their holdings, and banned the logging of all conifers younger than fifty years of age. See Michael Imort, "Eternal Forest—Eternal Volk': The Rhetoric and Reality of National Socialist Forest Policy," in *How Green Were the Nazis?*, ed. Franz-Josef Brüggemeier, Mark Cioc, and Thomas Zeller (Athens: Ohio University Press, 2005). Anna Bramwell has also explored the ecological aspirations of authoritarian regimes, especially with regard to German fascism, in *Ecology in the 20th Century: A History* (New Haven: Yale University Press, 1989).
3. Aldo Povari, "The Fascist Government and the Restoration of Italian Forests," *Forestry* 1, no. 8 (1934): 72-3. In its first years of existence, the fascist regime limited itself to legislative measures, but with the creation of the National Forest Militia in 1927, a more active approach was taken. The militia reforested 41,450 hectares between 1928 and 1933. In coordination with the Forest Militia, Benito Mussolini's brother Arnaldo founded the National Committee for Forestry, a body whose aim was "to send out to every citizen, and above all to the Fascist youth, the call for a rebirth of the nation's forests."
 4. *China's Forestry* (Beijing: China Forestry Publishing House, 2000), 3-4. Additional descriptions of the Chinese program can be found in Sandra Postel and Lori Heise, *Reforestation of the Earth* (Worldwatch Paper 83) (Washington DC: Worldwatch Institute, 1988), and Aisha Ram, "Reforestation Successes in China," *Panoscope* no. 3 (Alexandria: Panos Institute, 1987).
 5. James C. Scott, *Seeing Like a State* (New Haven: Yale University Press, 1998).
 6. Scott, *Seeing Like a State*, 340.
 7. Charles Ziegler, *Environmental Policy in the USSR* (London: Frances Pinter Publishers, 1987), 26.
 8. Philip Pryde, *Conservation in the Soviet Union* (Cambridge: Cambridge University Press, 1972), 17.
 9. Douglas R. Weiner, *A Little Corner of Freedom* (Berkeley: University of California Press, 1999), 89. Weiner differs from most authors in that he does not wholly condemn the plan. He contends that the Stalin Plan "cannot be characterized as 'good' or 'bad'" because the project did assist in controlling erosion in some places, and he notes that "many influential scientists and conservation activists consider the Plan's eventual abandonment to have been a mistake." See *A Little Corner*, 92.
 10. David Joravsky, *The Lysenko Affair* (Cambridge: Harvard University Press), 141-42.
 11. Mark Bassin has analyzed this conflict, although using the term "naturalism" rather than "technocracy," and sees it operating not only in Soviet science but in Marxist philosophy as a whole. See Mark Bassin, "Nature, Geopolitics and Marxism: Ecological Contestations in Weimar Germany," *Transactions of the Institute of British Geographers*, new series, 21, no. 2 (1996): 315-41.
 12. G. I. Red'ko and N. G. Red'ko, *Istoriia lesnogo khoziaistva Rossii* (Moscow: Izdatel'stvo Moskovskogo gosudarstvennogo universiteta lesa, 2002), 314.
 13. V. V. Dokuchaev, *Izbrannye sochineniia* t. 2 (Moscow: Gosudarstvennoe izdatel'stvo sel'skokhoziastvennoi literatury, 1948).
 14. David Moon, "The Environmental History of the Russian Steppes: Vasilii Dokuchaev and the Harvest Failure of 1891," *Transactions of the Royal Historical Society* 15 (2005): 156. Moon suggests that Dokuchaev, at the very least, was aware of the intellectual trend of identifying Russia with the forest and Asia with the steppe, and his familiarity with (and admiration for) the works of Nikolai Gogol' suggest that he was fully aware of the cultural implications of Russian geography.

15. For a discussion of the interaction of scientists and cultural voices in the growing awareness of forest in destruction in late nineteenth-century Russia, see Jane Costlow's two articles, "Imaginations of Destruction: The 'Forest Question' in Nineteenth-Century Russian Culture," *Russian Review* 62 (2003): 91-118, and "Who Holds the Axe? Violence and Peasants in Nineteenth-Century Russian Depictions of the Forest," *Slavic Review* 68 (Spring 2009): 10-30. Christopher Ely also develops this theme with reference to the visual arts in *This Meager Nature* (DeKalb: Northern Illinois University, 2002).
16. "Les i step' v russkoi istorii po V. Kliuchevskomu," *Lesnoi zhurnal* 3 (March 1905): 676-77.
17. Moon provides an analysis of Dokuchaev's plans in action in the aforementioned "The Environmental History of the Russian Steppes: Vasilii Dokuchaev and the Harvest Failure of 1891."
18. According to the memoirs of a Soviet forestry minister, only six thousand hectares of field-protective belts were established before 1917, but the government planned to establish more with every passing year after 1924. See RGAE f. 538, op. 1, d. 9, l. 340.
19. GARF f. 5446, op. 1, d. 61, l. 178. For an analysis of the internal debates in the Soviet Union regarding alternative visions and plans for forestry from the 1920s through the early 1950s that gave rise to Stalin's forest protection agencies, see Stephen Brain, "Stalin's Environmentalism," *Russian Review* 69, no. 1 (January 2010): 93-118.
20. "Postanovlenie Soveta narodnykh komissarov Soiuza SSSR ob organizatsii lesnogo khoziaistva," *Lesnoi spetsialist* 7-8 (July-August 1931): 9-10.
21. RGAE f. 9465, op. 1, d. 41, ll. 132-33.
22. RGAE f. 9465, op. 1, d. 59, l. 6.
23. M. G. Zdorik, "Perspektivy razvitiia lesnogo khoziaistva vodookhrannoi zony v tret'em piatiletii," *Za zashchitu lesa* 5 (May 1938): 8-9. Although the full name of the administration was the *Glavnoe upravlenie lesookhrany i lesonasazhdenii*, it was commonly called *Glavlesookhrana*, or GLO for short.
24. RGAE f. 9449, op. 1, d. 8, l. 119.
25. N. N. Stepanov, "Tipy lesnykh kul'tur," *Za zashchitu lesa* 3 (November 1937): 31. *Opodzolivanie*, or "podzolization," refers to the process whereby acidic organic materials in the soil decompose under wet conditions, leaching the organic material and soluble minerals (such as iron and aluminum) into layers far below the surface, where these nutrients are less available to young plants.
26. GLO did ratify and prescribe different planting patterns for each environment; damp pine forests were to be planted with pine, yellow acacia, and birch in this pattern (P = pine; A = Yellow acacia; B = birch): P PA P PA BA, plowed to a depth of 12-15 centimeters and rows 0.7 meters apart. GLO established seventy-nine different planting patterns, although the details changed periodically. See RGAE f. 9449, op. 1, d. 2041.
27. RGAE f. 9449, op. 1, d. 2214, l. 5. GLO's quota for the truncated fourth Five-Year Plan was to be 968,000 hectares, or 193,600 hectares per year. This compared quite favorably, GLO's leaders claimed, to achievements in countries like Switzerland, which afforested only 340 hectares per year. See RGAE f. 9449, op. 1, d. 2069, l. 4.
28. RGAE f. 9449, op. 1, d. 2214, ll. 77, 21.
29. RGAE f. 9449, op. 1, d. 2214, l. 65.
30. Despite the war, plantings continued, albeit at a curtailed rate. 38 percent of 1940's total was planted in 1941, 5.7 percent in 1942, 6.1 percent in 1943, 13.2 percent in 1944, and 26.6 percent in 1945. See GARF A-259, op. 6, d. 3520, l. 20. It is noteworthy, and emblematic of the importance accorded to forestry matters in the Stalin era,

- that even during the darkest days of the war, afforestation never ceased completely, and it started up again before victory was guaranteed.
31. RGAE f. 538, op. 1, d. 16, l. 103. The decree instituting the Ministry of Forest Management explicitly specified as an objective of the new ministry “the afforestation of the steppe and of drought regions, especially in Povolzh’ia, the eastern parts of the Ukrainian republic, and the Kulundinskii and Baraninskii steppes of Central Asia.” See RGAE f. 9466, op. 1, d. 22b, l. 2.
 32. RGAE f. 9466, op. 1, d. 23, l. 4.
 33. RGAE f. 243, op. 1, d. 1, ll. 1, 21.
 34. RGAE f. 9466, op. 1, d. 23, l. 18.
 35. Zhores Medvedev, *Soviet Agriculture* (New York: W. W. Norton and Company, 1987), 132-142.
 36. RGAE f. 9466, op. 1, d. 73, l. 48.
 37. RGAE f. 538, op. 1, d. 9, l. 244. Apparently, the question of who would carry out the bulk of the afforestation work on the collective farms was a prominent matter of dispute: “Some considered forest planting to be a task only of the state,” Koldanov remembered, “and others, on the contrary, a task for the collective farmers. The review of the dispute from an economic, legal, and technical point of view allowed [the conference] to come to an agreement about the collective farm plantings.” See RGAE f. 538, op. 1, d. 9, l. 243.
 38. The formal name of the decree was “On the Plan for Field-Protective Afforestation, the Adoption of Grass-Field Crop Rotation, and the Construction of Ponds and Reservoirs to Ensure High and Stable Harvests in the Steppe and Forest-Steppe Regions of the European Part of the USSR.”
 39. The belts were to be established at the following locations: a 900-kilometer belt from Saratov to Astrakhan along the Volga River; a 600-kilometer belt from Penza to Kamensk along the northern Donets River; a 170-kilometer belt from Kamyshin to Stalingrad; a 580 kilometer belt from Chapaevsk to Vladimirovka; a 570-kilometer belt from Stalingrad to Cherkessk; a 1,080-kilometer belt from Vishnevaia to the Caspian Sea along the banks of the Ural River; a 920-kilometer belt from Voronezh to Rostov-on-Don paralleling the Don River; and a 400-kilometer belt from Belgorod to the River Don. See “O plane polezashchitnykh lesonasazhdenii, vnedreniia travopol’nykh sevooborotov, stroitel’stva prudov i vodoemov dlia obespecheniia vysokikh i ustoiichivvykh urozhaev v stepnykh i lesostepnykh raionakh evropeiskoi chasti SSSR,” *Lesnoe khoziaistvo* 1 (October 1948): 2-3.
 40. *Zashchitnye lesnye nasazhdeniia v bor’be s zasukhoi i navolneniiami* (New York: East European Fund, Inc.: 1952), 3.
 41. Kremensov claims that “it was the Cold War that consolidated Soviet science, giving it its final form an enduring character.” See Kremensov, *Stalinist Science*, 9.
 42. For an example of an attempt to portray the Great Stalin plan as a proxy fight in the developing Cold War, see P. V. Vasil’ev, “Razval teorii i praktiki burzhuaznogo lesnogo khoziaistva v kapitalisticheskikh stranakh,” *Lesnoe khoziaistvo* 2 (December 1949): 11-17.
 43. RGAE f. 9466, op. 1, d. 140, l. 5.
 44. “O plane polezashchitnykh lesonasazhdenii, vnedreniia travopol’nykh sevooborotov, stroitel’stva prudov i vodoemov dlia obespecheniia vysokikh i ustoiichivvykh urozhaev v stepnykh i lesostepnykh raionakh evropeiskoi chasti SSSR,” *Lesnoe khoziaistvo* 1 (October 1948): 2-3.
 45. RGAE f. 243, op. 1, d. 8, l. 201.

46. Valeri Soyfer, *Lysenko and the Tragedy of Soviet Science* (New Brunswick: Rutgers University Press, 1994), 1.
47. According to Loren Graham, the term vernalization eventually came to be used by Lysenko “for almost anything that he did to plants, seeds or tubers... For example, when he planted potatoes he first allowed the sections of the potatoes to sprout before placing them in the ground. This is a practice known the world over and used by gardeners for centuries, but to Lysenko it was vernalization. He often soaked seeds before planting them, calling this vernalization, despite the fact that farmers and gardeners have also long done this to certain seeds.” See Loren Graham, *Science in Russia and the Soviet Union* (Cambridge: Cambridge University Press, 1993), 124-25.
48. For a discussion of the triumph of Lysenkoism as a scientific movement, see Ethan Pollock, *Stalin and the Soviet Science Wars* (Princeton: Princeton University Press, 2006).
49. For a discussion of the August 1948 meeting, see Nikolai Kremmentsov, *Stalinist Science* (Princeton: Princeton University Press, 1997), 158-83, as well as David Joravsky’s aforementioned *The Lysenko Affair* and Loren Graham’s *Science in Russia and the Soviet Union* (Cambridge: Cambridge University Press, 1993).
50. I. I. Khanbekov, “Bor’ba za razvedenie lesov v stepi,” *Lesnoe khoziaistvo* 1 (October 1948): 45-9. Lysenko wrote in his main theoretical explication of the matter: “In the spring of 1949 on the fields of scientific research institutions in different regions of our country, and also in leskhozoy and a few sovkhozoy and kolkhozoy, more than two thousand hectares of acorns were planted with the nest method” (T. D. Lysenko, *Posev polezashchitnykh lesnykh polos gnezhdovym sposobom* [Moscow: Izdatel’stvo Akademii Nauk SSSR: 1950], 6).
51. Both Soyfer and Medvedev have commented upon the analogy between Lysenko’s description of plant life and the relationships that would ostensibly prevail among humans under communism. For Lysenko’s description, see *Posev*, 23.
52. *Ibid.*, 4.
53. *Ibid.*, 7.
54. RGAE f. 243, op. 1, d. 12, l. 85. The speaker of these words was the head of GPUL, E. M. Chekmenev.
55. Lysenko, *Posev*, 4.
56. *Zashchitnye lesnye nasazhdeniia v bor’be s zasukhoi i navolneniiami* (New York: East European Fund, Inc.: 1952), 18.
57. The total area to be afforested under the Great Stalin Plan was calculated at 5,709,000 hectares. Of this, the Ministry of Forest Management was to plant 1,536,500 hectares, while the collective farms were to plant 3,529,500 hectares, albeit with the Ministry of Forest Management supervision. State farms (*sovkhozoy*) were to make up the balance, 580,000 hectares (RGAE f. A-337, op. 1, d. 1183, l. 85).
58. RGAE f. 243, op. 1, d. 42, l. 70.
59. RGAE f. 243, op. 1, d. 42, l. 193.
60. RGAE f. 243, op. 1, d. 42, ll. 206-7.
61. RGAE f. 243, op. 1, d. 11, l. 28.
62. RGAE f. 243, op. 1, d. 11, l. 114.
63. RGAE f. 243, op. 1, d. 133, ll. 19-24.
64. Other authors have contended that the nest method was the prescribed technique from the very beginning of the Stalin Plan, but this 1949 decree contradicts that claim. See RGAE f. 9466, op. 1, d. 243, l. 53.
65. RGAE f. 9466, op. 1, d. 142, ll. 67-8.

66. At 7 p.m. on June 13, 1947, Koldanov, as well as other representatives from various forest bureaus, met with Stalin and other members of the Politburo in Stalin's Kremlin office. Most of the meeting concerned timber mills in the Russian Far East, but when the deputy minister of Ministry of Forest Industry indicated that he was interested in logging some rare birch stands, Koldanov demurred. All waited anxiously for Stalin's reply. After puffing on his pipe, Stalin said "I know that place well; I swam there in my time ... back in 1913 I ran around there." And with that remark, the group moved on to another subject, the forest placed off limits. See RGAE f. 538, op. 1, d. 17, ll. 1-7.
67. RGAE f. 538, op. 1, d. 1, ll. 239-40.
68. RGAE f. 538, op. 1, d. 1, ll. 228-31.
69. Sukachëv intensely disliked Lysenko and what he stood for, but his response to Lysenkoism was a calm faith that "this too shall pass." When one of Sukachëv's students, in the dangerous and depressing days following the August 1948 VASKhNIL meeting, urged him to confront Lysenko directly, Sukachëv answered (more than once): "It is important to protect scientific cadres, to decrease as much as possible the damage of these decisions, to impede pseudoscientific research.... There will come a time, it *can't* not come, when our science will again develop unmolested" (T. A. Rabotov, "O Vladimire Nikolaeviche Sukacheve," A. L. Ianshin, ed., *Vladimir Nikolaevich Sukachev: ocherki, vospominaniia sovremennikov* [Leningrad: Izdatel'stvo "Nauka," 1986], 148). Readers may also be interested in Douglas Weiner's *A Little Corner of Freedom* for discussions of Sukachëv's scientific activities.
70. S. V. Zonn, *Otchet o deiatel'nosti kompleksnoi nauchnoi ekspeditsii po voprosam polezashchitnogo lesorazvedeniia za 1949-1952 gg.* (Moscow: Izdatel'stvo Akademii Nauk SSSR, 1955), 3; 9.
71. "Komsomol'sko-molodezhnaia gosudarstvennaia lesnaia polosa," *Lesnoe khoziaistvo* 2 (July 1949): 10.
72. RGAE f. 9466, op. 1, d. 216, l. 16.
73. RGAE f. 9466, op. 1, d. 218, l. 7.
74. RGAE f. 9466, op. 1, d. 218, ll. 5-6.
75. RGAE f. 548, op. 1, d. 1, l. 444.
76. As of early 1951, belts in the forest-steppe zone died 12.2 percent of the time; in the steppe zone, 18.3 percent; in the dry steppe, 37.5 percent, and in the semidesert, 45.5 percent. These numbers grew worse with time (RGAE f. 9466, op. 1, d. 327, l. 14).
77. On August 7, 1951, the Ministry of Forest Management issued a decree calling the nest method into question by indicating that "in 1951 there were 992 hectares of nested oak under the cover of agricultural crops in the Kamyshin-Stalingrad belt; but with the onset of high temperatures and dry winds, these died completely by July 15, 1951." On July 27, 1951, the Ministry of Forest Management upbraided the Ministry of Agriculture for "not implementing the needed guidance for the care for forest plantings" and for allowing the forest to be "trampled by cattle, destroyed by fire, and harmed by sowing with crops." See RGAE f. 538, op. 1, d. 9, ll. 206, 208-09.
78. Speakers at the 1951 conference seem to have felt free to make cutting statements. The director of the Voronezh forest management institute stated quite bluntly, "It seems to me that an indisputable proposition should be that the universality of no matter what method in different natural conditions, is undoubtedly mistaken." RGAE f. 243, op. 1, d. 327, l. 156. Lysenko's influence likely evinced itself most not so much in any hostile treatment that dissenters received, but in creating an atmosphere in which reporters tended to edit out inconvenient information. At a November

- 1951 meeting about the nest method held in the Tatar republic, one reporter noted: “Early sowing, under the cover of grain crops, did not give good results. Therefore I wrote nothing about it in my report” (RGAE f. 243, op. 1, d. 329, l. 28).
79. RGAE f. 243, op. 1, d. 328, l. 9.
 80. RGAE f. 243, op. 1, d. 328, ll. 234-46.
 81. RGAE f. 243, op. 1, d. 481, l. 2. In contrast, forests planted with the traditional row method featured 5000 or more seedlings per hectare 42.5 percent of the time, between 2,500 and 5,000 seedlings 27.7 percent of the time, and fewer than 2,500 seedlings 26.9 percent of the time—demonstrably better figures, and in 1951 these figures improved to 51 percent, 27 percent, and 19 percent, respectively (RGAE f. 243, op. 1, d. 481, l. 8).
 82. In a 1952 letter from the head of the Ministry of Forest Management to Chekmenev, it was indicated that all densities under 2,500 seedlings per hectare should be considered dead (RGAE f. 538, op. 1, d. 11, l. 512).
 83. RGAE f. 9466, op. 1, d. 373, ll. 40, 51).
 84. RGAE f. 243, op. 1, d. 481, ll. 42, 48-9.
 85. RGAE f. 243, op. 1, d. 481, l. 42. The cost of rehabilitating an oak forest, Koldanov reported, could reach a thousand rubles per hectare.
 86. RGAE f. 538, op. 1, d. 11, l. 449.
 87. RGAE f. 438, op. 1, d. 11, l. 452.
 88. RGAE f. 9466, op. 1, d. 471, l. 107.
 89. RGAE f. 9466, *predislovie*, l. 2.
 90. RGAE f. 538, op. 1, d. 1, l. 212; RGAE f. 538, op. 1, d. 2, l. 14; RGAE f. 538, op. 1, d. 2, l. 260.
 91. RGAE f. 538, op. 1, d. 1, l. 124.
 92. RGAE f. 538, op. 1, d. 16, l. 104.
 93. Koldanov indicated that 52.9 percent of collective farm belts had died by 1954, 36.5 percent of belts planted on gullies, and 51.3 percent of state shelter belts (RGAE f. 538, op. 1, d. 1, l. 20).
 94. Peter Rostankowski, “Transformation of Nature in the Soviet Union: Proposals, Plans and Reality,” *Soviet Geography* 23 (June 1982): 389. The belts are still visible today from space, as can be seen using Google Earth. To see a belt, visit the following link: <http://maps.google.com/maps?t=h&hl=en&ie=UTF8&ll=49.487977,44.911423&spn=0.135599,0.267105&z=12>. The belt appears as three parallel green lines crisscrossing the landscape.
 95. In 1949, the Ministry of Agriculture planted 152,000 ha of forest, in 1950, 368.2, in 1951, 260, and in 1952, 257.2; see RGAE f. 538, op. 1, d. 1, l. 355 and RGAE f. 538, op. 1, d. 9, l. 340. The total number of field protective belts, including those planted on collective farm lands by the Ministry of Forest Management, equaled 1.295 million hectares; 48 percent of these had died by January 1, 1954, and more than 200,000 hectares died over the next three years (RGAE f. 538, op. 1, d. 1, l. 130).
 96. RGAE f. 538, op. 1, d. 2, l. 277. Positive results were obtained throughout the country: along the Volga, in Stalingrad province, alfalfa yields improved from 6.2 centners per hectare to 7.0, and spring wheat from 9.7 to 12.3. In central Ukraine, in Dnepropetrovsk province, winter wheat yields increased from 6.0 to 7.5 centners per hectare. A centner is equal to fifty kilograms.
 97. RGAE f. 538, op. 1, d. 11, l. 109. Similar findings came from a nearby collective farm, where winter wheat yields within one hundred meters of the forest were 33.5 centners per hectare, but only 25.7 centners per hectare more than three hundred meters from the belt.
 98. Vasil’ii Koldanov, “Oblesenie stepei nashei rodiny,” *Priroda* (May 1958): 59.