

Exotic Plant Management
Klondike Gold Rush
National Historical Park



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ABSTRACT

In 2005 a natural shift from exotic plant inventory to control was made in the Klondike Gold Rush National Historical Park (KLGOP). Survey data collected in 2000 and 2004 were used this spring to develop an exotic plant control plan. In 2005, a total of 317 hours were devoted to exotic plant management. A total of 23 exotic plant species were found. This number includes 3 new plants, bird vetch (*Vicia cracca*), common tansy (*Tanacetum vulgare*), and sticky ragwort (*Senecio viscosus*). 221 hours were spent manually removing exotics with 114 hours devoted solely to the removal of common eyebright (*Euphrasia nemorosa*) in Nelson Slough.

KEY WORDS

Exotic plants, Klondike Gold Rush National Historical Park, Survey, Control, Alaska

INTRODUCTION

Overview

The idea of control of exotic plant species in Alaska as a natural resource management perspective is a relatively new one. With Alaska's pristine environment, relatively cold climate, and lack of human presence, land managers have been fortunate enough to avoid the headache that their counterparts in the lower 48 states have had to endure. Things are changing though. With the ever increasing use of land from the growth in population coupled with a warming climate, Alaska is showing more of the effects that exotic plants can have on the environment.



Lower 48 headache of Butter-and-eggs

Now, land managers of Alaska's national parks are starting the initial phases of exotic plant management. This involves an accurate inventory, a regular monitoring plan, and a quick acting treatment plan with long term foresight.

Purpose

The focus of this year's exotic plant management effort on the KLGO was first, treatment of known exotic plants, second, to survey for new exotic populations, and third, the continued monitoring of park lands. Extensive surveys of the park have been performed in 2000 (Furbish and Jorgenson 2001) and 2004 (Delost 2004). This year's task was to use that information to develop and implement a control and eradication plan for exotic plant species in the park.

Similar to last year, a majority of the control efforts were implemented at the Nelson Slough area. The white sweet-clover (*Melilotus alba*) problem in Skagway was also a major focus. Monitoring of the roadsides from Skagway to Dyea after the recent road improvement work revealed many small populations of exotics. In addition, there was continued monitoring of the Chilkoot trail all the way through the Canadian side to Bennett Lake. By keeping eyes in tune to exotic species a number of new exotic plant infestations were identified in other areas as well. Monitoring of the White Pass Unit was put on hold due to time and logistical restraints.

History of the Area

Skagway and Dyea, Alaska are located on the upper Lynn Canal in northern Southeast Alaska, at the end of the Taiya Inlet (Appendix A). They are approximately three miles apart by air and nine miles by road, each occupying the bottomlands of their respective river valleys. The Chilkoot Trail originates near Dyea and follows the Taiya River up the Taiya River Valley to the Chilkoot Pass where the trail enters Canada.

Skagway and Dyea both have rich histories as points of departure for the Klondike Gold Rush. Dyea, being the staging area for stampeders traveling over the Chilkoot Trail and Skagway as the staging area for those traveling over the White Pass Trail. At the peak of the Gold Rush (circa 1898), it is estimated that upwards of 8,000 people were present in the town of Dyea, circulating up the trail and back with goods. Both Canyon City and Sheep Camp had similar numbers of people during this time period; however, neither town grew as large as Dyea. Soon after the peak of the Gold Rush in 1898, several events took place that brought an end to the gold fever so many people had caught and Dyea soon became almost completely abandoned. At this time, the town of Skagway became the preferred site for those still interested in venturing to the Klondike, because of the completion of the White Pass railroad and Skagway's deepwater harbor, and the majority of Dyea's remaining business and families eventually moved to Skagway.

Currently, the historic town of Dyea is all but grown over with vegetation. A handful of permanent residents live nearby, but only faint reminders of the hustle and bustle of the Gold Rush days remain. Skagway, on the other hand, has experienced a renaissance of the historic downtown area, primarily due to a burgeoning cruise ship tourism industry. Many of the historic buildings downtown have been restored, successful businesses line the main streets, property values are high, and a population of around 800 year-round residents call Skagway home. Summer visitation by tourists to the Skagway and Dyea area is extremely high, with more than 750,000 visitors per summer on average arriving in Skagway, and a portion of those making their way to Dyea.

Ecology

The Skagway valley and the Taiya River valley have similar ecologies, but both are quite different than much of Southeast Alaska. The area is considered a temperate rainforest, but since both valleys lie in a rain shadow, the average annual precipitation of 27 inches is considerably less than other Southeast Alaska towns. Vegetation communities differ significantly with elevation, aspect, and disturbance regimes. Native forest in the area consists primarily of western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), devil's club (*Oplopanax horridus*), Sitka alder (*Alnus sitchensis*) and black cottonwood (*Populus trichocarpa*) plus numerous berries, mosses and lichens. At elevations above 3000', sub-alpine meadows and alpine tundra are present.

The Taiya and Skagway River valleys provide short pathways to glacier-free mountain passes connecting to the continental interior. Thus, the KLGGO area is the northern-most interior conduit for ecological exchange between the coastal rainforest ecosystem and the interior continental ecosystem. It has long been an important avenue for plant, animal, and cultural exchange, and continues to be a key site of species interchanges today (Carlson et al. 2004).

The combination of being positioned geographically at the focal point for ecological exchange between the interior and coast, and having environmental conditions unique to southeastern Alaska rainforest ecosystem, has led many ecologists to postulate that the

KLGO area is a biodiversity “hotspot” (Carlson et al. 2004) and possibly the “greatest center for plant diversity in Alaska” (Pojar and Mackinnon 1994).

METHODS AND MATERIALS

Identification

Where and what to look for was first determined from the previous reports however, the best and most direct source was KLGO Biological Technician Kevin Payne who had worked on this project last year and was a plant identification genius. Also, many hours were spent identifying plants to get an eye for what was native and what was not. The primary field guides were Weeds of Canada (Royer and Dickinson 1999) and Plants of the Pacific Northwest Coast (Pojar and Mackinnon 1994). In the office Flora of Alaska and Neighboring Territories (Hulten 1968) was used to confirm identification. Vouchers were also sent through Jeff Heys, coordinator of the Alaska Region’s Exotic Plant Management Team (AKEPMT), to the Alaska Natural Heritage Program for positive identification. Most of the plants encountered were also available at the KLGO herbarium.

Spatial Data Collection

To collect the spatial location of each infestation, Trimble GeoExplorer3 and Trimble ProXR GPS units were used. The GeoExplorer3 was the main GPS unit used due to its small size and ease of use. The ProXR GPS was turned to when the GeoExplorer3 was not accurate enough (i.e. Nelson Slough). Each of these GPS units is accurate when strict data collection techniques and standards are followed. A maximum PDOP of 6 was set, and a minimum of ten GPS readings were taken at each location. Differential correction was always run on the data for quality assurance, even when WAAS was employed for real-time corrections.

Attribute Data Collection

Both the GeoExplorer3 and the ProXR units enable the user to collect attribute data in the field using the built-in data dictionary. This feature ensures that the correct attribute data is always linked with the corresponding spatial data. For this study, a data dictionary was developed by the AKEPMT. This data dictionary was given to all National Parks in Alaska to use when collecting exotic plant information. This ensured that every member of the AKEPMT was collecting data the same way and that the data could be brought together to analyze the Alaska situation.

The collected data was downloaded into Trimble Pathfinder Office 2.90 software where the data was spatially corrected and edits were made. This data was then sent to Jeff Heys who entered all the relative information into the National Park Service’s APCAM (Alien Plant Control and Management) database. It was then converted to ArcMap shapefiles and sent back for use in KLGO GIS projects. (See Appendix G for data collection protocol (Jeff Heys 2005))

A time log of work was kept to keep track of the total hours spent working on exotic plant management.

Control Methods

Simple control methods were again employed to combat the exotic plants. Manual hand pulling was the most successful method used. The number one concern with this method was to make sure the entire root was pulled with the plant. Plants with rhizomatous root systems needed special care to remove the entire root. Most plants can grow back from just a small portion of root left in the soil. An effort was also made this season to cut the white sweet-clover at its base to retard its growth. This method was unsuccessful and has hence been replaced by manual hand pulling.

All plants removed were bagged on site and disposed of in nearby garbage cans for the effect of double bagging. This garbage was then burned in the Skagway incinerator. All this helps insure that any seeds collected with the exotic plants were not dispersed to other locations. The use of chemicals for control is not employed by the park service in Alaska.

RESULTS

Defined Work Areas

In this report 5 work areas are defined. They are as follows:

- 1) Dyea which is all the area in Dyea minus the Chilkoot trail and Nelson slough restoration site, (Appendix B);
- 2) the Nelson slough restoration site, (Appendix C);
- 3) the Chilkoot trail, (Appendix D);
- 4) the Dyea road from Skagway to the pavement in Dyea, (Appendix E); and
- 5) the town of Skagway, (Appendix F).

Species of Concern

Bird Vetch



Common Tansy



Sticky Ragwort



In a discussion with Jeff Heys, May 4, 2005, Jeff described 4 major species of concern in KLGO. Those species are: Narrowleaf hawksbeard (*Crepis tectorum*), oxeye daisy (*Leucanthemum vulgare*), butter-and-eggs (*Linaria vulgaris*), and white sweet-clover,

plus any new exotic species to the area were to be our top priorities. There were three new species identified this year. They were common tansy (*Tanacetum vulgare*), sticky ragwort (*Senecio viscosus*), and bird vetch (*Vicia cracca*). With bird vetch being one pointed out by Jeff in our conversation as a species to keep an eye out for. Also, sticky ragwort was not found in previous surveys but plenty of common groundsel (*Senecio vulgaris*) was found. This season only the sticky ragwort was found. These are similar looking plants so, one might have been confused for the other.

Dyea

The Dyea area was punctuated by massive outbreaks of oxeye daisy. There were three areas that had infestations along roads for a considerable length and one patch that was a localized point outbreak. These infestations are without a doubt coming from the Dyea road where many residents have them planted in their yards along the roadway. A total of 29 hours were spent pulling these plants. In the three areas along the road there are still many first year rosettes, which will need attention in the following years. A weekly treatment of hand pulling of these plants was activated June 16 and continued through August.



Oxeye Daisy



Narrowleaf Hawksbeard

Another major exotic of concern in this area was the patch of narrowleaf hawksbeard along the road ditch in front of the Chilkoot Trail Outpost Lodge. A weekly treatment of hand pulling was initiated July 6 and continued through September with permission from the lodge owner. A total of 16 hours were spent treating this site. There are also hundreds of first year rosettes still in the area and will need the vigilance of future treatments in the following years.

There were two small patches, less than 50 plants each, of common eyebright (*Euphrasia nemorosa*) found outside of the Nelson Slough area. One located 100m south of the entrance of the Chilkoot Trail Outpost Lodge and the other was found next to the outhouses near the Chilkoot trailhead. The latter was found on a pile of dirt brought over from the Nelson slough area. Both areas have been looked over numerous times and no new plants have been found.

The good news of the area was that the butter-and-eggs found last year about one-quarter mile west of the Taiya River Bridge on the north side of the road (Delost 2004) was nowhere to be seen.

With the priority this year towards control, many exotic plants of low priority were not recorded. Throughout the Dyea area there is pineapple weed (*Matricaria discoidea*),

plantain (*Plantago major*), sheep sorrel (*Rumex acetosella*), dandelion (*Taraxacum officinale*), and clover (*Trifolium repens*).

Nelson Slough Restoration Site

The work at the Nelson Slough restoration site continued this season where it left off last season. Almost 135 hours were spent pulling exotic plants here in 2005. A plastic sheet was placed over the restoration site last fall to retard the growth of new plants. This spring it was decided to leave it on throughout the year to kill any new sprouts that might start. It will be removed either late this fall or early next spring and seeded with Sitka spruce, wild-flag (*Iris setosa*), northern rice root (*Fritillaria camschatcensis*), and Nootka lupine (*Lupinus nootkatensis*). All seeds were collected from the site in 2004 and 2005.



Common Eyebright

The number one culprit at the site was common eyebright, which consisted of 114 hours of manual control. The work started June 28th with the first flowering plant found and continued into September. There was excellent help from a 6 person crew from SAGA (Southeast Alaskan Guidance Association). They were vital in really making a dent in the common eyebright population. Talking with Meg Hahr and Kevin Payne it seems that this year's population is close to last year's population. It is believed that a more vigilant effort was put forth this year and that the situation improved with weekly and sometimes biweekly eradication efforts during its peak flowering period. So, depending on the seed bank in the soil there should be positive results realized next season.

Also, a control effort was made on all other exotic species at this site. This included dandelion, plantain, and pineapple weed. The only exception was with clover which is out of control and has become part of the environment in some areas.

Chilkoot Trail

A monitoring effort was undertaken on the Chilkoot trail from June 11-15, 2005. Tall buttercup (*Ranunculus acris*), sheep sorrel, dandelion, and clover were all found again. The Kentucky bluegrass (*Poa pratensis*) was identified late at the trail head but not recorded. There doesn't seem to be much of a change in distribution from last year.

An effort was made again to remove the sheep sorrel at the Canyon city trail crew cabin. Twice during visits up the trail all visible plants were removed from around the helicopter pad. It is believed that in the next few years with repeated treatments the sheep sorrel can be removed from its Canyon city site.

No new exotic species were found up the trail in 2005.

Dyea Road

Extensive surveys of the Dyea road resulted in the newly recorded species common tansy and the location of several other species of concern. This road was traveled frequently via truck and bike by park biologists. The collective eyes were left open for possible infestations of exotics. Three patches of common tansy and one patch of ox-eye daisy, narrowleaf hawksbeard, and wormseed mustard (*Erysimum cheiranthoides*) each were found outside of the residential area. All of these invaders were removed and hopefully controlled. No new plants have come up in these locations.

Many other exotic species like plantain, dandelion, sheep sorrel, etc... were found along the road in numerous locations. There wasn't time or reason to survey common exotics along a road outside the park boundary.

Early in the season there was extensive road work done by the Alaska Department of Transportation to widen the road. These areas will be of utmost concern in the coming years because this construction has created prime locations for the establishment of exotic plants. Also, most of the equipment came from Juneau, AK, which might have had exotic plant seeds attached to them.

Skagway

Skagway is known as the garden city. With gardening can come many non-native plants that can escape the garden and grow where they are not wanted. This is what has happened in Skagway in some cases. It has become an overwhelming problem. The goal now is to stop the spread of these plants outside of the Skagway area and keep the problem locally contained.

Skagway contains all 4 of the species of concern identified by Jeff Heys. There is narrowleaf hawksbeard, butter-n-eggs, ox-eye daisy, and the most troubling white-sweet clover. A new plant which now belongs as the fifth plant of concern is bird vetch. This plant was found while searching and removing white-sweet clover on July 20, 2005. The bird vetch was found in full flower growing from what looked like lawn clippings. This is of special concern because this could mean it is still growing in somebody's yard in Skagway.

33 hours were spent by park biologists trying to control the white-sweet clover in Skagway plus countless hours by members of the community. Most of this work was spear headed by Amber Bethe, the head of the Tayia Inlet Watershed Council. The first control effort on June 15, 2005 cut the white-sweet clover at its base. This was found to be very successful in the Anchorage area, but turned out to be problematic in our area.

Instead of retarding the growth of the white-sweet clover it only promoted growth and new flowers. A decision to stop cutting and to pull all the white-sweet clover was made

White Sweet-Clover



July 7, 2005. This too proved to be problematic because now they had large roots with re-growth that had small stems that would break off when pulled. Repeated cuttings of up to 4 times would have been needed to hamper the spread of white-sweet clover this year. Where as pulling the whole plant once, which took only a little longer at first, would have had a greater effect with less time involved. It looks like there will be a spread of white-sweet clover next year because there wasn't the time or the people to repetitively cut the plant enough to be effective. Next years aim will be to solely pull the plant and only cut where the plant can't be pulled. Not all white sweet-clover locations on Appendix F are listed because of access issues (i.e. along airport runway)

DISCUSSION

Exotic Plant Management: 2005 vs. 2004

An emphasis on exotic plant inventorying in 2004 has allowed for an emphasis on control work in 2005. The summary of work in 2004 showed that prioritization of species is essential to make the best use of time and labor (Delost 2004). An updated priority list from 2004 was made this year with the addition of bird vetch and any other new exotic species found in controllable populations. This priority list helped focus the control efforts in areas where they would be the most effective. The survey work from 2004 showed that there is great value in first knowing what is out there and where it is. This then helped with the creation of a priority list for control work. For a complete list of exotic species from 2004 and 2005 see Table 1.

The Threat of Non-Native Plants to KLGO and the Surrounding Area

Most of the non-native plant invasions have occurred in disturbed area (e.g. road ditches and fill material). There are, however, locations where the non-native plants have established themselves in disturbed areas and are now spreading into native vegetation. This is the case at Nelson Slough where the common eyebright has established itself and is growing up through the moss and around native plants in non-disturbed areas. In general, exotic plants have a difficult time gaining a foot hold in non-disturbed areas, which is one of the reasons Alaska has not been affected much by exotic plant invasions. The lack of disturbance coupled with limited human presence and a cold climate has kept Alaska relatively safe from non-native plants. This, however, is changing. The increase in population inevitably brings with it more disturbances on the land, add to this a warming climate and you have a recipe for an outbreak in exotic plants in Alaska. This is becoming evident in the Dyea and Skagway valleys. A vigilant effort needs to continue to contain and/or remove existing exotic populations and prevent the establishment of new populations of exotics.

Table 1

Scientific Name	Common Names	Chilko ot Trail	Nelson Slough	Dyea	White Pass ¹	Dyea Road ²
<i>Capsella bursa-pastoris</i>	shepard's purse		* *			*
<i>Chenopodium album</i>	lambsquarters		*			*
<i>Crepis tectorum</i>	narrowleaf hawksbeard			* *		*
<i>Erysimum cheiranthoides</i>	wormseed mustard		* *			*
<i>Euphrasia nemorosa</i>	common eye-bright		* *			
<i>Galeopsis tetrahit</i>	hemp nettle		* *			
<i>Leucanthemum vulgare</i>	ox-eye daisy			* *		*
<i>Linaria vulgaris</i>	butter-and-eggs		* *		*	*
<i>Matricaria discoidea</i>	pineapple weed		* *	* *	*	*
<i>Melilotus alba</i>	white sweetclover	Found only in Skagway				
<i>Plantago major</i>	plantain		* *	* *	*	*
<i>Poa pratensis</i>	Kentucky bluegrass	* *		*	*	
<i>Polygonum aviculare</i>	prostrate knotweed		* *			*
<i>Ranunculus acris</i>	tall buttercup	* *	*	*	*	*
<i>Rumex acetosella</i>	sheep sorrel	* *	* *	*	*	*
<i>Rumex crispus</i>	curled dock		* *			*
<i>Senecio viscosus</i>	sticky ragwort			*		*
<i>Senecio vulgaris</i>	common groundsel		*			
<i>Silene cucubalus</i>	bladder campion		* *			*
<i>Stellaria media</i>	common chickweed		* *			*
<i>Tanacetum vulgare</i>	common tansy					*
<i>Taraxacum officinale</i>	dandelion	* *	* *	* *	*	*
<i>Thlaspi arvense</i>	field pennycress		*			
<i>Trifolium repens</i>	clover	* *	* *	* *	*	*
<i>Vicia cracca</i>	bird vetch	Found only in Skagway				
<i>Viola tricolor</i>	johnny-jump-up violet		*			

* 2004 survey results

* 2005 survey results

¹not surveyed in 2005

²not surveyed in 2004

Prioritizing

The key to effective non-native plant management planning is to prioritize species based upon their ecological impact and the feasibility to control them (Alaska Natural Heritage Program 2005). The feasibility to control a species is the easiest way to prioritize but this can cause problems (i.e. the white-sweet clover in Skagway). The feasibility of controlling white-sweet clover in Skagway after this year will be lower than what it should have been but the possible ecological impact it may have makes it necessary to continue to carry out a control effort.

After an analysis of the 2005 field season data an updated priority list can be created. Along with common eyebright and bird vetch, ox-eye daisy, white-sweet clover and butter-and-eggs outside of Skagway, and any new exotic species in controllable populations should take priority. This may seem like a long list of plants to watch out for, but right now they are in small enough populations in limited areas that it is possible to reach the goal of controlling these invaders.

Outreach

In order for land managers to be successful in minimizing the effects and the extent of exotic plants, outreach to the community and other agencies is essential. Plants don't recognize boundary lines and neither should land managers. Public education and cooperation can be achieved through presentations and community activities. For example, on June 28, 2005 KLGGO Biological Technician Dan Schultz gave a talk on exotic plants to the general public of Skagway. Discussed was the role of the NPS and what the problems with exotic plants in Skagway are. Also, contacts were made through talking with residents and having brochures available at community events. A continued effort is needed to maintain the support of the citizens of Skagway.

RECOMMENDATIONS AND PLANS FOR THE COMING YEAR

Dyea

Once flowering starts, continue weekly pulling treatments of the narrowleaf hawksbeard (approx. end of May) and oxeye daisy (approx. end of May) populations, continue searching the two isolated populations of common eyebright for new growth, and continue opportunistically monitoring all disturbed sites for new populations of exotics.

Nelson Slough

An equal effort of the last two years will be needed again in the coming year to get a handle on the non-native plant problem here. It is believed there should be a major reduction of the common eyebright unless there is still a large seed bank left in the soil. Help from the SAGA crew should be used once again during the peak flowering period (late July to early August). The plastic covering the restoration site should be removed

either late this season or early next season and re-vegetated with collected seed from the site and more transplants from the surrounding area. Care should be taken when removing the plastic as to prevent the transportation of exotic plant seeds that might be attached to the plastic. Bagging the plastic in separate bags should prevent this. Also, bi-weekly monitoring of this site will be necessary to stay on top of any new non-native plants sprouting after the plastic is removed.

Chilkoot Trail

Right now the non-native species on the trail are low on the priority list. Continued mapping of the trail and the extent of the exotic species should be done on a yearly basis to see if spread is occurring and becoming a problem. With all this said it might be reasonable to work at controlling the tall buttercup in its limited distribution above sheep camp. Also, even though the sheep sorrel is low on the priority list by itself, it is recommended that since the population at the Canyon city trail crew cabin is isolated and easy to access it should be treated anytime crews are in the vicinity.

Dyea Road

The road from Skagway to Dyea is of special concern after the past road construction. This construction has created the ideal spot for exotics plants. Not only is there a large disturbed site but the construction equipment came from out of town. This could easily allow the transport of new exotic species from out of town (i.e. Japanese knotweed (*Polygonum cuspidatum*) from Juneau). This roadside will need to be monitored continuously throughout the coming years. Anytime park biologists drive to Dyea they should be keeping an eye open for new exotic populations.

Skagway

The two species of concern that are possible to control in Skagway are white-sweet clover and bird vetch. The recommendation for the white-sweet clover is to keep at it and not get discouraged after this season's problems with cutting and re-sprouting. Also, manually hand pulling all plants and only cutting ones that are too imbedded is preferable. Even with the setbacks of this year, there is still time to get a handle on this plant. This should be the highest priority exotic in the area because of the ecological damage this plant is capable of (e.g. Stikine River, Alaska).

The other species of concern in Skagway is bird vetch. This is another high priority species that has shown to overtop and out-compete native vegetation in Alaska. Since this is such an isolated population, complete removal is possible and advised to prevent its spread. Bird vetch has proven to be extremely difficult to remove manually. It might be advised to use chemicals to eradicate it before it spreads. The affected area is extremely small and the amount of chemicals needed would not be noticeable.

Skagway has many other species in the high priority category like butter-n-eggs and oxeye daisy. The problem with managing these species here is that they are on private

and city properties and the time to obtain permission and do the work to remove the plants would be prohibitive. The idea in Skagway is to try and keep the non-natives in Skagway and to be on top of them if there is any evidence of spread outside of Skagway.

White Pass

Very little work was done on the White Pass unit of the park. This was mainly due to the workload in other areas and projects and the logistics of getting there and getting around. The Laughton Glacier trail, which is U.S. forest service land, was surveyed without any species of concern found. More monitoring of the White Pass railroad line will be needed in the future to see if species from Skagway are making their way up to the White Pass unit via the White Pass train.

KLGO Herbarium

The KLGO herbarium has an incredible array of plant vouchers that in most cases has filled the needs of the park. There are, though, a few missing plants that would be helpful to have in the future for identification purposes. An effort was started this year to fill in these holes at the KLGO herbarium. Next year it would be recommended to examine the list of plants in the herbarium and come up with a list of plants that would be useful to have added to the herbarium. Samples of the known exotic plants in the area would be especially helpful for future identification needs. A collection has already been started this year and needs to be followed through to completion next year.

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